TEXAS A&M UNIVERSITY KINGSVILLE

# South Texas Native Plant Restoration Project
# Final Report

## Technical Report 0-4570-1

**Cooperative Research Program**


CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
TEXAS A&M UNIVERSITY–KINGSVILLE
KINGSVILLE, TEXAS 78363



in cooperation with the
Federal Highway Administration and the
Texas Department of Transportation
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# APPENDIX A

# RELEASE DOCUMENTS FOR SPECIES FORMALLY RELEASED

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 LA SALLE GERMPLASM ARIZONA COTTONTOP 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 Arizona cottontop (*Digitaria californica* (Benth.) Henr.) for the south Texas ecoregion. La Salle Germplasm, accession number 9093398, is a composite of 13 collections that were tested under the following accession numbers: 9088955, 9088857, 9089072, 9090498, 9089189, 9089181, 9090681, 9089086, 9088930, 9090615, 9090619, 9091818, and 9090607**.**

As a selected release, this plant will be referred to as La Salle Germplasm Arizona cottontop. La Salle 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 Arizona cottontop. The potential for immediate use is high especially in range seeding mixes for restoration and diversification.

**Collection Site Information:** Table 1 shows the origin and collection information of each accession. Each accession is made up of seed obtained from a single wild population of Arizona cottontop (Figure 1). Seed was collected from the wild, cleaned and stored at the E. Kika De La Garza Plant Materials Center (PMC), in Kingsville, TX. Seedlings were grown from these field collections for evaluation.

**Description:** Arizona cottontop is highly self pollinated, in that over half of the florets are self pollinated (Cable, 1979) (Smith et al. 2000). Accessions comprising this release represent 2 kinds of ecotypic variation. Three accessions (9089181, 9089181, and 9091818) have blue-green coloration throughout, and are conspicuously pubescent throughout. All other selected accessions exhibit green coloration, and are considerably less pubescent. This ecotypic variation is genetic and highly heritable. Plants of each type were evaluated for 2 years at 4 locations (4

**Figure 1. Location of evaluation and collection sites of Selected Plant Material of Arizona cottontop.**

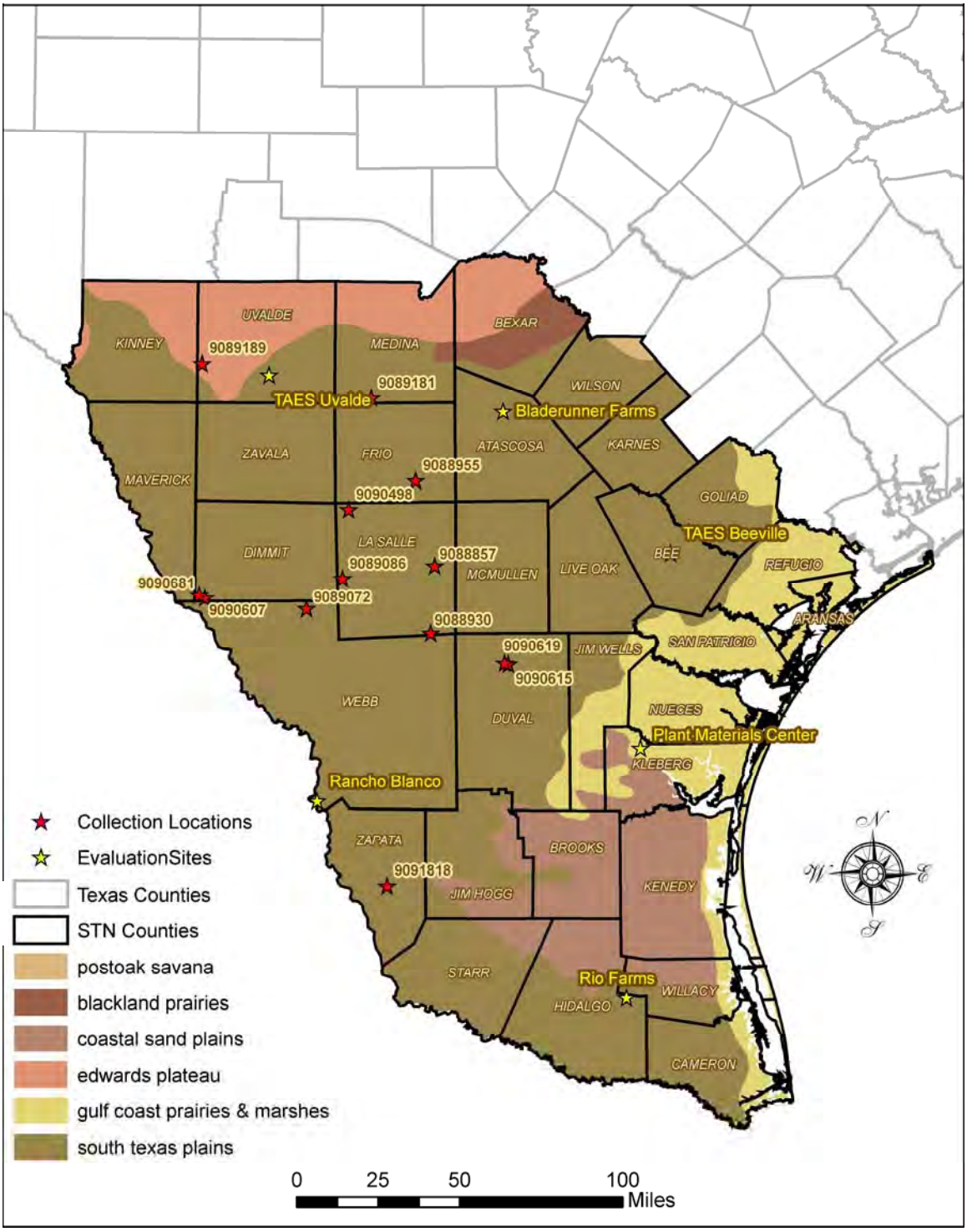

**Table 1. Origin and collection information for accessions that make up the Selected Plant Material release of Arizona cottontop.**

| Accession | Date | County | Location | Soil type | Collector |
|---|---|---|---|---|---|
| **9088955** | 8/21/2002 | Frio | Shiner Ranch | Sandy loam | F. Smith & C. Lawson |
| **9088857** | 7/26/2002 | Webb | 7 C's Ranch | Loam | F. Smith & C. Lawson |
| **9089072** | 8/14/2002 | Webb | Piloncillo Ranch | Sandy loam | F. Smith & C. Lawson |
| **9090498** | 5/18/2003 | LaSalle | Carrol Road | Sandy loam | F. Smith & C. Lawson |
| **9089189** | 10/18/2002 | Uvalde | Harris Ranch | Loam | F. Smith & C. Lawson |
| **9089181** | 10/19/2002 | Medina | CR 722 | Sandy loam | F. Smith, C. Lawson & P. Maywald |
| **9090681** | 6/26/2003 | Dimmitt | San Pedro Ranch | Sandy loam | F. Smith & C. Lawson |
| **9089086** | 8/12/2002 | LaSalle | Chaparral WMA | Sandy loam | F. Smith & C. Lawson |
| **9088930** | 8/10/2002 | LaSalle | 7 C's Ranch | Clay loam | F. Smith & C. Lawson |
| **9090615 & 9090619*** | 7/24/2002 | Duval | Welder Ranch | Clay loam | F. Smith, P. Maywald & C. Lawson |
| **9091818**** | 12/8/2003 | Zapata | Arroyo Velano Ranch | Sandy loam | C. Lawson & C. Craft |
| **9090607** | 6/27/2003 | Maverick | Faith Ranch | Sandy loam | F. Smith & C. Lawson |

*Accessions 9090615 & 9090619 were evaluated as separate accessions, but combined because of similarity of collection attributes (same ranch, soil type).
**Accession 9091818 was added because of collection location, and good performance in 1 year of evaluation.

different soil types), and the ecotypic variation was apparent at all locations. Seed was collected from pubescent plant ecotypes and adjacent (2-10 ft distance apart) non-pubescent plants at one location (TAES Uvalde), and planted to determine if the blue green color and pubescence was heritable, or crossed between accessions. More than 250 seedlings were grown from seed produced from 4 different accessions of the non-pubescent ecotype growing adjacent to one of the pubescent ecotypes. No blue-green coloration or conspicuous pubescence was found in any of the seedlings. Fifty seedlings were grown from seed collected from blue-green, pubescent plants at the same location. All 50 of these seedlings exhibited blue-green coloration and pubescence similar to the parent accession. Other than coloration and pubescence noted above, the morphology and phenology of all the accessions included in this release are extremely similar. Seed maturity, initiation of growth in the spring, dormancy (in the fall), seed production, and forage production are all similar among the accessions comprising this release. The general botanical description of Arizona cottontop is: tufted perennial from pubescent knotty bases; culms 35-110 cm long, 1-2 mm thick, erect, sometimes slightly geniculate at the lower nodes, essentially unbranched; ligule a hyaline scale 1-3 mm long; blades 5-18 cm long, 2-5 (-7) mm broad, usually flat or (when very dry) involute; sheaths sparsely to densely pilose; panicle 5-16

cm long, 4-16 (-20) mm thick, usually dense; racemes numerous, 3-7 cm long, ascending or usually appressed; spikelets (not including hairs) 3-4.2 mm long; first glume minute; second glume 3 nerved, densely covered with long silky whitish or purplish hairs that before drying are antrorse and much exceed the spikelet but after drying are widely spreading and fluffy; sterile lemma 3 nerved (actually 5 nerved, another faint pair of nerves discernible along the margins), pubescent like the second glume but with a broad glabrous median stripe between the midnerve and the nearest lateral, this stripe more than half the total breadth of the lemma; fruit 3-3.5 mm long (Correll and Johnston 1996

**Potential Uses**: La Salle Germplasm Arizona cottontop has high potential for use in rangeland revegetation in South Texas. In New Mexico and Arizona, Arizona cottontop had the best germination of all native forage plants tested. In a study conducted by Cable (1979), populations were maintained by establishment of new plants from seed during wet years, and once established Arizona cottontop is long lived with individual plants persisting up to 15 years even when grazed. Arizona cottontop is one of the easiest native species to establish in Sonoran and Chihuahuan desert environments (Cox et al., 1982). Arizona cottontop is considered a dominant grass on clay and clay loam range sites in South Texas (Gould 1975). "Loetta", a cultivar of Arizona cottontop released by the Tucson Plant Materials Center was shown to have excellent emergence and establishment in rangeland plantings (USDA et al., 1999). Arizona cottontop occurs throughout southern Texas (Gould 1975) (Correll and Johnston 1996), but no regionally adapted, commercially available seed stock is available for rangeland restoration in South Texas.

Arizona cottontop is recommended for upland wildlife plantings and in range seeding mixes. It can be used in many types of conservation plantings, such as stream-side buffers and filter strips.

**Method of Breeding and Selection:**

*Collection:* Arizona cottontop was selected for collection by *South Texas Natives* as part of an overall effort to collect, evaluate, and release germplasms of a number of plants native to South Texas. Personnel from *South Texas Natives* obtained seed from 52 separate field locations from 2001-2003 (Table 2).

*Field Evaluations*: After collection, seeds were assigned accessions numbers, cleaned and stored at the PMC. Based on the distribution of the collections, 31 accessions were chosen for evaluation from 2004-2005. An additional selected accession (PMT-389) from the Knox City PMC was also evaluated against these 31 accessions. Transplants for field evaluation were grown from original seed and transplanted at 3 locations throughout South Texas in the spring of 2004. Locations were: Rancho Blanco near Laredo, TX (soil type La Gloria silt loam (USDA-SCS, 1981)), Rio Farms near Monte Alto, TX (soil type Delfina fine sandy loam (USDA-SCS, 1979), and TAES Uvalde, TX (soil type Uvalde silty clay loam (USDA-SCS, 1970) (Figure 1). Two replications of 10 plants for each of the 32 accessions were planted in a randomized split plot design at each location. Plots at all locations were watered as needed from May-August to insure establishment. Irrigation was discontinued in November of 2004, and all plots were subjected to rain-fed conditions in 2005. Survival of all accessions at all locations was near

**Table 2. Collection information of 52 accessions of Arizona Cottontop obtained by South Texas Natives from 2001-2003.**

| Accession | County | Location | Soil type |
|---|---|---|---|
| 9085253 | Jim Hogg | Hebbronville | Sandy loam |
| 9086263 | Zavala | Westwind Ranch | Loam |
| 9088838 | Webb | 7 C's Ranch | Loam |
| 9088848 | Webb | 7 C's Ranch | Loam |
| 9088849 | Webb | 7 C's Ranch | Loam |
| 9088852 | Webb | 7 C's Ranch | Loam |
| 9088853 | Webb | 7 C's Ranch | Loam |
| 9088857 | Webb | 7 C's Ranch | Loam |
| 9088890 | Dimmit | Piloncillo Ranch | Sandy loam |
| 9088895 | Dimmit | Piloncillo Ranch | Loam |
| 9088918 | Dimmit | Piloncillo Ranch | Loam |
| 9088930 | LaSalle | 7 C's Ranch | Clay loam |
| 9088953 | Frio | Shiner Ranch | Sandy loam |
| 9088955 | Frio | Shiner Ranch | Sandy loam |
| 9088957 | Frio | Shiner Ranch | Sandy loam |
| 9089048 | Dimmit | Chaparral WMA | Sandy loam |
| 9089066 | Uvalde | HWY 90 | Loam |
| 9089072 | Webb | Piloncillo Ranch | Sandy loam |
| 9089075 | Dimmit | Piloncillo Ranch | Loam |
| 9089084 | Webb | Cerrito Prieto Ranch | Sandy loam |
| 9089085 | Webb | Cerrito Prieto Ranch | Sandy loam |
| 9089086 | LaSalle | Chaparral WMA | Sandy loam |
| 9089181 | Medina | CR 722 | Sandy loam |
| 9089189 | Medina | Harris Ranch | Loam |
| 9089213 | Medina | Coyote Ranch | Loam |
| 9090498 | LaSalle | Carrol Road | Sandy loam |
| 9090575 | LaSalle | Falsettee Ranch | Clay loam |
| 9090576 | Frio | Mixed | Mixed |
| 9090597 | Maverick | Faith Ranch | Loam |
| 9090607 | Maverick | Faith Ranch | Sandy loam |
| 9090615 | Duval | Welder Ranch | Clay loam |
| 9090619 | Duval | Welder Ranch | Clay loam |
| 9090630 | Dimmit | Piloncillo Ranch | Sandy loam |
| 9090643 | Dimmit | San Pedro Ranch | Sandy loam |
| 9090657 | Dimmit | San Pedro Ranch | Sandy loam |
| 9090662 | Maverick | Faith Ranch | Loam |
| 9090663 | Maverick | Faith Ranch | Loam |
| 9090667 | Dimmit | San Pedro Ranch | Sandy loam |
| 9090681 | Dimmit | San Pedro Ranch | Sandy loam |
| 9090688 | Dimmit | San Pedro Ranch | Sandy loam |
| 9090719 | Frio | Calvert Ranch | Sandy clay |
| 9090722 | Frio | Calvert Ranch | Sandy loam |
| 9091818 | Zapata | Arroyo Velano Ranch | Sandy loam |
| 9091849 | Zapata | Noser Ranch | Clay loam |
| 9091850 | Zapata | Noser Ranch | Clay loam |
| 9091860 | Zapata | Rancho Dolores | Sandy loam |
| 9091891 | Maverick | Comanche Ranch | Gravelly clay |
| 9091898 | Dimmitt | La Bandera Ranch | Sand |
| 9093182 | Duval | Duval County Ranch | Clay loam |
| 9093186 | Dimmitt | La Bandera Ranch | Silty clay |
| 9093191 | Jim Hogg | Palangana Ranch | Sandy loam |
| 9093200 | Frio | Horse Creek Ranch | Loam/sand |
| 9093211 | Webb | Corazon Ranch | Sandy loam |

100% over the two year evaluation period. Plots at Rancho Blanco, Rio Farms and TAES Uvalde were evaluated for important traits monthly throughout 2004 and 2005. 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.

Tables 3, 4, and 5 summarize the evaluation of the 32 accessions of Arizona cottontop at Rancho Blanco, Rio Farms, and TAES Uvalde. Fifty plants of each accession were also planted for initial evaluation at the PMC (Kingsville, TX, soil type Victoria clay). Limited evaluation data was collected (2 observations) from 2004-2005 on this planting. Because of the relatively small amount of evaluation data available, field observations at the PMC were not used for selection purposes. Additionally, germination data from seed collected in 2004 are presented (Table 6), but also not used for selection. Data from these plots will be used for long term evaluation.

*Germination Tests*: Seed was collected when ripe from each accession from May 2004-November 2005. Seed collected in 2004 was produced under irrigated conditions and tested for germination in March 2005. Seed collected from February-November 2005 was produced under rain-fed conditions and tested for germination in January 2006. Seed was stored at room temperature for at least 10 weeks to allow for after ripening (Gatica 1995). Table 6 shows the active germination results of the 31 accessions of Arizona cottontop from irrigated and non-irrigated plots. Germination tests were conducted on 150 seeds (3 reps x 50 seeds/accession) (12 hrs. dark @ 65º F, 12 hrs. light @ 85º F). Germinated seedlings were counted daily for 30 days. Seed from Arizona cottontop germinates rapidly after initiation of favorable conditions. In the 2005 germination tests, 93% of the observed germination occurred on days 3-5 of the experiment. Highest active germination in both 2004 and 2005 was observed in seed collected from plots at TAES Uvalde. In 2004, seed collected at TAES Uvalde had more than 26% higher germination than any other site. In 2005, seed collected at Uvalde was less than 3 % higher than any other site. Mean germination of all accessions combined over the 2 year period was 61%. This is the highest average active germination observed by South Texas Natives in a native grass species to date. Mean germination was higher in 2005 (72%) than 2004 (56%) at all sites. Increased plant establishment and favorable climatic conditions likely contributed to the higher observed germination in 2005. However, 2005 has been noted as being a poor seed production year in South Texas for many native species, because of record high temperatures, and very low rainfall in many areas. Rainfall at Rio Farms in 2005 was well above average, while Rancho Blanco and TAES Uvalde had below average rainfall in 2005. We suspect that seed germination may be even higher when grown under intensive input conditions in commercial seed production.

*Seed dormancy*: Two accessions of Arizona cottontop were used in an experiment to test germination substrates. Tetrazolium tests (TZ) of these 2 accessions were conducted. TZ test results showed 5 and 18% dormancy on the 2 accessions of Arizona cottontop. Dormancy tests on a 31 accession composite grown at Bladerunner Farms (Poteet, TX) in 2003 showed 28% seed dormancy.

**Table 3. Evaluation data collected during the 2004 and 2005 growing seasons on 32 accessions of Arizona cottontop planted at Ranch Blanco (Laredo). (1 = best, 9 = worst)**

| Accession | Plant Vigor* | Foliage Density | Uniformity | Development Stage | Seed production | Forage production | Plant Height | Drought tolerance |
|---|---|---|---|---|---|---|---|---|
| **9090663** | 2.8 | 2.6 | 2.6 | 1.7 | 2.9 | 2.6 | 2.6 | 4.0 |
| **9088895** | 3.2 | 3.4 | 2.9 | 1.8 | 2.9 | 3.6 | 3.0 | 3.5 |
| **9090597** | 2.9 | 3.1 | 3.3 | 1.9 | 3.1 | 3.0 | 3.1 | 4.0 |
| **9085253** | 3.3 | 3.6 | 3.5 | 1.9 | 3.4 | 3.8 | 3.5 | 6.0 |
| **9088849** | 2.9 | 3.1 | 2.6 | 1.7 | 3.4 | 3.1 | 2.9 | 4.0 |
| **9090643** | 3.3 | 3.1 | 2.9 | 1.8 | 3.1 | 3.2 | 3.4 | 4.0 |
| **9090662** | 3.6 | 3.8 | 3.5 | 2.1 | 3.8 | 4.1 | 3.6 | 5.0 |
| **9088957** | 2.7 | 3.0 | 2.4 | 1.7 | 3.6 | 3.0 | 2.9 | 3.5 |
| **9090575** | 2.6 | 2.8 | 2.6 | 1.6 | 3.0 | 2.6 | 2.8 | 4.0 |
| **9088955** | 2.5 | 2.4 | 2.3 | 1.7 | 2.9 | 2.9 | 2.7 | 5.0 |
| **9088953** | 2.7 | 2.9 | 2.3 | 1.6 | 3.0 | 2.9 | 2.7 | 4.5 |
| **9086263** | 2.8 | 2.9 | 2.8 | 1.7 | 2.9 | 2.9 | 2.8 | 4.0 |
| **9088857** | 2.2 | 1.9 | 2.0 | 1.6 | 2.5 | 1.9 | 1.9 | 3.5 |
| **9088852** | 2.6 | 2.9 | 3.0 | 1.8 | 3.1 | 2.8 | 2.8 | 4.0 |
| **9089084** | 2.7 | 2.8 | 3.1 | 1.7 | 3.0 | 2.9 | 3.0 | 4.5 |
| **9089072** | 2.6 | 2.7 | 2.1 | 1.7 | 2.8 | 2.4 | 2.4 | 4.0 |
| **9090619** | 2.7 | 2.4 | 2.4 | 1.8 | 3.0 | 2.6 | 2.5 | 4.5 |
| **9088848** | 3.3 | 3.4 | 2.5 | 1.7 | 3.3 | 3.4 | 3.2 | 5.5 |
| **9089095** | 3.0 | 3.3 | 3.6 | 1.8 | 3.2 | 3.4 | 2.9 | 4.5 |
| **9090498** | 2.4 | 2.6 | 2.1 | 1.6 | 2.9 | 2.4 | 2.3 | 4.0 |
| **9088890** | 2.6 | 2.6 | 2.5 | 1.7 | 2.9 | 2.6 | 2.4 | 3.0 |
| **9089189** | 2.6 | 2.7 | 1.8 | 1.9 | 2.9 | 2.6 | 2.6 | 5.0 |
| **9088838** | 2.8 | 2.8 | 2.3 | 1.7 | 2.8 | 2.8 | 2.5 | 3.5 |
| **9089181** | 2.4 | 2.2 | 1.9 | 1.6 | 2.6 | 2.1 | 2.3 | 3.0 |
| **9090681** | 2.6 | 2.8 | 2.6 | 1.8 | 2.8 | 2.6 | 2.5 | 4.0 |
| **9090607** | 2.8 | 2.7 | 2.7 | 1.7 | 2.8 | 2.8 | 2.6 | 3.0 |
| **9089086** | 2.6 | 2.9 | 2.5 | 1.7 | 3.4 | 2.7 | 2.6 | 3.3 |
| **9088930** | 2.6 | 2.7 | 2.4 | 1.7 | 2.9 | 2.6 | 2.6 | 5.0 |
| **9088853** | 3.1 | 3.3 | 3.0 | 1.7 | 3.1 | 3.3 | 3.0 | 4.5 |
| **9088918** | 2.6 | 2.8 | 2.3 | 1.6 | 3.1 | 2.9 | 2.9 | 5.0 |
| **9090615** | 2.1 | 1.9 | 1.8 | 1.8 | 2.4 | 1.8 | 1.9 | 4.0 |
| **PMT-389** | 3.6 | 2.8 | 2.5 | 1.3 | 3.9 | 3.2 | 2.7 | 4.0 |

* 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

**Table 4. Evaluation data collected during the 2004 and 2005 growing seasons on 32 accessions of Arizona cottontop planted at Rio Farms (Monte Alto). (1 = best, 9 = worst)**

| Accession | Plant Vigor | Foliage Density | Uniformity | Development Stage | Seed production | Forage production | Plant Height |
|---|---|---|---|---|---|---|---|
| **9090663** | 2.3 | 2.1 | 2.0 | 1.3 | 2.6 | 2.2 | 1.9 |
| **9088895** | 2.7 | 2.6 | 2.4 | 1.1 | 2.7 | 2.9 | 2.1 |
| **9090597** | 2.6 | 2.6 | 2.2 | 1.4 | 3.4 | 2.9 | 2.3 |
| **9085253** | 3.0 | 3.1 | 2.7 | 1.4 | 3.3 | 3.1 | 2.9 |
| **9088849** | 2.8 | 3.1 | 2.7 | 1.3 | 3.0 | 3.0 | 2.7 |
| **9090643** | 2.8 | 2.8 | 2.5 | 1.2 | 3.5 | 2.8 | 2.5 |
| **9090662** | 3.5 | 3.6 | 3.4 | 1.9 | 3.4 | 3.3 | 2.9 |
| **9088957** | 3.3 | 3.3 | 3.2 | 1.5 | 3.6 | 3.2 | 2.9 |
| **9090575** | 3.1 | 2.8 | 2.9 | 1.4 | 3.0 | 3.2 | 2.7 |
| **9088955** | 2.8 | 2.6 | 2.0 | 1.1 | 2.9 | 2.8 | 2.3 |
| **9088953** | 2.7 | 2.6 | 2.1 | 1.2 | 3.0 | 2.7 | 2.3 |
| **9086263** | 2.7 | 2.7 | 2.3 | 1.1 | 2.7 | 2.7 | 2.5 |
| **9088857** | 2.5 | 2.6 | 2.1 | 1.1 | 2.6 | 2.2 | 2.1 |
| **9088852** | 2.9 | 2.9 | 2.9 | 1.4 | 2.8 | 3.1 | 2.7 |
| **9089084** | 2.7 | 2.7 | 2.1 | 1.3 | 2.9 | 2.8 | 2.4 |
| **9089072** | 2.6 | 2.4 | 2.2 | 1.2 | 2.9 | 2.6 | 2.4 |
| **9090619** | 2.8 | 3.0 | 2.4 | 1.2 | 3.0 | 2.9 | 2.4 |
| **9088848** | 2.7 | 2.5 | 2.6 | 1.3 | 2.9 | 2.6 | 2.4 |
| **9089095** | 2.7 | 2.6 | 2.4 | 1.3 | 2.7 | 2.8 | 2.6 |
| **9090498** | 2.9 | 2.7 | 2.4 | 1.2 | 2.7 | 2.9 | 2.4 |
| **9088890** | 2.9 | 3.3 | 2.4 | 1.2 | 2.7 | 3.1 | 2.5 |
| **9089189** | 3.0 | 2.5 | 2.0 | 1.2 | 2.8 | 2.7 | 2.4 |
| **9088838** | 2.7 | 2.6 | 2.4 | 1.1 | 2.9 | 2.6 | 2.3 |
| **9089181** | 2.6 | 2.4 | 2.1 | 1.2 | 2.4 | 2.2 | 1.9 |
| **9090681** | 2.4 | 2.6 | 2.5 | 1.3 | 2.4 | 2.6 | 2.1 |
| **9090607** | 2.6 | 2.7 | 2.1 | 1.1 | 2.5 | 2.8 | 2.1 |
| **9089086** | 2.2 | 2.4 | 2.3 | 1.4 | 2.8 | 2.5 | 2.2 |
| **9088930** | 2.0 | 2.2 | 1.7 | 1.1 | 1.9 | 1.9 | 1.9 |
| **9088853** | 2.2 | 2.0 | 2.4 | 1.3 | 2.1 | 2.1 | 2.0 |
| **9088918** | 2.8 | 2.4 | 2.4 | 1.2 | 3.1 | 2.8 | 2.4 |
| **9090615** | 2.4 | 2.4 | 2.2 | 1.1 | 2.9 | 2.4 | 2.0 |
| **Knox City** | 2.3 | 2.3 | 2.0 | 1.0 | 2.4 | 2.5 | 1.8 |

**Table 5. Evaluation data collected during the 2004 and 2005 growing seasons on 32 accessions of Arizona cottontop planted at TAES Uvalde. (1 = best, 9 = worst)**

| Accession | Plant Vigor | Foliage Density | Uniformity | Development Stage | Seed production | Forage production | Plant Height |
|---|---|---|---|---|---|---|---|
| **9090663** | 2.6 | 2.6 | 2.4 | 1.9 | 2.9 | 2.7 | 2.5 |
| **9088895** | 2.6 | 2.5 | 2.5 | 1.8 | 2.2 | 2.6 | 2.3 |
| **9090597** | 2.6 | 2.6 | 2.1 | 1.8 | 2.7 | 2.7 | 2.3 |
| **9085253** | 2.3 | 2.0 | 1.9 | 1.9 | 2.2 | 2.1 | 1.9 |
| **9088849** | 2.8 | 3.1 | 2.6 | 1.8 | 3.0 | 2.9 | 2.4 |
| **9090643** | 2.6 | 2.5 | 2.4 | 1.9 | 2.9 | 2.8 | 2.3 |
| **9090662** | 3.3 | 3.2 | 4.1 | 1.9 | 3.2 | 3.1 | 2.8 |
| **9088957** | 2.9 | 2.8 | 2.8 | 2.0 | 3.3 | 2.9 | 2.7 |
| **9090575** | 2.9 | 2.9 | 2.7 | 2.0 | 3.5 | 2.9 | 2.7 |
| **9088955** | 2.1 | 1.9 | 1.8 | 1.9 | 2.1 | 2.3 | 1.8 |
| **9088953** | 2.8 | 2.6 | 2.6 | 1.8 | 3.0 | 2.6 | 2.5 |
| **9086263** | 2.6 | 2.5 | 2.1 | 1.8 | 2.7 | 2.6 | 2.3 |
| **9088857** | 2.1 | 2.6 | 2.2 | 1.8 | 2.0 | 2.3 | 1.9 |
| **9088852** | 2.7 | 3.0 | 2.6 | 1.9 | 2.9 | 2.8 | 2.1 |
| **9089084** | 2.6 | 2.8 | 1.8 | 1.8 | 2.4 | 2.8 | 2.3 |
| **9089072** | 2.6 | 2.6 | 1.9 | 1.9 | 2.7 | 2.4 | 2.1 |
| **9090619** | 2.5 | 2.6 | 2.3 | 1.9 | 2.7 | 2.6 | 2.1 |
| **9088848** | 2.6 | 2.5 | 2.2 | 1.9 | 2.9 | 2.5 | 2.5 |
| **9089095** | 3.6 | 3.8 | 3.4 | 1.9 | 4.3 | 4.1 | 3.4 |
| **9090498** | 2.3 | 2.6 | 2.3 | 1.8 | 2.8 | 2.8 | 2.2 |
| **9088890** | 3.1 | 3.2 | 2.7 | 1.9 | 3.2 | 3.1 | 2.8 |
| **9089189** | 2.4 | 2.5 | 1.9 | 1.8 | 2.3 | 2.6 | 2.4 |
| **9088838** | 2.8 | 2.6 | 2.6 | 1.9 | 2.8 | 2.9 | 2.4 |
| **9089181** | 2.4 | 2.6 | 2.3 | 1.9 | 3.0 | 2.4 | 2.4 |
| **9090681** | 2.5 | 2.6 | 2.1 | 1.8 | 2.6 | 2.6 | 2.2 |
| **9090607** | 2.9 | 2.8 | 2.6 | 1.9 | 3.2 | 3.1 | 2.8 |
| **9089086** | 2.4 | 2.2 | 2.2 | 1.8 | 2.6 | 2.3 | 2.2 |
| **9088930** | 2.6 | 2.8 | 2.3 | 1.9 | 3.1 | 2.8 | 2.5 |
| **9088853** | 2.6 | 2.6 | 2.5 | 1.9 | 3.1 | 2.8 | 2.2 |
| **9088918** | 2.8 | 2.7 | 2.4 | 1.9 | 2.6 | 2.7 | 2.5 |
| **9090615** | 2.1 | 1.9 | 2.3 | 1.8 | 2.4 | 2.0 | 2.2 |
| **PMT-389** | 2.9 | 2.6 | 2.4 | 1.8 | 2.8 | 3.5 | 3.3 |

**Table 6. Germination of 31 accessions of Arizona Cottontop in 2004 (irrigated) and 2005 (non-irrigated) grown at 3 locations in South Texas.**

| Accession | TAES-U | Rio Farms | Rancho Blanco | PMC | 2004 Mean | TAES-U | Rio Farms | Rancho Blanco | 2005 Mean | 2 year mean |
|---|---|---|---|---|---|---|---|---|---|---|
| **9090663** | 65 | 46 | 23 | 13 | 37 | 83 | 72 | 72 | 76 | 56 |
| **9088895** | 77 | 18 | 45 | 23 | 40 | 77 | 70 | 67 | 71 | 56 |
| **9090597** | 87 | 28 | 36 | no seed | 50 | 72 | 69 | 64 | 68 | 59 |
| **9085253** | 66 | 42 | 41 | 40 | 47 | 70 | 71 | 60 | 67 | 57 |
| **9088849** | 64 | 63 | 27 | 45 | 50 | 75 | 79 | 59 | 71 | 60 |
| **9090643** | 89 | 81 | 28 | 8 | 51 | 76 | 80 | 57 | 71 | 61 |
| **9090662** | 69 | 72 | 25 | 7 | 43 | 79 | 69 | 61 | 70 | 56 |
| **9088957** | 73 | 45 | 40 | 26 | 46 | 78 | 59 | 65 | 67 | 56 |
| **9090575** | 75 | 28 | 40 | 18 | 40 | 79 | 54 | 72 | 68 | 54 |
| **9088955** | 88 | 70 | 26 | 26 | 52 | 62 | 59 | 75 | 65 | 59 |
| **9088953** | 66 | 48 | 53 | 36 | 51 | 70 | 72 | 76 | 73 | 62 |
| **9086263** | 75 | 62 | 51 | 15 | 51 | 75 | 78 | 71 | 74 | 63 |
| **9088857** | 94 | 53 | 44 | 10 | 50 | 89 | 86 | 67 | 81 | 65 |
| **9088852** | 58 | 32 | 22 | 18 | 32 | 88 | 82 | 69 | 80 | 56 |
| **9089084** | 93 | 67 | 65 | 40 | 66 | 80 | 84 | 69 | 78 | 72 |
| **9089072** | 83 | 61 | 50 | 56 | 62 | 78 | 83 | 75 | 78 | 70 |
| **9090619** | 87 | 31 | 38 | 40 | 49 | 73 | 77 | 73 | 74 | 62 |
| **9088848** | 85 | 46 | 33 | no seed | 54 | 80 | 81 | 72 | 78 | 66 |
| **9089095** | 66 | 52 | 40 | 43 | 50 | 84 | 77 | 63 | 74 | 62 |
| **9090498** | 89 | 59 | 55 | 53 | 64 | 70 | 75 | 55 | 67 | 65 |
| **9088890** | 75 | 33 | 52 | 44 | 51 | 66 | 69 | 61 | 66 | 58 |
| **9089189** | 53 | 56 | 11 | 25 | 36 | 64 | 73 | 65 | 67 | 52 |
| **9088838** | 43 | 62 | 44 | 40 | 47 | 82 | 84 | 62 | 76 | 61 |
| **9089181** | 72 | 52 | 19 | 18 | 40 | 85 | 85 | 60 | 76 | 58 |
| **9090681** | 80 | 60 | 29 | 31 | 50 | 89 | 89 | 59 | 79 | 64 |
| **9090607** | 87 | 51 | 41 | 66 | 61 | 87 | 81 | 71 | 80 | 70 |
| **9089086** | 96 | 44 | 54 | 57 | 63 | 86 | 73 | 61 | 74 | 68 |
| **9088930** | 88 | 66 | 42 | 61 | 64 | 81 | 70 | 61 | 71 | 67 |
| **9088853** | 84 | 44 | 45 | 32 | 51 | 81 | 72 | 57 | 70 | 61 |
| **9088918** | 90 | 45 | 55 | 43 | 58 | 75 | 64 | 41 | 60 | 59 |
| **9090615** | 86 | 61 | 38 | 26 | 53 | 72 | 55 | 19 | 49 | 51 |
| **Means** | 77 | 51 | 39 | 33 | 50 (56 not including PMC) | 78 | 74 | 63 | 72 | 61 |

*Seed harvest and storage*: Seed was harvested with a Flail-vac seed stripper @ 200-1000 rpm. Harvest at 400-1000 rpm removes all seed heads, including large amounts of green seed, which significantly reduces purity of the harvest. We found that stands that can be harvested multiple times should be harvested at 200-400 rpm. After-ripening of Arizona cottontop is recommended for obtaining maximum germination. Gatica (1995) reported that storage for 10 weeks at ambient temperatures resulted in best seed germination. Cold storage at 39º F is recommended following after ripening.

*Seed cleaning/Seed coating:* The Tucson PMC recommends cleaning of "Loetta" Arizona cottontop with a Westrup Laboratory Brush Huller/Scarifier to remove the hairs from the glumes. After this treatment, the seed is processed through a dual screen air separator using a #8 top screen and a # 1/23 bottom screen. The hairs are removed for easier storage and to allow the seed to flow through drill tubes when seeding (USDA et al., 1999). Research by Gatica (1995) has shown that the glume and lemma surrounding the caryopsis of Arizona cottontop slows germination. Another option for making Arizona cottontop easier to plant is to coat the seed with a talc or lime-based coating. Active germination of Arizona cottontop was reduced by only 2 % (68 % uncoated, 66 % coated) when coated for use in a seeding trial; seed dormancy of the same seedlot was reduced 10 % by coating. In our experiments coating Arizona cottontop was shown to have no effect on active seed germination in field or laboratory tests, or plant establishment after 30 days. In seedling emergence trails at the Kingsville PMC in 2004, emergence of Arizona cottontop seedlings was not inhibited by coating the seed (NRCS 2005).

*Seed production*: Evaluation plots at Rancho Blanco (Laredo, TX) were harvested with a Flail-vac seed stripper in the summer of 2005 to estimate seed production of Arizona cottontop. Seed production was estimated at 142 lbs. of seed/acre and 63 lbs pure live seed (PLS)/acre. Table 7 shows the results of the seed harvest.

**Table 7. Seed production of 31 accessions of Arizona cottontop at Rancho Blanco (Laredo), harvested in June and July 2005. Plots were under rain fed conditions.**

| Seed production (bulk lbs./acre/harvest) | Seed production (lbs PLS/acre/harvest) | Seed production (lbs PLS/plant) | % active germination | % PLS | % purity |
|---|---|---|---|---|---|
| 142 | 63 | 0.0015 | 56 | 44.8 | 80 |

*Seeding trials*: One seeding trial was initiated in the fall of 2005, a planting in conjunction with a herbicide tolerance study at the Welder Wildlife Refuge near Sinton, TX. Four 10' x 10' plots were seeded at 1.33 lbs PLS/acre. Three of the four plots were treated with pre-emergent herbicides (Plateau (Imazapic) @ 3 oz/acre, Plateau @ 6 oz/acre, and Stalker (Imazapyr) @ 12 oz/acre); one plot was used as a control. Plots were seeded in October 2005. Plots will be monitored in 2006 for stand establishment and resistance to each herbicide. In another trial seed from a South Texas composite collection (coated and non-coated), and PMT-389 (Knox City selection) of Arizona cottontop were planted (3 replications of 10' x 20' plots, seeded at 20 PLS/ft²) at the Kingsville PMC in May 2004 for observation of seedling emergence. The South

Texas composite collection (coated and non-coated) showed greater emergence and higher seedling density than PMT-389 in November 2004. Additional data will be collected on this planting from 2005-2006 (NRCS 2005). Additional rangeland seeding trials are planned for 2006 at various locations (Uvalde, Webb, Frio, Duval, and Hidalgo counties) throughout South Texas.

**Criteria for inclusion in release:** Selection of accessions to be included in this release was based on 2004-2005 evaluation data and germination test results from Rancho Blanco, Rio Farms, and TAES Uvalde. Evaluation data was compared by site, with equal weight given to each evaluation category. Germination data was also compared by site over the evaluation period. Accessions were selected that had superior mean performance in the greatest number of categories (evaluation at each site, germination of seed from each site = 6 total possible categories). Sixteen of the 31 evaluated accessions had greater than mean performance in 4 or more categories. Of these 16, 3 accessions (9088838, 9088848, and 9089084) were eliminated because they had the same collection attributes as higher ranking accessions (same collection location, county and or soil type). One accession (9086263) was eliminated because no original seed was remaining. Two accessions (9090615 & 9090619) were combined because of similar performance and collection attributes (both originated from the same ranch and soil type, and were collected on the same date). The total number of selected accessions from this evaluation was 11 (Table 8). Seed stock of the release originates from 9 South Texas counties, and represents a variety of soil types. Average germination of the 11 accessions comprising this release (4 sites over 2 years) was 63 %. Three additional accessions were planted for evaluation in 2005. These accessions originated from areas not represented by the accessions evaluated in 2004-2005 evaluation.

**Current/projected seed availability:** Small quantities of the original seed collections of each accession selected for release are in storage at the E. Kika De La Garza PMC. This seed was used to grow transplants (+/- 1500) of each accession in January 2006. These transplants were planted at Rio Farms (Monte Alto, TX) for use as foundation seed fields in March 2006. Seed will be harvested when ripe throughout 2006. Based on previous performance of Arizona cottontop at Rio Farms, 5 seed harvests are estimated in 2006. Estimated seed production of each of the 12 accessions is 24.75 lbs. (1500 plants * 0.0033 lbs. seed./plant/harvest * 5 seed harvests in 2006 = 24.75 lbs. seed/accession). This will result in an estimated total seed production from all accessions of about 300 lbs.

**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 La Salle Germplasm Arizona cottontop was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that Arizona cottontop 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

**Table 8. Selection chart for selected plant material of Arizona cottontop.**

| Accession | County | Location | Soil type | Number of categories with >mean performance | Selection decision |
|---|---|---|---|---|---|
| **9088857** | Webb | 7 C's Ranch | Loam | 6 | Included |
| **9089072** | Webb | Piloncillo Ranch | Sandy loam | 6 | Included |
| **9088930** | LaSalle | 7 C's Ranch | Clay loam | 5 | Included |
| **9089086** | LaSalle | Chaparral WMA | Sandy loam | 5 | Included |
| **9089181** | Medina | CR 722 | Sandy loam | 5 | Included |
| **9090498** | LaSalle | Carrol Road | Sandy loam | 5 | Included |
| **9090607** | Maverick | Faith Ranch | Sandy loam | 5 | Included |
| **9090681** | Dimmit | San Pedro Ranch | Sandy loam | 5 | Included |
| **9086263** | Zavala | Westwind Ranch | Loam | 4 | No original seed-delete |
| **9088838** | Webb | 7 C's Ranch | Loam | 4 | Already selected same attributes-delete |
| **9088848** | Webb | 7 C's Ranch | Loam | 4 | Already selected same attributes-delete |
| **9088955** | Frio | Shiner Ranch | Sandy loam | 4 | Included |
| **9089084** | Webb | Cerrito Prieto Ranch | Sandy loam | 4 | Already selected same attributes-delete |
| **9089189** | Uvalde | Harris Ranch | Loam | 4 | Included |
| **9090615** | Duval | Welder Ranch | Clay loam | 4 | Combined with 9090619 |
| **9090619** | Duval | Welder Ranch | Clay loam | 4 | Combined with 9090615 |
| **9091818*** | Zapata | Arroyo Velano Ranch | Sandy loam | * | Increased for evaluation against others |

*Accession 9091818 has been evaluated separately for one year, but shown promise, it will be evaluated against the other 11 selections in the seed increase process.

native species for rangeland planting, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Forage value of Arizona cottontop is fair for livestock, and poor for wildlife in the Gulf Prairies and Marshes of Texas (Hatch et. al. 1999). Gould (1979) reports that grazing value is good for livestock and fair for wildlife. High palatability ratings have been given to Arizona cottontop (Bedunah and Sosbee, 1984). It is palatable throughout the year (Gould 1979), and is preferred by livestock over most other grass species at all seasons of the year (Cable 1979). Seed longevity of Arizona cottontop has been found to be good for up to three years following harvest (>80%). Germination then declines about 6 % per year for the next 12-14 years (Tiedmann and Pond 1967). Arizona cottontop contains approximately 653,000 seeds per pound.

**Area of Adaptation:** Accessions comprising this release were originally collected from loam, sandy loam and clay loam soil types. Table 9 shows the soil types that these selected accessions have been planted or evaluated on. Arizona cottontop occurs in the Gulf Prairies and Marshes, Blackland Prairies, Cross Timbers and Prairies, South Texas Plains, Edwards Plateau, Rolling Plains, High Plains, and Trans-Pecos Mountains and Basins vegetational areas of Texas. It ranges from Colorado to Texas to Arizona and northern Mexico (Gould 1975). It is found growing on open well-drained sites (Gould 1978), in clay loam, sandy loam, and loose gravelly soils, as well as limestone ledges and porphyritic hills. It is more abundant and productive on clay, sand or sandy loam subsoils than on shallow, stony or cobbly soils (Cable 1979). Based on our evaluation results, distribution information, and the original distribution of the collections comprising the release, these accessions should be adapted to the South Texas Plains, Coastal Sand Plains, Gulf Prairies and Marshes, and Edwards Plateau (southern portions) (Figure 1).

Arizona cottontop ranges from an early successional to climax species dependant upon the range site, soil type, and region considered. Across most of the recommended planting area, Arizona cottontop is a climax decreaser species on sandy loam soils and an increaser on heavy textured soils. Adaptation of this release is unknown outside of the area described.

**Table 9. Soil types of known adaptability of Selected Plant Material of Arizona Cottontop.**

| Site/location | Year(s) | Soil Type | Performance |
|---|---|---|---|
| Bladerunner Farms (Poteet, TX) | 2003-2006 | Miguel fine sandy loam | Excellent year 1, declined thereafter |
| TAES-Uvalde (Uvalde, TX) | 2004-2006 | Uvalde silty clay loam | Excellent |
| Rio Farms (Monte Alto, TX) | 2004-2006 | Delfina fine sandy loam | Excellent |
| Rancho Blanco (Laredo, TX) | 2004-2006 | La Gloria silt loam | Excellent |
| Kingsville PMC (Kingsville, TX) | 2004-2006 | Victoria clay | Moderate |

**Availability of Plant Materials:** Foundation seed will be produced and maintained by *South Texas Natives* in conjunction with Texas Foundation Seed Service. Seed will be produced from transplants grown from original seed. Each accession must be separated from existing plots of Arizona cottontop, 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.

All commercial seed production must take place in Texas. All certified seed fields must be isolated from native or other cultivated stands of Arizona cottontop by 900 ft. Foundation and certified seed fields will be limited to 7 production years.

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TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Arizona Cottontop (*Digitaria californica*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **numerous, see release proposal coversheet**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations:
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 18, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **19 May 2006**

1. Crop: **Arizona Cottontop, *Digitaria californica* (Benth.) Henr.**

Type of Release: **Selected Plant Material**

2. Proposed name or identification: **9088955, 9088857, 9089072, 9090498, 9089189, 9089181, 9090681, 9089086, 9088930, 9090615, 9090619, 9091818, and 9090607 Arizona cottontop**

3. Designation or name in development stages: **13 accession numbers (9088955, 9088857, 9089072, 9090498, 9089189, 9089181, 9090681, 9089086, 9088930, 9090615, 9090619, 9091818, and 9090607).**

4. Primary features or advantages:

- **Native to and adapted to southern Texas**
- **Rapid germination (93% of active germination occurs within 3-5 days of favorable conditions) and growth rate (20 days from dormancy to seed maturity)**
- **Superior adaptability compared to the commercial line from New Mexico (PMT 389).**
- **High active germination (average 63%)**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **300 lbs by November 2006**

7. Proposed seed distribution:

Small samples distributed by: **South Texas Natives**

Royalty: **Yes**

8. Provisions: **Seed to be produced in Texas**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

Breeders and Scientists – Date

W R Ocumpaugh 5-26-06

Unit Heads – Date

Bobby R. Eddleman 5-30-06

**Signatures for release of:**

**La Salle Germplasm Arizona cottontop**
**(*Digitaria californica*) (Benth.) Henr.**

Fred C. Bryant — 3/12/07

Dr. Fred Bryant, Director — Date
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Mark C. Hussey — 4-6-2007

Texas Agricultural Experiment Station — Date
College Station, Texas

Walter J. Douglas — Acting — 4-12-2007

Walter W. Douglas — Date
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Robert T. Escheman — 4-23-07

Robert Escheman — Date
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

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 DILLEY GERMPLASM SLENDER 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 slender grama (*Bouteloua repens* (H.B.K.) Scribn. & Merr.) for the south Texas ecoregion. Dilley Germplasm, accession number 9093399, is a composite of 5 collections that were tested under the following accession numbers: 9088905, 9088914, 9089049, 9089135, and 9088897.

As a selected release, this plant will be referred to as Dilley Germplasm slender grama. Dilley 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 slender 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 slender 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.

**Description:** Slender grama is a cross, wind pollinated species. All Selected accessions exhibit similar characteristics in respect to phenology and morphology. The general botanical description of *Bouteloua repens* is: Tufted perennial (flowering first year and

**Figure 1. Location of evaluation and collection sites of Selected Plant Material of slender grama.**

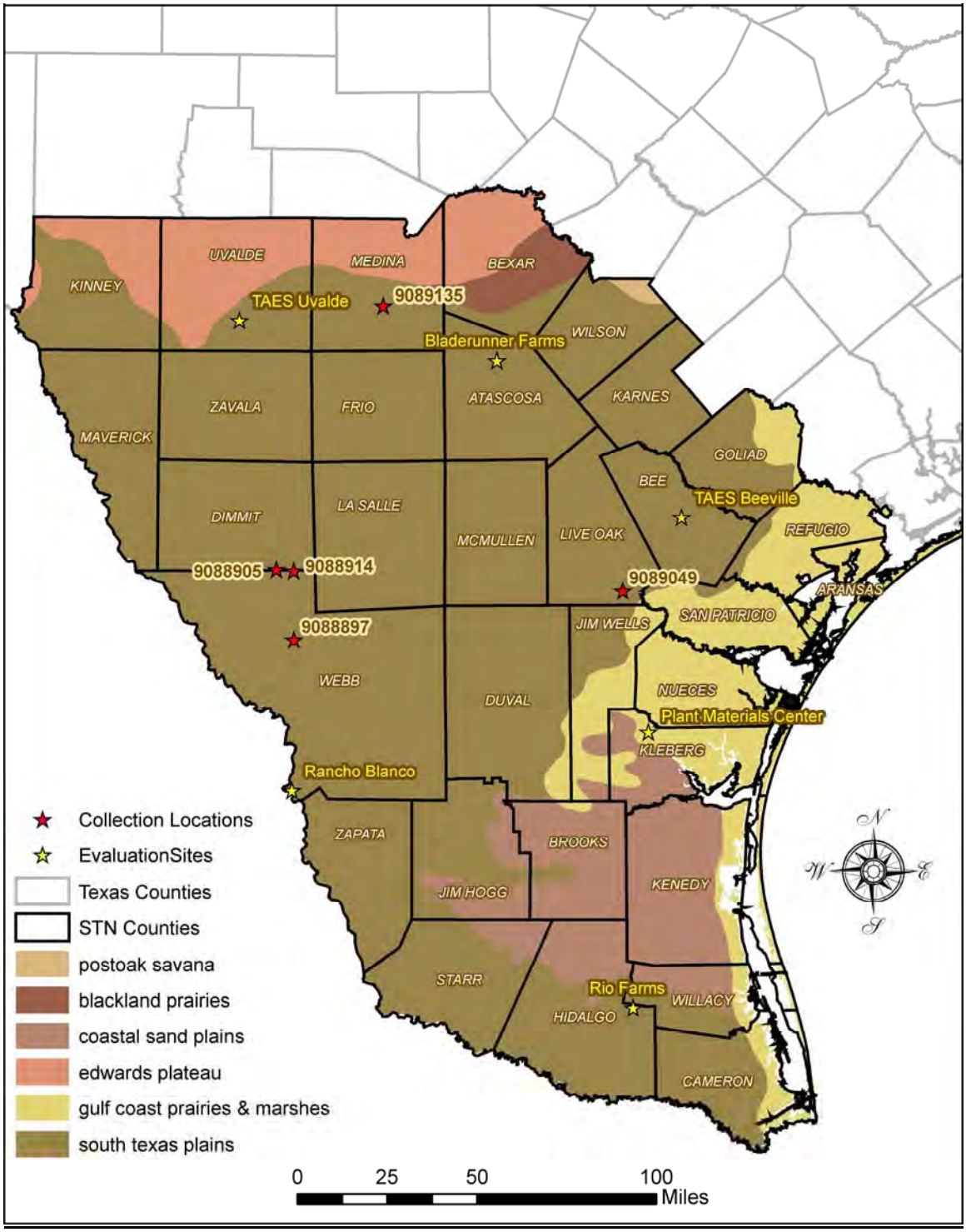

**Table 1. Origin and collection information for Selected Plant Material of slender grama.**

| Accession | Date | County | Location | Soil type | Collector |
|---|---|---|---|---|---|
| 9088905 & 9088914* | 8/14/2002 | Dimmit & Webb | Piloncillo Ranch | Sandy loam | F. Smith & C. Lawson |
| 9089049 | 9/6/2002 | Live Oak | Richard Lucas Ranch | Sandy loam | F. Smith & C. Lawson |
| 9089135 | 9/21/2002 | Medina | US HWY 90 | Loam | F. Smith & C. Lawson |
| 9088897 | 8/11/2002 | Webb | Cerrito Prieto Ranch | Sandy loam | F. Smith & C. Lawson |

*** Accessions 9088905 &9088914 were evaluated as separate accessions, but were combined for Foundation Seed Production because of similar collection site, originating soil type and morphology and phenology.**
**(USDA-SCS, 1972, 1981a, 1981b)**

often behaving as an annual); culms 15-40 cm long, 0.4-1 mm thick, mostly erect, very slightly geniculate and sparingly branched at the lower nodes; ligule a scale, sometimes fringed, about 0.2 mm long; blades 3-18 cm long, 1-3 mm broad, mostly flat, marginally sparsely papillose-pilose; spikes 5 to 9, 9-16 (-20) mm long, distributed over a panicle axis 3-8 cm long, at length each deciduous as a unit, the rachis smooth, prolonged beyond the most distal fertile spikelet as a needle; glumes essentially smooth and glabrous; spikelets 5 to 8 per spike, at maturity the longest of them about as long as the rachis (Correll & Johnston, 1996). Slender grama is noted as having a stoloniferous habit by Morrow et al. (1954). All accessions comprising this release exhibit stoloniferous growth habits. None of the four accessions selected for release exhibit the noted characteristic of "flowering the first year, and often behaving as an annual". Plants do flower and produce seed the first year, but survive and continue to produce seed for 3 years or longer. Plots have been maintained at Bladerunner Farms, near Poteet, TX since April 2003. Plots of all four selections remain alive, with little or no mortality observed. Plots have been in existence at the E. Kika de la Garza PMC in Kingsville, TX since 2003 as well. Plots at Rancho Blanco near Laredo, TX, TAES at Beeville, and the Caesar Kleberg Wildlife Research Institute (CKWRI) Wildlife Complex at Texas A&M University-Kingsville (TAMUK), and an experimental landscape planting on the campus of TAMUK have persisted and produced seed beyond one year of growth. Forage value of slender grama in South Texas is relatively poor. On red sandy loam range sites it is known to make up 0-15 % of the herbaceous vegetation available to cattle. The average composition of slender grama in cattle diets on these range sites was found to be 6.3 %. Relative preference value given for slender grama was highest in the summer months. (Everitt et al., 1981). It had the second lowest digestible energy (DE) value of the common range grasses studied from September 1976 to November 1977 in Hidalgo County, TX (Gonzalez and Everitt, 1992). Slender grama contains approximately 125,000 seeds per pound.

**Potential Uses:** Slender grama was targeted for collection by *South Texas Natives* because of the potential for use on highway right of ways, reclamation sites, and in rangeland plantings.

**Method of Breeding and Selection:**

*Collection:* As part of an overall effort to collect, evaluate, and release a number of plants native to South Texas, personnel from *South Texas Natives* collected seed of slender grama from 9 separate field locations in South Texas during 2002-2003 (Table 2).

*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.

**Table 2. Collection information for 9 accessions of slender grama obtained by *South Texas Natives* from 2002-2003.**

| Accession | County | Location | Soil type |
|---|---|---|---|
| **9088897** | Webb | Cerrito Prieto Ranch | Sandy loam |
| **9088905** | Dimmit | Piloncillo Ranch | Sandy loam |
| **9088914** | Dimmit | Piloncillo Ranch | Sandy loam |
| **9089049** | Live Oak | Richard Lucas Ranch | Sandy loam |
| **9089135** | Medina | US HWY 90 | Loam |
| **9090624** | Maverick | Faith Ranch | Loam |
| **9090668** | Maverick | San Pedro Ranch | Sandy loam |
| **9090670** | Dimmit | San Pedro Ranch | Sandy loam |
| **9090710** | Jim Hogg | Jones Ranch | Sandy loam |

*Germination Tests:* From June-August 2003 seed was collected when ripe from each field plot. Table 3 shows the amount of seed collected from each accession. Seed from the 2003 harvest was tested for active seed germination in January 2004. 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 germination of slender grama, but similar species such as sideoats grama are tested for germination by this method (AOSA, 2003). Germination was tested for 30 days in controlled environment germination chamber (12 hrs. light @ 85º F, 12 hrs dark @ 65º F). Germinated seedlings were counted daily. 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 88º F, night 65º F). Seventy two seeds of each accession were planted in flats, watered as needed and counted weekly. In germination chamber tests more than 50 % of germinating spikelets germinated 4-5 days after the onset of favorable conditions. Table 4 summarizes the germination tests of the 2003 seed harvest. Following the germination tests, 3 accessions were randomly picked for tetrazolium tests (TZ) to determine percent dormant seed. The TZ tests were conducted on 400 seeds by Hulsey Seed Laboratory, Inc., in February 2004. Table 5 shows the

results of the TZ tests, and percent dormancy of three accessions. The germination results shown in Table 5 are the same as those given in Table 4. Insufficient rainfall in 2004 at the evaluation site resulted in poor seed production in 2004. Seed was not harvested due to the limited yield. However, survival of established plants was excellent, and newly sprouted seedlings were noted near all plots.

**Table 3. Seed production record of the 5 surviving slender grama accessions at Bladerunner Farms. Total seed production is for the period from June-August 2003.**

| Accession | Lbs seed produced from June-August 2003 | Plots size ($ft^2$) | Seed production bulk lbs/acre |
|---|---|---|---|
| **9088914** | 2.17 | 400 | 236 |
| **9088897** | 1.62 | 400 | 176 |
| **9088905** | 2.53 | 400 | 275 |
| **9089049** | 3.09 | 400 | 336 |
| **9089135*** | 0.30 | 200* | 65 |

* One 10' x 20' plot, limited by availability of transplants

**Table 4. Active germination of slender grama seed harvested at Bladerunner Farms during the summer of 2003.**

| Accession | Germination chamber (% germ) | Greenhouse (% germ) |
|---|---|---|
| **9088914** | 21.00 | 30.55 |
| **9088897** | 14.66 | 22.22 |
| **9088905** | 22.66 | 50.00 |
| **9089049** | 30.66 | 25.00 |
| **9089135** | 11.33 | 27.77 |

**Table 5. Seed dormancy of three accessions of slender grama. Dormancy is calculated as the difference between tetrazolium test values and the percent active germination values taken on the same seedlot.**

| | % active germination | TZ test (%) | % dormant seed |
|---|---|---|---|
| **9088897** | 14.66 | 93.00 | 78.34 |
| **9089049** | 30.66 | 94.00 | 63.34 |
| **9089135** | 11.33 | 95.00 | 83.67 |

*Advanced Evaluations:* Four accessions experienced 100% mortality by November 11, 2004, and were subsequently removed from the experiment. Surviving accessions were evaluated against one another. Table 6 shows the results of the November 2004 evaluation at Bladerunner Farms. 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.

**Table 6. Evaluation scores of the 5 surviving accessions of slender grama at Bladerunner Farms, Nov. 11, 2004. 1=best, 9= worst, 2 reps x 25 plants/accession.**

| Accession | 9088905 | 9088897 | 90889049 | 9089135 | 9088914 | Mean |
|---|---|---|---|---|---|---|
| **Plant vigor** | 3 | 3.5 | 2.0 | 4.0 | 2.0 | 2.9 |
| **Foliage density** | 2.5 | 2.0 | 2.67 | 3.5 | 2.67 | 2.67 |
| **Uniformity** | 1.0 | 3.0 | 2.67 | 2.0 | 3.0 | 2.3 |
| **Development stage** | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| **Seed production** | 2.0 | 4.5 | 2.0 | 4.0 | 2.67 | 3.03 |
| **Forage production** | 2.5 | 3.0 | 1.67 | 3.0 | 2.0 | 2.43 |
| **Plant height** | 2.0 | 2.5 | 2.0 | 2.5 | 1.33 | 2.07 |

* 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, based on field evaluations and germination tests, all 5 surviving accessions of slender grama from the initial planting at Bladerunner Farms were chosen for advanced evaluation at 3 locations in the Rio Grande Plains. Transplants were grown from original seed and planted at the 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)), Rancho Blanco, near Laredo, TX (soil type Lagloria silt loam(USDA-SCS, 1981)), and the PMC in Kingsville, TX (soil type Victoria clay)

(Figure 1). Germination tests of the original field collected seed of each of the 5 accessions were conducted at the PMC in December 2004 (Table 7). Germination tests were conducted in the greenhouse using potting soil in 2" x 2" x 4" plant bands. Field plots were established at Rancho Blanco (March 2005), TAES Beeville (May 2005), the PMC (May 2005) and CKWRI Wildlife Complex (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 at the PMC in single repetitions of 50 plants per accession. 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, PMC, CKWRI Wildlife Complex) for important traits, and seed was collected when ripe. Tables 8, 9, 10, and 11 summarize the performance of each accession at Rancho Blanco, TAES Beeville, CKWRI Wildlife Complex, and the PMC, respectively. Seed collected from the evaluation sites was tested for active seed germination in December 2005. Results of the germination tests are given in Table 12.

**Table 7. Greenhouse germination of the 5 accessions of slender grama selected for advanced evaluation. Seed used for this evaluation was collected from the wild in 2002, and had been stored in cold storage until germination tests were initiated in 2004.**

| Accession | % germination * |
|---|---|
| **9088914** | 77.50 |
| **9088897** | 57.50 |
| **9088905** | 50.25 |
| **9089049** | 38.00 |
| **9089135** | 5.00 |

*each spike was considered a single unit, 2 spikes planted per cell

**Table 8. Evaluation data collected during the 2005 growing season on the 5 accessions of slender grama planted at Rancho Blanco (Laredo) (1=best, 9= worst).**

| Accession | 9089049 | 9089135 | 9088914 | 9088905 | 9088897 | Mean |
|---|---|---|---|---|---|---|
| Plant vigor | 1.63 | 1.38 | 1.75 | 1.50 | 1.88 | 1.63 |
| Foliage density | 1.75 | 1.88 | 1.88 | 1.75 | 2.00 | 1.85 |
| Uniformity | 1.38 | 1.50 | 1.63 | 1.50 | 1.63 | 1.53 |
| Development stage | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Seed production | 2.00 | 2.13 | 1.75 | 1.63 | 2.13 | 1.93 |
| Forage production | 1.88 | 2.00 | 1.63 | 1.88 | 2.38 | 1.95 |
| Plant height | 2.00 | 1.63 | 1.75 | 1.75 | 2.00 | 1.83 |
| Drought tolerance | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |

**Table 9. Evaluation data collected during the 2005 growing season on the 5 accessions of slender grama planted at TAES Beeville (1=best, 9=worst).**

| Accession | 9089049 | 9089135 | 9088914 | 9088905 | 9088897 | Mean |
|---|---|---|---|---|---|---|
| Plant vigor | 2 | 2 | 1 | 2 | 2 | 1.8 |
| Foliage density | 2 | 3 | 2 | 2 | 2 | 2.2 |
| Uniformity | 2 | 2 | 1 | 1 | 1 | 1.4 |
| Development stage | 1 | 1 | 1 | 1 | 1 | 1.0 |
| Seed production | 1 | 1 | 1 | 2 | 1 | 1.2 |
| Forage production | 2 | 2 | 1 | 2 | 2 | 1.8 |
| Plant height | 1 | 1 | 1 | 1 | 1 | 1 |
| Seed production (lbs./plant /year) | 0.00871 | 0.00929 | 0.00838 | 0.00754 | 0.00851 | 0.00849 |

**Table 10. Evaluation data collected during the 2005 growing season on the 5 accessions of slender grama planted at CKWRI Wildlife Complex (Kingsville) (1=best, 9=worst).**

| Accession | 9089049 | 9089135 | 9088914 | 9088905 | 9088897 | Mean |
|---|---|---|---|---|---|---|
| **Plant vigor** | 2 | 3 | 2 | 2 | 3 | 2.4 |
| **Foliage density** | 2 | 2 | 2 | 2 | 2 | 2 |
| **Uniformity** | 3 | 2 | 2 | 2 | 2 | 2.2 |
| **Development stage** | 1 | 1 | 1 | 1 | 1 | 1 |
| **Seed production** | 2 | 2 | 1 | 3 | 2 | 2 |
| **Forage production** | 2 | 3 | 2 | 2 | 3 | 2.4 |
| **Plant height** | 1 | 2 | 2 | 1 | 2 | 1.6 |

**Table 11. Evaluation data collected during the 2005 growing season on the 5 accessions of slender grama planted at E. Kika De La Garza PMC (Kingsville) (1=best, 9=worst).**

| Accession | 9089049 | 9089135 | 9088914 | 9088905 | 9088897 | Mean |
|---|---|---|---|---|---|---|
| **Plant vigor** | 5 | 5 | 5 | 5 | 5 | 5 |
| **Foliage density** | 5 | 5 | 4 | 5 | 4 | 4.6 |
| **Uniformity** | 5 | 5 | 5 | 5 | 5 | 5 |
| **Development stage** | 1 | 1 | 1 | 1 | 1 | 1 |
| **Seed production** | 5 | 5 | 5 | 5 | 5 | 5 |

**Table 12. Active germination of seed from 5 accessions of slender grama harvested in 2005.**

| Accession | % active germ. (Rancho Blanco) | % active germ. (TAES Beeville) | % active germ. (CKWRI WLC) | Mean % active germ/acc |
|---|---|---|---|---|
| **9089049** | 38.00 | 77.33 | 60.00 | 58.44 |
| **9089135** | 33.33 | 55.33 | 38.00 | 42.22 |
| **9088914** | 28.00 | 15.33 | 9.33 | 17.56 |
| **9088905** | 24.00 | 10.00 | 9.33 | 14.44 |
| **9088897** | 29.33 | 24.67 | 16.00 | 23.33 |
| **Mean % active germ/site** | 30.53 | 36.53 | 26.53 | 31.20 |

*Seeding trials:* Two seeding trials were initiated in the fall of 2005. Seed of accession 9089049 was used in both trials. The first seeding trial was in conjunction with a herbicide tolerance study at the Welder Wildlife Refuge near Sinton, TX. Four 10' x 10' plots were seeded at 6.96 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. Slender grama was seeded as part of a native grass mixture at a rate of 2.5 lbs PLS/acre in the highway medians. Medians were seeded in November 2005. This planting will be monitored for stand establishment and percent cover/species throughout 2006. Additional rangeland seeding trials are planned for 2006 at various locations (Uvalde, Webb, Frio, Duval, and Hidalgo counties) throughout South Texas.

*Seed production:* Accession 9089049 was chosen for a large scale seed increase for use in a demonstration planting for TXDOT on US HWY 77. In August 2004, 2,000 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 1 per 3 $ft^2$ (plot size = 6000 $ft^2$). Plants were watered and fertilized, and seed was harvested when ripe throughout 2005. Table 13 shows the amount of seed produced and seed quality from this increase. Seed production of 50.16 lbs pure live seed (PLS)/acre was achieved. Seed was harvested by use of a Flail-vac Seed Stripper at 1000 rpm. Table 14 shows the seed production of each accession from the seed increase at TAES Beeville in 2005. Seed was harvested by hand, from May through October at Beeville.

**Table 13. Seed production of slender grama accession 9089049, in 2005 at CKWRI Wildlife Complex.**

| | |
|---|---|
| **Bulk seed produced (lbs.)** | 16.6 |
| **Purity (%)** | 60 |
| **Active germination (%)** | 69.33 |
| **Pure live seed (PLS) (%)** | 41.6 |
| **Lbs. PLS produced** | 6.91 |
| **Seed production (bulk lbs/acre)** | 116.16 |
| **Seed production lbs PLS/acre** | 50.16 |

**Table 14. Seed production of 5 slender grama accessions from May through October of 2005 at TAES Beeville.**

| Accession | Bulk seed produced (lbs) | Seed production (bulk lbs/acre) |
|---|---|---|
| **9088905** | 0.1885* | 283 |
| **9089135** | 0.0278 | 403 |
| **9089049** | 0.1219 | 379 |
| **9088897** | 0.2127 | 370 |
| **9088914** | 0.2094 | 364 |

*Seed production was limited by number of plants available from original seed

*Insect damage:* The rice stink bug (*Oebalus pugnax*) has been observed on plants of slender 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 slender 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 slender grama.

**Criteria for inclusion in release:** All 5 accessions chosen in 2005 from the initial planting at Bladerunner Farms have shown excellent adaptability, seed production, and performance at all planting locations. The distribution of the original collections mirrors that of the native range of the species. All 5 accessions have exhibited similar flowering and seed maturity times, and seed quality and quantity among all accessions is good. Accessions 9088905 and 9088914 will be combined for Foundation Seed production because of the close proximity of collection sites and the similarity of collection attributes (range site, soil type). Plots of each accession will be monitored for long term survival, and seeding trials will be conducted from 2006-2008. Seed production data will also be collected from Foundation Seed Fields, as well as insect and pest identification and control information.

**Current/projected seed availability:** Amounts of seed currently available for increase are given in Table 15. This seed was harvested from plots at TAES Beeville, from plants grown from the original field seed collections. Seed was harvested throughout 2005, cleaned and is in cold storage at the PMC. Small quantities of the original field collections are also in storage at the PMC. Table 15 estimates the number of plants possible for planting in foundation seed fields in 2006 for each accession, and projected seed production assuming 80% of production goal is met.

**Table 15. Current/projected seed availability of accessions of Slender grama selections. Seed is currently in cold storage at the PMC, and will be used to grow transplants for Foundation Seed Fields in 2006.**

| Accession | lbs seed (from 2005 Beeville seed increase) | Projected # of plants possible to produce* | lbs seed (half of original field collection) | Projected # of plants possible to produce | Projected Total number of plants possible | 2006 Projected Foundation seed production (bulk lbs)** |
|---|---|---|---|---|---|---|
| **9088905** | 0.1885 | 11,781 | 0.0108 | 678 | 12,459 | 74 |
| **9089135** | 0.0278 | 1,737 | 0.0036 | 22 | 1,759 | 12 |
| **9089049** | 0.1219 | 7,618 | 0.0051 | 242 | 7,860 | 54 |
| **9088897** | 0.2127 | 13,293 | 0.0163 | 1,171 | 14,464 | 98 |
| **9088914** | 0.2094 | 13,087 | 0.0203 | 1,966 | 15,053 | 100 |

* Projected number of plants is calculated using active germination of each seedlot
** Projected seed production (using seed production amounts calculated from TAES Beeville in 2005) assuming 80 % of production goals are met

**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 Dilley Germplasm slender grama was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that slender 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:** Slender 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.

**Area of adaptation:** Accessions 9088905, 9088914, 9089049, 9089135, and 9088897 were originally collected from sandy loam and loam soil types. Table 16 shows the soil types that these accessions have been evaluated on; acceptable performance has been documented on each soil type. Slender grama occurs in the South Texas Plains and Edward Plateau of Texas, in open brush pastures, right of ways, and along stream banks (Gould, 1975). Correll and Johnston (1996) state that slender grama occurs in grasslands and open brush on sandy or gravelly loam soils in the Rio Grande Plains. Additional observations confirm the presence of slender grama in many areas within the Coastal Sand Plains, and Gulf Prairies and Marshes. Everitt et al. (1981) lists slender grama as a major grass component of red sandy loam range sites of the Delmita-Randado soils

complex. Based on evaluation results, distribution information and other observations, this Selected Plant Material of slender grama should be adapted to the South Texas Plains, Coastal Sand Plains, Gulf Prairies and Marshes, and Edwards Plateau (extreme southern portions) of Texas (Figure 1). Slender grama frequently occurs in disturbed areas, and is likely an early successional species. It does however occur in climax communities interspersed with late successional species. Adaptation of this release is unknown outside of the area described.

**Table 16. Soil types of known adaptability for selected Slender grama accessions.**

| 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, PMC (Kingsville, TX) | 2005-2006 | Victoria clay |

**Availability of Plant Materials**: Foundation seed will be produced and maintained by *South Texas Natives* in conjunction with 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 accessions must be separated from existing plots of slender 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.

All commercial seed production must take place in Texas. All certified seed fields must be isolated from native or other cultivated stands of slender grama by 900 ft. Foundation and certified seed fields will be limited to 7 production years.

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TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Slender grama (*Bouteloua repens*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **numerous, see proposal coversheet**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations:
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **19 May 2006**

1. Crop: **Slender grama, *Bouteloua repens* (H.B.K.) Scribn. & Merr.**

Type of Release: **Selected Plant Material**

2. Proposed name or identification: **9088905, 9088914, 9089049, 9089135, and 9088897 Slender grama**

3. Designation or name in development stages: **5 accession numbers (9088905, 9088914, 9089049, 9089135, and 9088897).**

4. Primary features or advantages:

- **Native and adapted to the South Texas Plains, Gulf Prairies and Marshes, Coastal Sand Plains and Edwards Plateau ecological regions of Texas**
- **Selected for superior plant persistence.**
- **Selected for superior seed quality, and high active seed germination**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **300 lbs by November 2006**

7. Proposed seed distribution:

Small samples distributed by: **South Texas Natives**

Royalty: **Yes**

8. Provisions: **Seed to be produced in Texas**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

Breeders and Scientists – Date

5-26-06

Unit Heads – Date

Bobby R. Eddleman 5-30-06

**Signatures for release of:**

**Dilley Germplasm slender grama**
**(*Bouteloua repens* (H.B.K.) Scribn. & Merr.)**

Fred C. Bryant — 3/12/07
Dr. Fred Bryant, Director — Date
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Mark A. Hussey — 4-6-2007
Texas Agricultural Experiment Station — Date
College Station, Texas

Walter W. Douglas — Acting — 4-12-2007
Walter W. Douglas — Date
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Robert Escheman — 4-23-2007
Robert Escheman — Date
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

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 CHAPARRAL GERMPLASM HAIRY 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 hairy grama (*Bouteloua hirsuta* Lag.) for the south Texas ecoregion. Chaparral Germplasm, accession number 9093400, is a composite of 4 collections that were tested under the following accession numbers: 9086141, 9089054, 9086154, and 9088996.

As a selected release, this plant will be referred to as Chaparral Germplasm hairy grama. Chaparral 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 hairy 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 hairy grama. Seed was cleaned and stored for evaluation at the E. Kika De La Garza Plant Materials Center (PMC), in Kingsville, TX after field collection. No breeding or genetic manipulation was conducted on the accessions.

**Description:** Hairy grama is a cross, wind pollinated species. It is likely self sterile (Girija, 1968). The general botanical description of hairy grama is: Tufted perennial (but flowering the first year); culms numerous, 10-75 cm long, 0.5-2 mm thick, slightly geniculate at the lower nodes, essentially unbranched above the base; ligule a scale 0.1-0.3 mm long; blades occurring mostly in the lower half of the plant, 5-12 (-20) cm long,

**Table 1. Origin and collection information for Selected Plant Material of hairy grama.**

| Accession | Date | County | Location | Soil type | Collector |
|---|---|---|---|---|---|
| 9086141 | 11/15/2001 | San Patricio | Welder Wildlife Refuge | Sandy loam | F. Smith & C. Lawson |
| 9086154 | 11/1/2001 | Kenedy | La Paloma Ranch | Sand | F. Smith |
| 9088996 | 8/13/2005 | Dimmit | Chaparral Wildlife Management Area | Sandy loam | F. Smith & C. Lawson |
| 9089054 | 8/17/2002 | Uvalde | FM 1002 | Loam | F. Smith & P. Ortega |

1-2.2 mm broad, flat basally, passing into a closely involute arcuate tip, usually pilose near the ligule and on the lower margins; spikes persistent, (1 or) 2 to 4 (to 6) per culm, 10-35 (-60) mm long, 3-6 mm thick, distributed over a panicle axis 1-8 (-19) cm long, the rachis apically subspinose, i.e., prolonged beyond the most distal fertile spikelet into a semi-rigid needle 3-11 mm. long (in one variety the needle terminating in a rudimentary spikelet); second glume on and near the keel with tubercles (at maturity the spikelet is black and usually visible to the unaided eye) and these with long white whiskers, rarely only short-pilose; spikelets 18-50 (to 70) per spike (Correll & Johnston, 1996).

The 4 accessions comprising this release exhibit 2 distinct types of ecotypic variation: a stoloniferous ecotype, and a non-stoloniferous ecotype. Hairy grama was observed to have a stoloniferous growth form in Brooks, County, TX, by Morrow et al. (1954). Subsequent study of this ecotype revealed the stoloniferous habit to be genetic and heritable. Morrow et al. (1954) states that the occurrence of this stoloniferous ecotype ranges from Lavaca to Wilacy Counties, TX. Hairy grama has also been documented to frequently reproduce vegetatively by Steiger (1930). Accessions 9086141 (San Patricio County) and 9086154 (Kenedy County), exhibit stoloniferous growth habits. Forage value of hairy grama is reported to be fair for livestock and poor for wildlife (Hatch et. al., 1999). However, it is reported to occur in 67% of undisturbed sites in sand prairie community types, but in only 4% of grazed sites in South Texas (Johnston, 1963). When compared to other prairie grasses hairy grama has been shown to be extremely drought tolerant (Mueller & Weaver, 1942). Studies by Morrow et al. (1954) showed that some ecotypes of hairy grama survived and maintained themselves better than many associated grasses such as seacoast bluestem and brownseed paspalum in South Texas under drought conditions. Hairy grama contains approximately 800,000 seeds per pound.

**Potential Uses:** Hairy grama was targeted for collection by *South Texas Natives* because of the potential for use on highway right of ways, reclamation sites, and rangeland plantings.

## Method of Breeding and Selection:

*Collection:* As part of an overall effort to collect, evaluate and release germplasms of a number of plants native to South Texas, personnel from *South Texas Natives* collected seed of hairy grama from 24 separate field locations during 2001-2003 (Table 2).

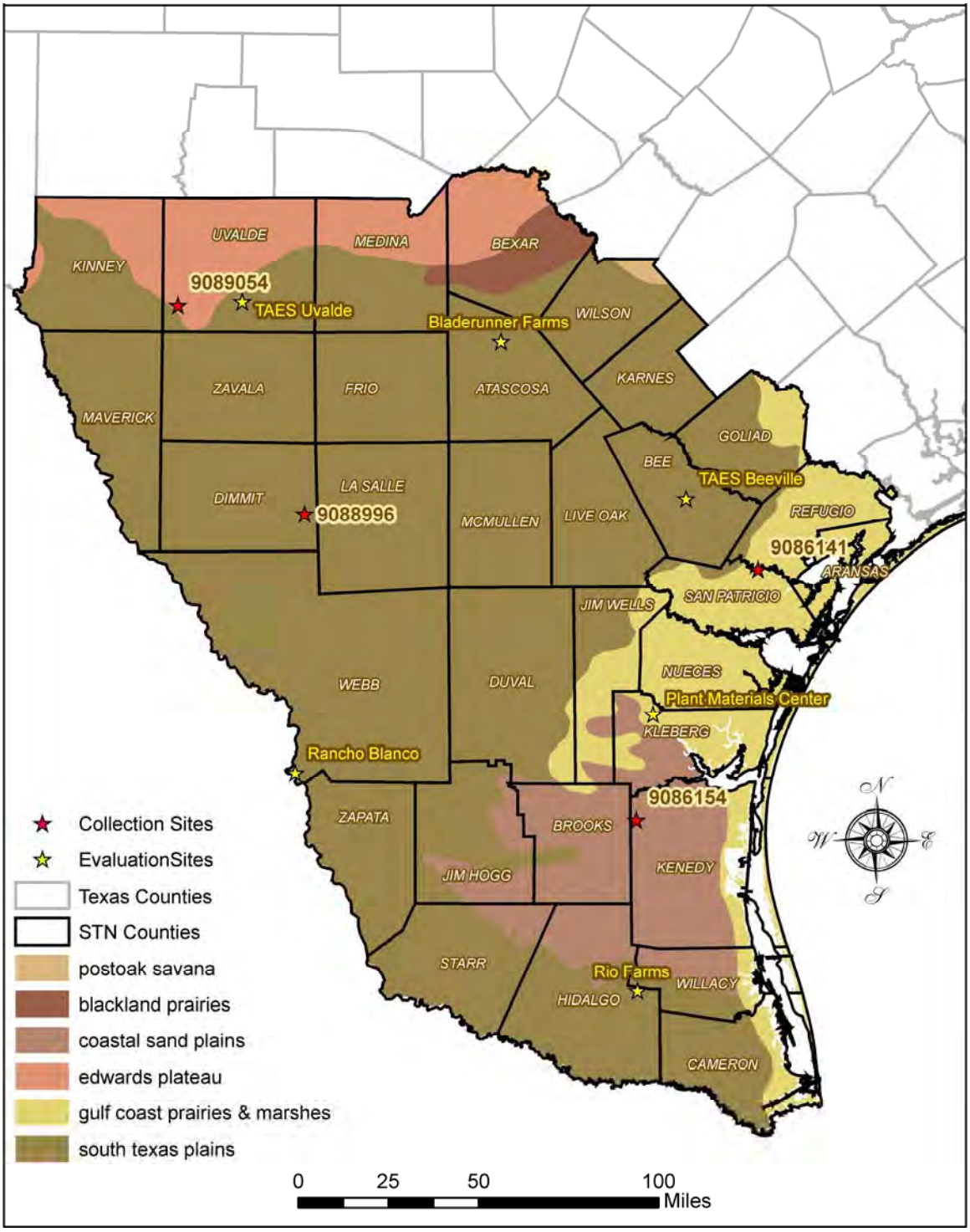
**Table 2. Collection information of 24 accessions of hairy grama obtained by *South Texas Natives* from 2001-2003.**

| Accession | County | Location | Soil type |
|---|---|---|---|
| **9086141** | San Patricio | Welder Wildlife Refuge | Sandy loam |
| **9086142** | Kenedy | La Paloma Ranch | Sand |
| **9086154** | Kenedy | La Paloma Ranch | Sand |
| **9088876** | Webb | Cerrito Prieto Ranch | Sandy loam |
| **9088910** | Dimmit | Piloncillo Ranch | Sandy loam |
| **9088991** | Webb | Cerrito Prieto Ranch | Sandy loam |
| **9088996** | Dimmit | Chaparral WMA | Sandy loam |
| **9089043** | Webb | Piloncillo Ranch | Sandy loam |
| **9089054** | Uvalde | FM 1022 | Loam |
| **9089073** | Dimmit | Piloncillo Ranch | Sandy loam |
| **9089077** | LaSalle | Chaparral WMA | Sandy loam |
| **9089111** | Goliad | Sarko Ranch | Sandy loam |
| **9089152** | Goliad | Sarko Ranch | Sandy loam |
| **9089201** | Medina | CR 742 | Sand |
| **9090345** | San Patricio | Welder Wildlife Refuge | Sandy loam |
| **9090391** | Jim Hogg | Jones Ranch | Sandy loam |
| **9090393** | Jim Hogg | Jones Ranch | Sandy loam |
| **9090417** | Kinney | Anaconcho Ranch | Gravel/loam |
| **9090427** | Kinney | FM 334 | Gravel/loam |
| **9090437** | Kinney | Anaconcho Ranch | Gravel/loam |
| **9090445** | Jim Hogg | Jones Ranch | Sandy loam |
| **9090450** | Jim Hogg | Jones Ranch | Sandy loam |
| **9090455** | Jim Hogg | Jones Ranch | Sandy loam |
| **9090610** | Maverick | Faith Ranch | Sandy loam |

*Initial Field Evaluations:* Seed from these accessions was planted in the greenhouse at the E. Kika De La Garza Plant Materials Center (PMC) in December of 2002 and 2003. Seedlings grown from these plantings were planted for evaluation at Bladerunner Farms, near Poteet, TX (soil type Miguel fine sandy loam (USDA-SCS, 1977) (Figure 1) in 2003 and 2004. Of the 24 original collections, 11 collections produced enough plants for evaluation.

*Advanced Evaluation:* Of the 11 accessions planted for initial evaluation, 6 experienced 100% mortality by November 2004. The 5 surviving accessions were evaluated against one another for important traits on November 11, 2004. 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

**Figure 1. Location of evaluation and collection sites of CHAPARRAL germplasm hairy grama.**



poor performance. Table 3 shows the results of the November 2004 evaluation at Bladerunner Farms.

**Table 3. Evaluation scores of the 5 surviving accessions of hairy grama at Bladerunner Farms, November 11, 2004. 1=best, 9=worst, 2 field reps/accession.**

| Accession | 9086141 | 9086154 | 9088996 | 9089054 | 9089152 | Mean |
|---|---|---|---|---|---|---|
| **Plant Vigor*** | 2 | 2.5 | 2 | 2 | 4 | 2.5 |
| **Foliage density** | 2 | 3 | 3 | 1 | 5 | 2.8 |
| **Uniformity** | 2 | 1.5 | 2 | 2 | 2 | 1.9 |
| **Development stage** | 1 | 1 | 1 | 1 | 1 | 1 |
| **Seed production** | 1 | 3.5 | 4 | 1 | 6 | 3.1 |
| **Forage production** | 3 | 3 | 4 | 3 | 4 | 3.4 |
| **Plant height** | 2 | 2 | 2 | 3 | 4 | 2.6 |

*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

Seed from each accession was collected on November 11, 2004, and tested for active germination on February 2, 2005. Germination was tested for 15 days (12 hours light @ 85º F, 12 hours dark @ 65º F). Germinated seedlings for each accession were counted daily. All germination occurred on days 3, 4, 5, and 6 after initiation of favorable conditions. No germination was observed past day 7 of the experiment. Table 4 shows the results of the germination test.

**Table 4. Active germination of the 5 surviving accessions of hairy grama seed collected on November 11, 2004, from Bladerunner Farms, Poteet, TX.**

| Accession | % active germination |
|---|---|
| **9089141** | 2.00 |
| **9086154** | 2.66 |
| **9088996** | 3.33 |
| **9089054** | 10.66 |
| **9089152** | 4.66 |

In February of 2005, based on field evaluations and germination tests, all 5 surviving accessions from the initial planting at Bladerunner Farms were selected for advanced evaluation at 3 locations in the Rio Grande Plains. Accession 9089152 was determined to have no original seed remaining. Plants were dug from existing plots at Bladerunner Farms and divided to produce enough plants for a small seed increase. However we observed 100% mortality in the divided plants, and without adequate collection information to recollect the accession, it was eliminated from the advanced evaluation. Transplants of the 4 remaining accessions were grown from original seed and planted for evaluation at the Caesar Kleberg Wildlife Research Institute (CKWRI) Wildlife Complex in Kingsville, TX (soil type Victoria clay), TAES Beeville, TX (soil type Clareville sandy clay loam & Parrita sandy clay loam (USDA-SCS, 1979)) and Rio Farms, Monte Alto, TX (soil type Delfina fine sandy loam (USDA-SCS, 1979)) (Figure 1). Plots at Rio Farms and the CKWRI Wildlife Complex were planted in a split plot design (2 replications x 10 plants of each accession). Plots at TAES Beeville were planted in isolated blocks, 900 ft apart, to facilitate use as a seed increase site. All plots were irrigated to ensure establishment and weeded as needed. Plots at TAES Beeville were irrigated all year to facilitate seed production. Plots were evaluated monthly for important traits, and seed was collected when ripe. The initial evaluation plots at Bladerunner Farms were also evaluated on June 2, 2005. Tables 5, 6, 7, and 8 summarize the performance of each accession in 2005 at Rio Farms, TAES-Beeville, CKWRI Wildlife Complex and Bladerunner Farms, respectively. Seed was collected from each evaluation site when ripe in 2005. This seed was tested for active germination in December 2005. Results of the germination tests are given in Table 9.

*Seed Production:* Seed was harvested from small seed increase plots at TAES Beeville monthly, or whenever ripe throughout 2005. Yearly seed production estimates of each accession are given in Table 10.

**Table 5. Evaluation data collected during the 2005 growing season on the 4 accessions of hairy grama planted at Rio Farms (Monte Alto) (1=best, 9=worst).**

| Accession | 9086141 | 9086154 | 9088996 | 9089054 | Mean |
|---|---|---|---|---|---|
| **Plant vigor** | 1.83 | 1.5 | 1.5 | 1.58 | 1.60 |
| **Foliage density** | 1.91 | 1.5 | 2.25 | 2.33 | 1.99 |
| **Uniformity** | 1.67 | 1.5 | 1.25 | 1.08 | 1.38 |
| **Development stage** | 1.41 | 1.83 | 1 | 1 | 1.31 |
| **Seed production** | 3.67 | 4.5 | 1.17 | 1.67 | 2.76 |
| **Forage production** | 1.83 | 1.25 | 2.08 | 2.08 | 1.81 |
| **Plant height** | 2.08 | 1.75 | 1.41 | 1.73 | 1.74 |

**Table 6. Evaluation data collected during the 2005 growing season on the 4 accessions of hairy grama planted at TAES Beeville (1=best, 9=worst).**

| Accession | 9086141 | 9086154 | 9088996 | 9089054 | Mean |
|---|---|---|---|---|---|
| **Plant vigor** | 3 | 1 | 3 | 2 | 2.25 |
| **Foliage density** | 3 | 1 | 3 | 2 | 2.25 |
| **Uniformity** | 2 | 2 | 3 | 3 | 2.5 |
| **Development stage** | 2 | 2 | 1 | 1 | 1.5 |
| **Seed production** | x* | x* | 5 | 2 | 3.5 |
| **Forage production** | 2 | 2 | 3 | 2 | 2.25 |
| **Plant height** | 2 | 2 | 2 | 2 | 2 |

* Accessions were not flowering at the time of evaluation

**Table 7. Evaluation data collected during the 2005 growing season on the 4 accessions of hairy grama planted at the CKWRI Wildlife Complex (Kingsville).**

| Accession | 9086141 | 9086154 | 9088996 | 9089054 | Mean |
|---|---|---|---|---|---|
| **Plant vigor** | 3 | 3 | 3 | 3 | 3 |
| **Foliage density** | 1 | 3 | 2 | 4 | 2.5 |
| **Uniformity** | 1 | 3 | 2 | 2 | 2 |
| **Development stage** | 1 | 1 | 1 | 1 | 1 |
| **Seed production** | 2 | 1 | 4 | 3 | 2.5 |
| **Forage production** | 3 | 3 | 3 | 3 | 3 |
| **Plant height** | 2 | 2 | 2 | 3 | 2.25 |

**Table 8. Evaluation data collected during the 2005 growing season on the 4 accessions of hairy grama planted at Bladerunner Farms (Poteet) (1=best, 9=worst).**

| Accession | 9086141 | 9086154 | 9088996 | 9089054 | Mean |
|---|---|---|---|---|---|
| **Plant vigor** | 3 | 2.5 | 2.5 | 3 | 2.75 |
| **Foliage density** | 2.5 | 2 | 3.5 | 2 | 2.5 |
| **Uniformity** | 2.5 | 2 | 1.5 | 3 | 2.25 |
| **Development stage** | 3 | 3 | 1.5 | 2 | 2.38 |
| **Seed production** | x* | x* | 2.5 | x* | 2.5 |
| **Forage production** | 2 | 2 | 4 | 3 | 2.75 |
| **Plant height** | 2 | 2 | 2.5 | 3 | 2.38 |

*evaluated under dry land conditions

**Table 9. Active germination of hairy grama seed collected from evaluation plots in 2005.**

| Accession | % active germ. (TAES Beeville) | % active germ. (Rio Farms) | % active germ. (CKWRI WLC) | Mean % active germ/acc |
|---|---|---|---|---|
| **9086141** | 0.67 | 1.33 | 4.67 | 2.22 |
| **9086154** | 0.00 | 1.33 | 0.00 | 0.44 |
| **9088996** | 2.00 | 0.00 | 5.33 | 2.44 |
| **9089054** | 1.33 | 11.33 | 5.33 | 6.00 |
| **Mean % active germ/site** | 1.00 | 3.50 | 3.83 | 2.78 |

**Table 10. Yearly seed production estimates of 4 accessions of hairy grama at TAES Beeville, 2005.**

| Accession | lbs. seed produced/plant | Est. production lbs./acre/year |
|---|---|---|
| **9086141** | 0.00038 | 16 |
| **9086154** | 0.00291 | 126 |
| **9088996** | 0.00600 | 261 |
| **9089054** | 0.01000 | 435 |

**Selection criteria for inclusion in release:** All 4 accessions of hairy grama selected for advanced evaluation are recommended for release. All accessions have shown broad adaptability for various soil types, and the original collection locations are representative of the native range of the species throughout South Texas. Two distinct ecotypic varieties of hairy grama are included in this release. Accessions 9086141 & 9086154 are stoloniferous ecotypes. These accessions produce seed year round, but seeds routinely germinate while still attached to the spike. Seed production is highest from September through November; during this period, sprouting seed has not been observed. Accessions 9088996 & 9089054 are more typical ecotypes of hairy grama, given that no stoloniferous growth has been observed and seed is produced throughout the year. All plots will be monitored for long term survival until 2008. Seeding trials for 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:** Amounts of seed currently available for increase of 9086141, 9089054, 9086154, and 9088996 is listed in Table 11. This seed was harvested from plots at TAES Beeville from plants grown from the original field seed collections. Seed was harvested throughout 2005, cleaned, and is in cold storage at the PMC. Small quantities of the original field collections are also in storage at the PMC (this seed will not be used for increase due to the small amount remaining). Table 11 estimates the 2006 seed increase. 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 Chaparral Germplasm hairy grama was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that hariy 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

**Table 11. Current/projected seed availability of Selected Plant Material accessions. Seed is currently in cold storage at the PMC, and will be used to grow transplants for Foundation Seed Fields in 2006.**

| Accession | lbs. seed (from 2005 Beeville seed increase) | Projected # of plants possible to produce* | 2006 projected foundation seed production (bulk lbs.)** |
|---|---|---|---|
| **9086141** | 0.005 | 960 | 4.6 |
| **9086154** | 0.035 | 123.2 | 0.36 |
| **9088996** | 0.06 | 26.8 | 0.0081 |
| **9089054** | 0.12 | 1,276 | 10.21 |

* Projected number of plants is calculated using active germination of the 2005 Beeville seed increase
** Projected seed production (using seed production amounts calculated from 2005 Beeville seed increase) assumes 80% of production goals are met

**Conservation Use:** Hairy 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.

**Area of adaptation:** The selected accessions were originally collected from sand, loam, and sandy loam soil types in South Texas. Table 12 shows the soil types that the selected accessions have been evaluated on, and acceptable performance has been documented on each soil type. Hairy grama occurs throughout Texas on a wide variety of soil types (Gould, 1975), but is rare in East Texas (Correll & Johnston, 1996). Hatch et al.(1999) reported that it grows best on sandy or sandy loam soils, on well drained sites. Hairy grama is a sub-dominant plant in the little bluestem-trichloris vegetation association (McClendon, 1991). It is found in adobe, stony Ridge, gravelly ridge, loamy sand, and sandy loam range sites in South Texas (NRCS-SCS, 1970). Based on evaluation results and distribution information, 9086141, 9089054, 9086154, and 9088996 should be adapted to the South Texas Plains, Coastal Sand Plains, Gulf Prairies and Marshes, and Edwards Plateau (extreme southern portions) (Figure 1). This selected material will be best adapted to sand, sandy loam, and well drained loamy soils. Additionally, hairy grama occurs in disturbed and undisturbed areas, and is adaptable to various successional stages of many vegetation communities. Adaptation of 9086141, 9089054, 9086154, and 9088996 outside of the area described is unknown

**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 4 accessions must be separated from existing plots of hairy grama and each other by 900 ft. Seed harvested from Foundation Seed Fields will be cleaned and stored at the E. Kika De La Garza Plant Materials Center, in Kingsville, TX. All seed will be tested by outside laboratories for germination, purity, and dormancy.

**Table 12. Soil types of known adaptability for 9086141, 9089054, 9086154, and 9088996 accessions of hairy 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 |
| Rio Farms (Monte Alto, TX) | 2005-2006 | Delfina fine sandy loam |
| CKWRI WLC (Kingsville, TX) | 2005-2006 | Victoria clay |

All commercial seed production must take place in Texas. Certified seed fields must be isolated from native or other cultivated stands of hairy grama by 900 ft. Foundation and certified seed fields have a 7 year production limit.

**Figure 2. Photographs of accessions of Selected Plant Material of hairy grama (photographs taken on October 19, 2005 at Rio Farms (Monte Alto)).**

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TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Hairy grama (*Bouteloua hirsuta*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **numerous, see release proposal coversheet**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations:
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 18, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **19 May 2006**

1. Crop: **Hairy grama, *Bouteloua hirsuta* Lag.**

Type of Release: **Selected Plant Material**

2. Proposed name or identification: **9086141, 9089054, 9086154, and 9088996 hairy grama**

3. Designation or name in development stages: **4 accession numbers (9086141, 9089054, 9086154, and 9088996)**

4. Primary features or advantages:

- **Native to and adapted to the South Texas Plains, Gulf Prairies and Marshes, Coastal Sand Plains and Edwards Plateau ecological regions of Texas**
- **Selected for superior persistence.**
- **Accessions 9086141 & 9086154 are stoloniferous ecotypes.**
- **Accessions 9088996 & 9089054 are more typical ecotypes of hairy grama, given that no stoloniferous growth has been observed**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **15 lbs by November 2006**

7. Proposed seed distribution:

Small samples distributed by: **South Texas Natives**

Royalty: **Yes**

8. Provisions: **Seed to be produced in Texas**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

Breeders and Scientists – Date

W R Chamberlain 5-26-06

Unit Heads – Date

Bobby R. Eddleman 5-30-06

**Signatures for release of:**

**Chaparral Germplasm hairy grama**
**(*Bouteloua hirsuta* Lag.)**

Fred C. Bryant — 3/12/07

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Date

Texas Agricultural Experiment Station — 4-6-2007

College Station, Texas

Date

Walter W. Douglas — Acting — 4-12-2007

Walter W. Douglas
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

Robert T. Escheman — 4-23-2007

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

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, accession number 9093401, 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.

**Figure 1. Location of evaluation and collection sites of Selected Plant Material of Texas grama.**

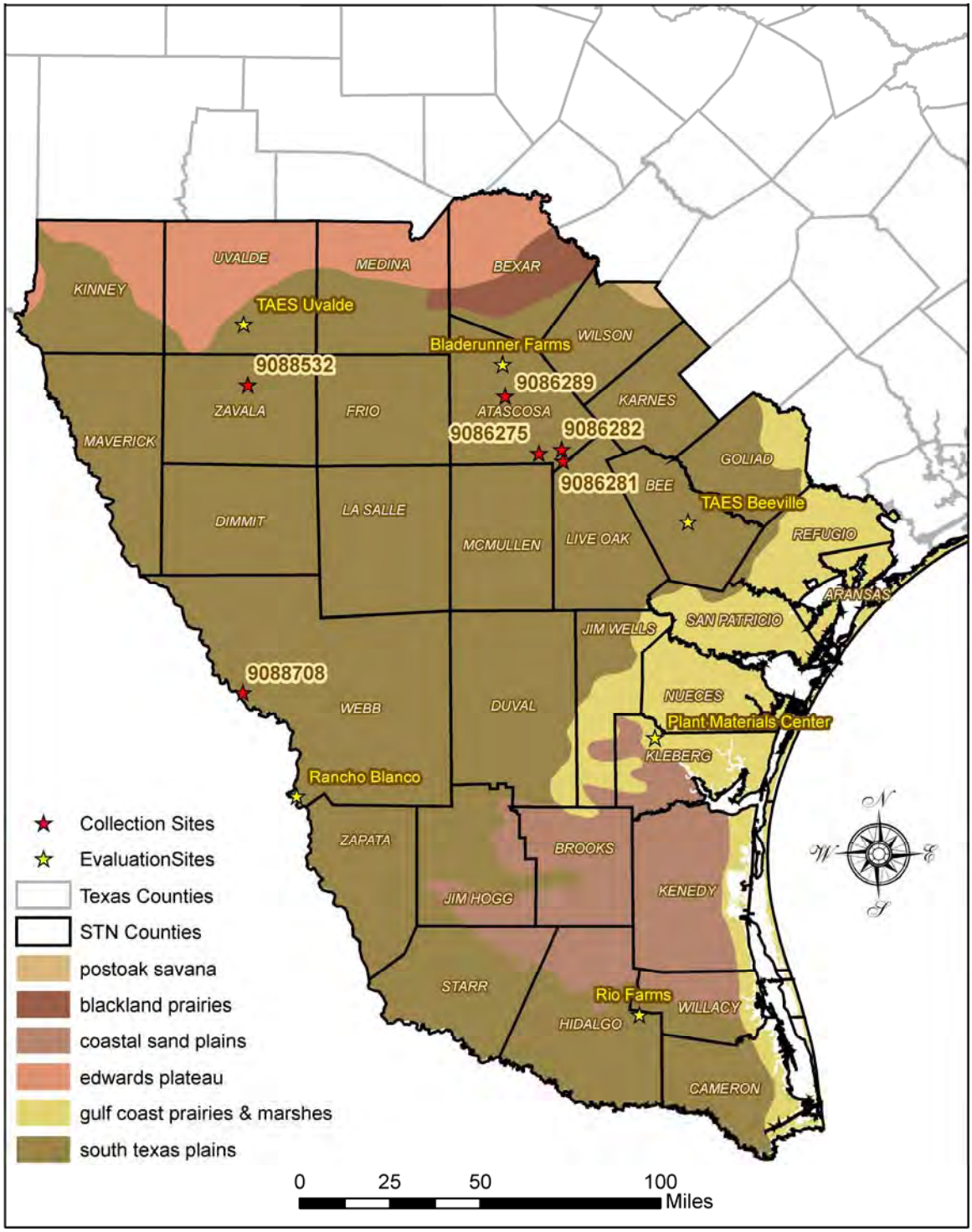

**Table 1. Origin and collection information of Selected Plant Material of Texas grama.**

| Accession | Date | County | Location | Soil type | Collector |
|---|---|---|---|---|---|
| 9088532 | 5/13/2002 | Zavala | Westwind Ranch | Sandy loam | F. Smith & P. Maywald |
| 9086289 & 9086275* | 5/9/2002 & 5/21/2002 | Atascosa | 74 Ranch | Sandy loam | F. Smith & C. Lawson |
| 9086282 & 9086281** | 5/8/2002 &5/20/2002 | Live Oak & Atascosa | ALT US HWY 281 | Loam | F. Smith & C. Lawson |
| 9088708 | 6/11/2002 | Webb | Old Mines road | Gravel/loam | F. Smith & P. Maywald |

*** Accessions 9086289 & 9086275 were evaluated as separate accessions, but were combined because of similar collection site, originating soil type, morphology, and phenology.**
****Accessions 9086282 & 9086281 were evaluated as separate accessions, but were combined because of similar collection site, originating soil type, morphology, and phenology.**
**(USDA-SCS, 1977) (USDA-SCS, 1981)**

**Description:** The Selected Plant Material of Texas grama can be traced back to 6 collections (Table 1). However, in our field evaluations, we could not distinguish accession 9086289 from 9086275 from each other and since they were both collected on the same ranch in Atascosa County, we propose to blend these two together for the production of Foundation seed. Likewise we feel that accessions 9086281 and 9086282 which were both collected along US highway 181 in adjacent counties are also indistinguishable, and therefore will be blended together for Foundation Seed production.

Texas grama is a cross, wind pollinated species. The general botanical description of Texas grama is: Tufted perrenial; culms numerous, 15-40 cm long, 0.5-1 mm thick, erect, very sparingly branched in the lower part; ligule a fringe about 0.1 mm long; blades 3-10 (-17) cm long, 1-2 mm broad, flat with involute-filiform tip, on drying mostly involute, sparingly papillose-pilose; spikes 5-14, spreading or slightly pendulous, at length each spike deciduous as a unit, the rachis prolonged beyond the most distal spikelet, apically trifurcate, basally and laterally with much pubescence; glumes appressed-pubescent near the midnerve; spikelets (2 or) 3 to 5 per spike, at maturity the longest of them much longer than the rachis (Correll and Johnston, 1996). All of the selected accessions exhibit similar characteristics in respect to phenology and morphology.

**Potential Uses**: Texas grama was targeted for collection by *South Texas Natives* because of its 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

**Method of Breeding and Selection:**

*Collection:* . As part of an overall effort to collect, evaluate, and release germplasms of a number of plants native to South Texas, personnel from *South Texas Natives* collected seed of Texas grama from 21 separate field locations in South Texas from 2001-2003 (Table 2).

**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 @ 85º F, 12 hours dark @ 65º 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 88º F, night 65º 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 ft² (plot size = 1280 ft²). 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:**

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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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TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Texas grama (*Bouteloua rigidiseta*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **numerous, see proposal coversheet**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations:
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **19 May 2006**

1. Crop: **Texas grama, *Bouteloua rigidiseta* (Steud.) Hitchc.**

Type of Release: **Selected Plant Material**

2. Proposed name or identification: **9088532, 9086289, 9086275, 9086282, 9086281, and 9088708m Texas grama**

3. Designation or name in development stages: **6 accession numbers (9088532, 9086289, 9086275, 9086282, 9086281, and 9088708).**

4. Primary features or advantages:

- **Native to and adapted to the South Texas Plains, Gulf Prairies and Marshes, Coastal Sand Plains and Edwards Plateau ecological regions of Texas**
- **Selected for superior persistence.**
- **Selected for superior germination.**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **small quantities by November 2006**

7. Proposed seed distribution:

Small samples distributed by: **South Texas Natives**

Royalty: **Yes**

8. Provisions: **Seed to be produced in Texas**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| 5-26-06 | 5-30-06 |

**Signatures for release of:**

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

Fred C. Bryant — 3/12/07

Dr. Fred Bryant, Director — Date
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Mark C. Hussey — 4/6/2007

Texas Agricultural Experiment Station — Date
College Station, Texas

Walter W. Douglas — Acting — 4-12-2007

Walter W. Douglas — Date
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Robert T. Escheman — 4-23-07

Robert Escheman — Date
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF KIKA820 GERMPLASM STREAMBED BRISTLEGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material of streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.) for the south Texas ecoregion. Kika820 Germplasm was tested under the accession number 9038820 and 820.

This plant will be referred to as Kika820 Germplasm streambed bristlegrass and is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted streambed bristlegrass. The potential for immediate use is high especially for upland wildlife plantings and for range seeding mixes.

**Collection Site Information:** Accession 9038820 was collected in 1983 from native plants located at the Yturria Station near Raymondville, Texas at 26°34' N. latitude and 97° 46' W. longitude (MLRA 83). It was growing on a Sarita fine sand soil type. Collection site elevation was 12.2 meters (40 feet) and average annual precipitation for this location is 86.4 centimeters (34 inches).

**Description:** Streambed bristlegrass is a native perennial bunch grass with stiffly erect stems. Mature foliage height ranges from 26 to 100 centimeters (1.0 to 3.0 feet) tall and is usually pale or with a whitish or grayish color. Stems are in dense clumps, infrequently branched, and rough. It has a ligule that has hairs 2 to 4 mm in length. The leaf blades are flat or folded 8 to 25 centimeters (3 to 9.8 inches) long, with a prominent midrib, and typically 5 to 8 millimeters wide, hairless or sparsely pilose. The inflorescence is densely flowered with a cylindrical or columnar panicle that is commonly 3 to 9 centimeters, although shorter in some plants, and 1 to 2 cm thick. The bristles, by which it gets its common name, are 6 to 7 mm long and are usually solitary below each spikelet. Spikelets are 1.75 to 2 mm long at maturity. The paleas are flat or slightly rounded. The stigmas and anthers appear together with the stigmas purple in color. The

chromosome number is *2n=54, 68 or 72*. The plants produce seed from May through November. Streambed bristlegrass is found mainly in the western, drier portions of the State. It is absent from the eastern areas extending from the Blackland prairie to the Pineywoods.

**Potential Uses:** Kika820 Germplasm is recommended for upland wildlife plantings and in range seeding mixes. It provides good grazing for livestock and fair grazing for wildlife. It can be used in many types of conservation plantings, such as streamside buffers and filter strips.

**Method of Breeding and Selection:**

***Initial evaluation*:** Initial evaluations of Kika820 Germplasm began in 1984 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 96 accessions of bristlegrass (*Setaria* spp.) were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9038819 and 9038820 were determined to be the best accessions of bristlegrass for survival, vigor, growth form and development, and disease resistance.

An advanced evaluation plot was established at the PMC in 1994 that consisted of 4 replications of ten plants each of 9038819, 9038820, 9003939 (Arizona release) and a Texas "common" commercial source. In 1996, we took biweekly seed harvests to determine total seed yield. We also evaluated the plots for total biomass production and survival in October, 1996 (Table 1). However, despite numerous trials to get active germination above 10%, work with bristlegrass was abandoned due to poor germination results.

In 2001, in conjunction with the development of the South Texas Natives project, interest was revived in plains bristlegrass and a new initial evaluation was started. Nine collections of bristlegrass were transplanted to field plots at the PMC in April and May 2001. Seed was collected from these nine accessions at the end of 2001 and germination tests were performed in June 2002 (Table 2). All nine accessions exhibited very poor germination results. Another 5

**Table 1. Bristlegrass Evaluations at Kingsville, Texas in 1996.**

| Accession Number | Source (County) | Percent Survival | Forage Yield (g/plant) | Number of Seed Heads/Plant | Grams of Seed/Plant |
|---|---|---|---|---|---|
| 9038819 | Bexar | 90 | 113 | 30 | 23 |
| 9038820 | Willacy | 90 | 150 | 14 | 11 |
| 9003939 | Arizona | 80 | 113 | 13 | 9 |
| TX "Common" | Commercial | 52 | 168 | 9 | 15 |

**Table 2. Bristlegrass 2001 Harvest Seed Germination, Kingsville, Texas**

| Accession Number | Origin (County) | Grams Harvested | 8 Days % | 15 Days % | 28 Days % |
|---|---|---|---|---|---|
| 9029648 | Webb | 189 | 0 | 2 | 2 |
| 9029677 | Karnes | 124 | 0 | 0 | 0 |
| 9038819 | Bexar | 92 | 0 | 0 | 0 |
| 9038713 | Duval | 25 | 0 | 0 | 0 |
| 9038833 | Frio | 79 | 0 | 0 | 0 |
| 9029636 | Live Oak | 55 | 0 | 2 | 2 |
| 9038708 | Goliad | 107 | 0 | 0 | 0 |
| 9029679 | Mc Mullen | 207 | 0 | 0 | 0 |
| 9038820 | Willacy | 58 | 0 | 0 | 0 |

* 24 hours dark, 16 hours 10°C (50°F) / 8 hours 30°C (86°F).

accessions were added to the field nursery in November 2001. Thirteen of the fourteen accessions had good field survival and growth through the winter of 2001. Seed was collected from all fourteen of the 2001 plantings during the summer of 2002. A germination test was run on this harvest in March 2003 (Table 3). All accessions again exhibited poor germination.

The field plot was evaluated for plant performance from May to December of 2002. Only five of the fourteen collections planted in the plot exhibited above average performance in field characteristics (Table 4). Only accession 9038819-Bexar exhibited above average seed retention, but it also exhibited above average lodging problems. All accessions exhibited average seed shattering problems. In addition, all seedheads in the field plot became infested with fungi in October 2002.

Sixteen more collections were added to the field evaluation plot in April 2003, increasing the total number of field accessions to 30. The field plot of plains bristlegrass was evaluated for plant performance from May to August of 2003 (Table 5). Two of the collections planted in 2001 in the field plot exhibited above average seed production (Acc# 9038708-Goliad & 9029667-La Salle), and two of the new accessions planted in 2003 (Acc# 9088932-Duval & 9086210-Kenedy) exhibited above average resistance and vigor. All accessions exhibited average seed shattering problems. All seed heads in the entire field plot became infested with fungi again in October 2003.

**Table 3. Bristlegrass 2002 Harvest Germination, Kingsville, Texas**

| Accession Number | Origin (County) | Grams Harvested | 5 Days % | 15 Days % | 28 Days % |
|---|---|---|---|---|---|
| 9029587 | Webb | 293 | 0 | 0 | 0 |
| 9029605 | Val Verde | 402 | 0 | 0 | 0 |
| 9029636 | Live Oak | 144 | 0 | 2 | 2 |
| 9029648 | Webb | 139 | 0 | 2 | 2 |
| 9029667 | La Salle | 365 | 0 | 0 | 0 |
| 9029677 | Karnes | 123 | 0 | 4 | 4 |
| 9029678 | Mc Mullen | 105 | 0 | 0 | 0 |
| 9029679 | Mc Mullen | 310 | 0 | 0 | 2 |
| 9038708 | Goliad | 204 | 0 | 0 | 0 |
| 9038713 | Duval | 108 | 0 | 0 | 0 |
| 9038715 | Duval | 488 | 0 | 0 | 0 |
| 9038819 | Bexar | 189 | 0 | 0 | 0 |
| 9038820 | Willacy | 199 | 0 | 0 | 0 |
| 9038833 | Frio | 125 | 0 | 0 | 0 |

* 24 hours dark, 16 hours 10°C (50°F) / 8 hours 30°C (86°F).

**Table 4. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2002**

| Accession Number | Origin (County) | % Survival | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|
| 9029587 | Webb | 96 | 6.0 | 5.6 | 6.2 |
| 9029605 | Val Verde | 78 | 6.0 | 4.0 | 7.2 |
| 9029636 | Live Oak | 96 | 5.2 | 4.6 | 5.4 |
| 9029648 | Webb | 92 | 5.0 | 6.2 | 6.2 |
| 9029667 | La Salle | 90 | 6.3 | 6.8 | 7.8 |
| 9029677 | Karnes | 100 | 5.8 | 6.0 | 5.0 |
| 9029678 | Mc Mullen | 90 | 5.3 | 5.8 | 6.8 |
| 9029679 | Mc Mullen | 90 | 6.3 | 5.2 | 5.4 |
| 9038708 | Goliad | 96 | 5.5 | 5.0 | 7.0 |
| 9038713 | Duval | 42 | 6.5 | 5.2 | 6.0 |
| 9038715 | Duval | 88 | 5.0 | 4.0 | 7.8 |
| 9038819 | Bexar | 94 | 5.8 | 5.8 | 4.4 |
| 9038820 | Willacy | 96 | 7.3 | 6.8 | 6.0 |
| 9038833 | Frio | 96 | 6.5 | 4.0 | 5.4 |

*Ocular estimate (1 = Best)

In February of 2003, South Texas Natives took half of the 2002 seed harvest from the 14 accessions in the PMC field evaluation plot and seeded it in the greenhouse. The resulting plants were taken to the Texas Agricultural Experiment Station at Beeville and planted out that spring on weed mat. Seed was harvested from these accessions in 2003 by three different methods: (1) fallen seed was swept off the weed mat (referred to as mat harvest), (2) the seed heads were cut off the plants and allowed to dry on tarps, then fallen seed was collected (referred to as tarp harvest), and (3) seed that still remained on the plants after drying on the tarp was stripped off the plants using a brush machine (referred to as plant harvest). Dr. Ocumpaugh evaluated these accessions at Beeville and chose 6 accessions he thought warranted further study (Accessions 9038820-Willacy, 9038715-Duval, 9029677-Karnes, 9029667-LaSalle, 9038819-Bexar, and 9029648-Webb).

In order to test which harvesting method collected the highest quality seed, a germination chamber and greenhouse experiment was run on two accessions. Germination of both experiments was low (0-6% and 0-13% respectively). A tetrazolium viability test was done on the seeds from the germination chamber experiment (Table 6). Seeds collected from either the tarp or weed mat had much better germ and viability than the seeds stripped off the plants. One sample had 42% viability with no germination, and all of the samples had higher viability than germination.

A germination experiment was also conducted on seed harvested at the PMC in 2003 and stored only in the office (Table 7). There were indications that cold storage (50% humidity and 50$^{o}$F) was causing the seed to go into greater dormancy. Accessions 9029820 had a germination rate of 5%.

**Table 5. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2003**

| Accession Number | Origin (County) | % Survival | % Regrowth | Plant Vigor* | Foliage Density* | Seed Production* |
|---|---|---|---|---|---|---|
| 9029648 | Webb | 100 | 50 | 5.0 | 5.0 | 5.3 |
| 9029677 | Karnes | 98 | 50 | 5.0 | 5.0 | 5.3 |
| 9038820 | Willacy | 98 | 50 | 5.7 | 5.0 | 5.0 |
| 9038819 | Bexar | 92 | 50 | 5.3 | 6.0 | 5.3 |
| 9029679 | McMullen | 100 | 50 | 5.0 | 5.0 | 5.3 |
| 9038713 | Duval | 98 | 50 | 6.3 | 6.3 | 6.3 |
| 9038833 | Frio | 96 | 50 | 5.3 | 6.0 | 6.7 |
| 9029636 | Live Oak | 98 | 50 | 5.3 | 5.7 | 5.3 |
| 9038708 | Goliad | 98 | 50 | 6.0 | 5.0 | 4.7 |
| 9029667 | La Salle | 94 | 50 | 5.7 | 5.0 | 4.7 |
| 9038715 | Duval | 100 | 50 | 5.0 | 5.0 | 5.0 |
| 9029605 | Val Verde | 88 | 50 | 6.0 | 6.0 | 5.7 |
| 9029587 | Webb | 96 | 50 | 5.0 | 5.0 | 5.3 |
| 9029678 | McMullen | 92 | 50 | 6.3 | 6.3 | 5.3 |
| 9086153 | Zavala | 94 | - | 5.0 | 5.0 | 5.0 |
| 9086163 | Zavala | 90 | - | 6.3 | 6.3 | 6.5 |
| 9088606 | Zavala | 92 | - | 5.3 | 5.7 | 6.5 |
| 9088574 | Zavala | 87 | - | 6.7 | 6.7 | 6.5 |
| 9089041 | Live Oak | 92 | - | 6.7 | 6.7 | 7.0 |
| 9089116 | Medina | 80 | - | 7.0 | 7.0 | 7.0 |
| 9089207 | Uvalde | 68 | - | 7.0 | 7.0 | 6.0 |
| 9089209 | Uvalde | 93 | - | 6.0 | 5.7 | 6.5 |
| 9086280 | Atascosa | 90 | - | 5.3 | 5.0 | 6.0 |
| 9086980 | Frio | 95 | - | 5.7 | 5.3 | 5.5 |
| 9088959 | Atascosa | 98 | - | 6.0 | 5.7 | 6.5 |
| 9088928 | Dimmit | 94 | - | 5.7 | 5.3 | 5.5 |
| 9088932 | Duval | 100 | - | 4.3 | 4.3 | 4.5 |
| 9089059 | La Salle | 100 | - | 5.7 | 5.3 | 5.0 |
| 9088958 | Atascosa | 98 | - | 5.3 | 5.0 | 5.5 |
| 9086210 | Kenedy | 100 | - | 4.7 | 5.0 | 5.0 |

*Ocular estimate (1 = Best)

**Table 6. Bristlegrass Tetrazolium Viability Test – Beeville Seed, 2003**

| Accession Number | Harvest Type | Harvest Date | Germination | Non-Germ. Viable | Total Viable |
|---|---|---|---|---|---|
| 9029677 | Tarp | 8-24-03 | 6% | 10% | 16% |
| 9029677 | Mat | 8-25-03 | 5% | 9% | 15% |
| 9029677 | Plant | 8-24-03 | 3% | 14% | 17% |
| 9038820 | Tarp | 8-4-03 | 0% | 42% | 42% |
| 9038820 | Mat | 8-4-03 | 0% | 15% | 15% |
| 9038820 | Plant | 8-5-03 | 1% | 8% | 9% |
| 9038820 | Tarp | 9-8-03 | 0% | 11% | 11% |
| 9038820 | Mat | 9-8-03 | 0% | 14% | 14% |
| 9038820 | Plant | 9-8-03 | 0% | 4% | 4% |

**Table 7. Bristlegrass Germination Test – 2003 PMC Harvest, Office-Stored Seed**

| Accession Number | Germination (3-Day) | Total Germination | Seed Fill | Viability Test |
|---|---|---|---|---|
| 9029677 | 5% | 24% | 49% | 42% |
| 9029648 | 9% | 33% | 37% | 21% |
| 9038819 | 0% | 17% | 68% | 48% |
| 9038820 | 0% | 5% | 32% | 31% |
| 9038715 | 0% | 7% | 34% | 27% |

***Seed Dormancy:*** In 2003 and early 2004, numerous attempts ranging from moist heat to acid scarification were made to increase the germination or break the seed dormancy of bristlegrass. None of the attempts were very successful (Kika de la Garza PMC, 2003).

In 2004, efforts continued to be focused on evaluating seed production and quality at different locations and at different months of the year. Seed fill and germination was good from accessions 9038819 and 9029677 at Knox City in 2004 (Table 8). Accession 9029677 had exceptional germination from greenhouse-stored seed having 34% and 36% three-day germination from either harvest date. Likewise seed harvested at Beeville for accession 9029677 had germination rates at 80% in June 2004 (Table 9) and germination rates of 72% in September 2004 (Table 10).

**Table 8. Bristlegrass Germination Test – Knox City Seed 2004**

| Accession Number | Storage Type | Harvest Date | Germination 3-day | Germination 9-day | Total Germination | Seed Fill |
|---|---|---|---|---|---|---|
| 677 | Greenhouse | 8-16-04 | 34% | 72% | 76% | 72% |
| | Office | | 2% | 84% | 92% | 66% |
| | Greenhouse | 9-08-04 | 36% | 88% | 90% | 63% |
| | Office | | 2% | 82% | 84% | 83% |
| 819 | Greenhouse | 8-16-04 | 0% | 8% | 14% | 74% |
| | Office | | 0% | 20% | 36% | 91% |
| | Greenhouse | 9-08-04 | 0% | 24% | 37% | 81% |
| | Office | | 0% | 34% | 46% | 79% |
| 820 | Greenhouse | 9-08-04 | 0% | 0% | 2% | 19% |
| | Office | | 0% | 0% | 2% | 27% |
| 715 | Greenhouse | 9-08-04 | 0% | 0% | 0% | 30% |
| | Office | | 0% | 2% | 2% | 29% |

**Table 9. Bristlegrass Germination Test – Beeville Seed, 2004**

| Accession Number | Harvest Type | Harvest Date | Germination | Seeds/Pound |
|---|---|---|---|---|
| 9029677 | Tarp | 6-04-04 | 80% | 504,444 |
| 9039819 | Tarp | 6-03-04 | 13% | 368,108 |

**Table 10. Bristlegrass Seed Harvest Yield and Germination – Beeville Seed, 2004**

| Accession Number | Harvest Date | Seed Harvest (grams) | Germination | Total Viable |
|---|---|---|---|---|
| 9029677 | 9-23-04 | 1676 | 72% | 83% |
| 9038715 | 9-30-04 | 783 | 4% | 73% |
| 9038819 | 9-23-04 | 660 | 9% | 50% |
| 9038820 | 9-30-04 | 705 | 3% | 49% |
| 9029677 | 6-04-04 | 2055 | - | - |
| 9038715 | 6-16-04 | 773 | - | - |
| 9038819 | 6-03-04 | 1218 | - | - |
| 9038820 | 6-16-04 | 758 | - | - |

***Seed Production*:** Average annual seed yields of Kika820 Germplasm streambed bristlegrass at Beeville have been 544 pounds per acre (610 kg $ha^{-1}$) with 31 percent pure live seed (Table 11).

**Table 11. Bristlegrass Seed Harvest Yield – Beeville Seed, 2005**

| Accession Number | Harvest Date | Seed Harvest (lbs) | Harvest (lb/ac) | % PLS | PLS Pounds |
|---|---|---|---|---|---|
| 9029677 | 2005 | 54 | 108 | 43 | 25 |
| 9038715 | 2005 | 25 | 175 | 44 | 10 |
| 9038819 | 2005 | 50 | 275 | 32 | 12 |
| 9038820 | 2005 | 126 | 544 | 31 | 30 |

Indeterminate seed maturity, seed shattering and lodging are factors that may influence economical seed yields of streambed bristlegrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Kingsville, Texas ranged from 31% to 65% in 2005. However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from Knox City (Table 8) for both month of harvest as well as storage location shows variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where bristlegrass can be most economically grown for seed production.

Seed shattering is a problem with bristlegrass species. However, one attribute to an indeterminate seed development is that all the seed is not lost at maturity if a storm or high winds occur. Furthermore, with the use of a Shelborne header it is possible to get multiple harvests when the seed reaches maturity without cutting off the inflorescence.

Lodging, while seen at the PMC in Kingsville, never occurred at Beeville. We are unsure of the cause of this. It may be a result of growing the bristlegrass on the heavy textured soils at Kingsville versus the coarse textured soils at Beeville. Though more likely, it is a result of growing it on raised beds spaced 36 inches apart at Kingsville whereas at Beeville it was on flat ground. Even in our fist year's evaluation at Beeville, with the plants grown in wide rows with weed mat rolled out between the rows, no lodging was observed. An experiment starting in 2005 at Beeville is evaluating 5 rates of N fertilizer application on bristlegrass. The first year's results show no indication that any of the bristlegrasses are going to lodge, even with high rates of N fertilizer.

Rice stinkbugs and ergot have been observed on our bristlegrasses. Appropriate use and timeliness of applications of insectides or fungicides can control these infestations. However, inattention to these outbreaks can affect both the quantity and the quality of the seed harvest. Rice stinkbugs are known to destroy the endosperm of developing grass seeds (Drees and Jackman, 1999). Fields treated with Sevin XLR at 3 quarts/acre have effectively controlled rice stinkbugs.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a forage harvester (clipping the heads, and air drying on tarps) then keeping only the seed that shattered onto the tarp at Beeville in 2005 and then run through *Clipper* seed cleaner has produced 59 % pure seed.

**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 Kika820 Germplasm streambed bristlegrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that streambed bristlegrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Kika820 Germplasm streambed bristlegrass will provide a native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has good germination, while retaining some dormant seed to deal with unpredictable weather conditions. Its bunch growth habit and good seed size make it particularly suitable for upland-bird habitat.

**Area of Adaptation:** Kika820 Germplasm streambed bristlegrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation, so it may be adapted in more northern zones. Test sites in Texas have been established in Knox City and Stephenville, and additional sites are planned for in Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

**References:**


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**Signatures for release of:**

**Kika820 Germplasm streambed bristlegrass**
**(*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**

Salvador Salinas Acting SEP 05 2006

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

Mark C. Hussey 8-29-2006

Texas Agricultural Experiment Station
College Station, Texas

Date

Fred Bryant 9/08/06

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Date

Robert T Escheman 9-18-06

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Streambed bristlegrass (*Setaria luecopila*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika677 streambed bristlegrass**
   **Kika819 streambed bristlegrass**
   **Kika820 streambed bristlegrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: **joint release with USDA-NRCS**
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **Streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**
Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika820 streambed bristlegrass**

3. Designation or name in development stages: **9038820 and 820**

4. Primary features or advantages:

- **Native to and adapted to southern Texas**
- **Large seed size is desirable seed for upland game birds**
- **Excellent seed production.**
- **Good long-term survival**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **126 lbs by November 2005, 200 lbs more by November 2006**

7. Proposed seed distribution: Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service. Foundation seed will be released to commercial growers to be grown as monocultures for seed production.

All seed shall be produced in Texas. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| 5-26-06 | Bobby R. Eddleman 5-30-06 |

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF KIKA819 GERMPLASM STREAMBED BRISTLEGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.) for the south Texas ecoregion. Kika819 Germplasm was tested under the accession number 9038819 and 819.

This plant will be referred to as Kika819 Germplasm streambed bristlegrass and is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted streambed bristlegrass. The potential for immediate use is high especially for upland wildlife plantings and for range seeding mixes.

**Collection Site Information:** Accession 9038819 was collected in 1983 from native plants located near San Antonio, Texas at 29°16' N. latitude and 98° 35' W. longitude (MLRA 83). It was growing on a Lewisville silty clay soil type. Collection site elevation was 170.7 meters (560 feet) and average annual precipitation for this location is 68.6 centimeters (27 inches).

**Description:** Streambed bristlegrass is a native perennial bunch grass with stiffly erect stems. Mature foliage height ranges from 26 to 100 centimeters (1.0 to 3.0 feet) tall and is usually pale or with a whitish or grayish coloring. Stems are in dense clumps, infrequently branched, and rough. The ligule is a short tuft of hair 1 mm in length. The leaf blades are flat or rolled 8 to 25 centimeters (3 to 9.8 inches) long and typically 2 to 4 millimeters wide, hairless or sparsely pilose. The inflorescence is densely flowered with a contracted panicle that is commonly 3 to 11 centimeters, although shorter in some plants, and 1 to 2 cm thick. The bristles, by which it gets its common name, are 4 to 7 mm long and are usually solitary below each spikelet. Spikelets are 2 mm long at maturity. The stigmas and anthers appear together with the stigmas purple in color. The paleas are flat or slightly rounded. The chromosome number is *2n=54, 68 or 72*. The plants produce seed from May through November. Streambed bristlegrass is found mainly

in the western, drier portions of the State. It is absent from the eastern areas extending from the Blackland prairie to the Pineywoods.

**Potential Uses:** Kika819 Germplasm is recommended for upland wildlife plantings and in range seeding mixes. It provides good grazing for livestock and fair grazing for wildlife. It can be used in many types of conservation plantings, such as streamside buffers and filter strips.

**Method of Breeding and Selection:**

***Initial evaluation*:** Initial evaluations of Kika819 Germplasm began in 1984 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 96 accessions of bristlegrass (*Setaria* spp.) were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9038819 and 9038820 were determined to be the best accessions of bristlegrass for survival, vigor, growth form and development, and disease resistance.

An advanced evaluation plot was established at the PMC in 1994 that consisted of 4 replications of ten plants each of 9038819, 9038820, 9003939 (Arizona release) and a Texas "common" commercial source. In 1996, we took biweekly seed harvests to determine total seed yield. We also evaluated the plots for total biomass production and survival in October 1996 (Table 1). However, despite numerous trials to get active germination above 10%, work with bristlegrass was abandoned due to poor germination results.

In 2001, in conjunction with the development of the South Texas Natives Project, interest was revived in plains bristlegrass and a new initial evaluation was started. Nine collections of bristlegrass were transplanted to field plots at the PMC in April and May 2001. Seed was collected from these nine accessions at the end of 2001 and germination tests were performed in June 2002 (Table 2). All nine accessions exhibited very poor germination results. Another 5

**Table 1. Bristlegrass Evaluations at Kingsville, Texas in 1996.**

| Accession Number | Source (County) | Percent Survival | Forage Yield (g/plant) | Number of Seed Heads/Plant | Grams of Seed/Plant |
|---|---|---|---|---|---|
| 9038819 | Bexar | 90 | 113 | 30 | 23 |
| 9038820 | Willacy | 90 | 150 | 14 | 11 |
| 9003939 | Arizona | 80 | 113 | 13 | 9 |
| TX "Common" | Commercial | 52 | 168 | 9 | 15 |

**Table 2. Bristlegrass 2001 Harvest Seed Germination, Kingsville, Texas**

| Accession Number | Origin (County) | Grams Harvested | 8 Days % | 15 Days % | 28 Days % |
|---|---|---|---|---|---|
| 9029648 | Webb | 189 | 0 | 2 | 2 |
| 9029677 | Karnes | 124 | 0 | 0 | 0 |
| 9038819 | Bexar | 92 | 0 | 0 | 0 |
| 9038713 | Duval | 25 | 0 | 0 | 0 |
| 9038833 | Frio | 79 | 0 | 0 | 0 |
| 9029636 | Live Oak | 55 | 0 | 2 | 2 |
| 9038708 | Goliad | 107 | 0 | 0 | 0 |
| 9029679 | Mc Mullen | 207 | 0 | 0 | 0 |
| 9038820 | Willacy | 58 | 0 | 0 | 0 |

* 24 hours dark, 16 hours 10°C (50°F) / 8 hours 30°C (86°F).

accessions were added to the field nursery in November 2001. Thirteen of the fourteen accessions had good field survival and growth through the winter of 2001. Seed was collected from all fourteen of the 2001 plantings during the summer of 2002. A germination test was run on this harvest in March 2003 (Table 3). All accessions again exhibited poor germination.

The field plot was evaluated for plant performance from May to December of 2002. Only five of the fourteen collections planted in the plot exhibited above average performance in field characteristics (Table 4). Only accession 9038819-Bexar exhibited above average seed retention, but it also exhibited above average lodging problems. All accessions exhibited average seed shattering problems. In addition, all seedheads in the field plot became infested with fungi in October 2002.

Sixteen more collections were added to the field evaluation plot in April 2003, increasing the total number of field accessions to 30. The field plot of plains bristlegrass was evaluated for plant performance from May to August of 2003 (Table 5). Two of the collections planted in 2001 in the field plot exhibited above average seed production (Accessions 9038708-Goliad & 9029667-La Salle), and two of the new accessions planted in 2003 (Accessions 9088932-Duval & 9086210-Kenedy) exhibited above average resistance and vigor. All accessions exhibited average seed shattering problems. All seed heads in the entire field plot became infested with fungi again in October 2003

**Table 3. Bristlegrass 2002 Harvest Germination, Kingsville, Texas**

| Accession Number | Origin (County) | Grams Harvested | 5 Days % | 15 Days % | 28 Days % |
|---|---|---|---|---|---|
| 9029587 | Webb | 293 | 0 | 0 | 0 |
| 9029605 | Val Verde | 402 | 0 | 0 | 0 |
| 9029636 | Live Oak | 144 | 0 | 2 | 2 |
| 9029648 | Webb | 139 | 0 | 2 | 2 |
| 9029667 | La Salle | 365 | 0 | 0 | 0 |
| 9029677 | Karnes | 123 | 0 | 4 | 4 |
| 9029678 | Mc Mullen | 105 | 0 | 0 | 0 |
| 9029679 | Mc Mullen | 310 | 0 | 0 | 2 |
| 9038708 | Goliad | 204 | 0 | 0 | 0 |
| 9038713 | Duval | 108 | 0 | 0 | 0 |
| 9038715 | Duval | 488 | 0 | 0 | 0 |
| 9038819 | Bexar | 189 | 0 | 0 | 0 |
| 9038820 | Willacy | 199 | 0 | 0 | 0 |
| 9038833 | Frio | 125 | 0 | 0 | 0 |

* 24 hours dark, 16 hours 10°C (50°F) / 8 hours 30°C (86°F).

**Table 4. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2002**

| Accession Number | Origin (County) | % Survival | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|
| 9029587 | Webb | 96 | 6.0 | 5.6 | 6.2 |
| 9029605 | Val Verde | 78 | 6.0 | 4.0 | 7.2 |
| 9029636 | Live Oak | 96 | 5.2 | 4.6 | 5.4 |
| 9029648 | Webb | 92 | 5.0 | 6.2 | 6.2 |
| 9029667 | La Salle | 90 | 6.3 | 6.8 | 7.8 |
| 9029677 | Karnes | 100 | 5.8 | 6.0 | 5.0 |
| 9029678 | Mc Mullen | 90 | 5.3 | 5.8 | 6.8 |
| 9029679 | Mc Mullen | 90 | 6.3 | 5.2 | 5.4 |
| 9038708 | Goliad | 96 | 5.5 | 5.0 | 7.0 |
| 9038713 | Duval | 42 | 6.5 | 5.2 | 6.0 |
| 9038715 | Duval | 88 | 5.0 | 4.0 | 7.8 |
| 9038819 | Bexar | 94 | 5.8 | 5.8 | 4.4 |
| 9038820 | Willacy | 96 | 7.3 | 6.8 | 6.0 |
| 9038833 | Frio | 96 | 6.5 | 4.0 | 5.4 |

*Ocular estimate (1 = Best)

In February of 2003, South Texas Natives took half of the 2002 seed harvest from the 14 accessions in the PMC field evaluation plot and seeded it in the greenhouse. The resulting plants were taken to the Texas Agricultural Experiment Station at Beeville and planted out that spring on weed mat. Seed was harvested from these accessions in 2003 by three different methods: (1) fallen seed was swept off the weed mat (referred to as mat harvest), (2) the seed heads were cut off the plants and allowed to dry on tarps, then fallen seed was collected (referred to as tarp harvest), and (3) seed that still remained on the plants after drying on the tarp was stripped off the plants using a brush machine (referred to as plant harvest). Dr. Ocumpaugh evaluated these accessions at Beeville and chose 6 accessions he thought warranted further study (Accessions 9038820-Willacy, 9038715-Duval, 9029677-Karnes, 9029667-LaSalle, 9038819-Bexar, and 9029648-Webb).

In order to test which harvesting method collected the highest quality seed, a germination chamber and greenhouse experiment was run on two accessions. Germination of both experiments was low (0-6% and 0-13% respectively). A tetrazolium viability test was done on the seeds from the germination chamber experiment (Table 6). Seeds collected from either the tarp or weed mat had much better germ and viability than the seeds stripped off the plants. One sample had 42% viability with no germination, and all of the samples had higher viability than germination.

A germination experiment was also conducted on seed harvested at the PMC in 2003 and stored only in the office (Table 7). There were indications that cold storage (50% humidity and 50$^{o}$F) was causing the seed to go into greater dormancy. Accession 9038819 had a germination rate of 17%.

**Table 5. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2003**

| Accession Number | Origin (County) | % Survival | % Regrowth | Plant Vigor* | Foliage Density* | Uniformity * | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|---|---|
| 9029648 | Webb | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029677 | Karnes | 98 | 50 | 5.0 | 5.0 | 6.7 | 5.3 | 5.0 |
| 9038820 | Willacy | 98 | 50 | 5.7 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9038819 | Bexar | 92 | 50 | 5.3 | 6.0 | 5.0 | 5.3 | 5.0 |
| 9029679 | McMullen | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9038713 | Duval | 98 | 50 | 6.3 | 6.3 | 5.3 | 6.3 | 5.0 |
| 9038833 | Frio | 96 | 50 | 5.3 | 6.0 | 5.0 | 6.7 | 5.0 |
| 9029636 | Live Oak | 98 | 50 | 5.3 | 5.7 | 5.0 | 5.3 | 5.0 |
| 9038708 | Goliad | 98 | 50 | 6.0 | 5.0 | 5.0 | 4.7 | 5.0 |
| 9029667 | La Salle | 94 | 50 | 5.7 | 5.0 | 5.0 | 4.7 | 5.0 |
| 9038715 | Duval | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9029605 | Val Verde | 88 | 50 | 6.0 | 6.0 | 5.0 | 5.7 | 5.0 |
| 9029587 | Webb | 96 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029678 | McMullen | 92 | 50 | 6.3 | 6.3 | 5.0 | 5.3 | 5.0 |
| 9086153 | Zavala | 94 | - | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9086163 | Zavala | 90 | - | 6.3 | 6.3 | 5.0 | 6.5 | 5.0 |
| 9088606 | Zavala | 92 | - | 5.3 | 5.7 | 5.0 | 6.5 | 5.0 |
| 9088574 | Zavala | 87 | - | 6.7 | 6.7 | 6.0 | 6.5 | 5.0 |
| 9089041 | Live Oak | 92 | - | 6.7 | 6.7 | 5.0 | 7.0 | 5.0 |
| 9089116 | Medina | 80 | - | 7.0 | 7.0 | 5.0 | 7.0 | 5.0 |
| 9089207 | Uvalde | 68 | - | 7.0 | 7.0 | 5.3 | 6.0 | 5.0 |
| 9089209 | Uvalde | 93 | - | 6.0 | 5.7 | 6.7 | 6.5 | 5.0 |
| 9086280 | Atascosa | 90 | - | 5.3 | 5.0 | 6.7 | 6.0 | 5.0 |
| 9086980 | Frio | 95 | - | 5.7 | 5.3 | 6.7 | 5.5 | 5.0 |
| 9088959 | Atascosa | 98 | - | 6.0 | 5.7 | 5.7 | 6.5 | 5.0 |
| 9088928 | Dimmit | 94 | - | 5.7 | 5.3 | 5.0 | 5.5 | 5.0 |
| 9088932 | Duval | 100 | - | 4.3 | 4.3 | 5.0 | 4.5 | 5.0 |
| 9089059 | La Salle | 100 | - | 5.7 | 5.3 | 5.7 | 5.0 | 5.0 |
| 9088958 | Atascosa | 98 | - | 5.3 | 5.0 | 5.7 | 5.5 | 5.0 |
| 9086210 | Kenedy | 100 | - | 4.7 | 5.0 | 5.0 | 5.0 | 5.0 |

*Ocular estimate (1 = Best)

**Table 6. Bristlegrass Tetrazolium Viability Test – Beeville Seed, 2003**

| Accession Number | Harvest Type | Harvest Date | Germination | Non-Germ. Viable | Total Viable |
|---|---|---|---|---|---|
| 9029677 | Tarp | 8-24-03 | 6% | 10% | 16% |
| 9029677 | Mat | 8-25-03 | 5% | 9% | 15% |
| 9029677 | Plant | 8-24-03 | 3% | 14% | 17% |
| 9038820 | Tarp | 8-4-03 | 0% | 42% | 42% |
| 9038820 | Mat | 8-4-03 | 0% | 15% | 15% |
| 9038820 | Plant | 8-5-03 | 1% | 8% | 9% |
| 9038820 | Tarp | 9-8-03 | 0% | 11% | 11% |
| 9038820 | Mat | 9-8-03 | 0% | 14% | 14% |
| 9038820 | Plant | 9-8-03 | 0% | 4% | 4% |

**Table 7. Bristlegrass Germination Test – 2003 PMC Harvest, Office-Stored Seed**

| Accession Number | Germination (3-Day) | Total Germination | Seed Fill | Viability Test |
|---|---|---|---|---|
| 9029677 | 5% | 24% | 49% | 42% |
| 9029648 | 9% | 33% | 37% | 21% |
| 9038819 | 0% | 17% | 68% | 48% |
| 9038820 | 0% | 5% | 32% | 31% |
| 9038715 | 0% | 7% | 34% | 27% |

***Seed Dormancy:*** In 2003 and early 2004, numerous attempts ranging from moist heat to acid scarification were made to increase the germination or break the seed dormancy of bristlegrass. None of the attempts were very successful (Kika de la Garza PMC, 2003).

In 2004, efforts continued to be focused on evaluating seed production and quality at different locations and at different months of the year. Seed fill and germination was good from accessions 9038819 and 9029677 at Knox City in 2004 (Table 8). Accession 9029677 had exceptional germination from greenhouse-stored seed having 34% and 36% three-day germination from either harvest date. Likewise seed harvested at Beeville for accession 9029677 had germination rates at 80% in June 2004 (Table 9) and germination rates of 72% in September 2004 (Table 10).

**Table 8. Bristlegrass Germination Test – Knox City Seed 2004**

| Accession Number | Storage Type | Harvest Date | Germination 3-day | Germination 9-day | Total Germination | Seed Fill |
|---|---|---|---|---|---|---|
| 677 | Greenhouse | 8-16-04 | 34% | 72% | 76% | 72% |
| | Office | | 2% | 84% | 92% | 66% |
| | Greenhouse | 9-08-04 | 36% | 88% | 90% | 63% |
| | Office | | 2% | 82% | 84% | 83% |
| 819 | Greenhouse | 8-16-04 | 0% | 8% | 14% | 74% |
| | Office | | 0% | 20% | 36% | 91% |
| | Greenhouse | 9-08-04 | 0% | 24% | 37% | 81% |
| | Office | | 0% | 34% | 46% | 79% |
| 820 | Greenhouse | 9-08-04 | 0% | 0% | 2% | 19% |
| | Office | | 0% | 0% | 2% | 27% |
| 715 | Greenhouse | 9-08-04 | 0% | 0% | 0% | 30% |
| | Office | | 0% | 2% | 2% | 29% |

**Table 9. Bristlegrass Germination Test – Beeville Seed, 2004**

| Accession Number | Harvest Type | Harvest Date | Germination | Seeds/Pound |
|---|---|---|---|---|
| 9029677 | Tarp | 6-04-04 | 80% | 504,444 |
| 9039819 | Tarp | 6-03-04 | 13% | 368,108 |

**Table 10. Bristlegrass Seed Harvest Yield and Germination – Beeville Seed, 2004**

| Accession Number | Harvest Date | Seed Harvest (grams) | Germination | Total Viable |
|---|---|---|---|---|
| 9029677 | 9-23-04 | 1676 | 72% | 83% |
| 9038715 | 9-30-04 | 783 | 4% | 73% |
| 9038819 | 9-23-04 | 660 | 9% | 50% |
| 9038820 | 9-30-04 | 705 | 3% | 49% |
| 9029677 | 6-04-04 | 2055 | - | - |
| 9038715 | 6-16-04 | 773 | - | - |
| 9038819 | 6-03-04 | 1218 | - | - |
| 9038820 | 6-16-04 | 758 | - | - |

***Seed Production*:** Average annual seed yields of Kika819 Germplasm streambed bristlegrass at Beeville have been 275 pounds to the acre (308 kg $ha^{-1}$), with 32 percent pure live seed (Table 11).

**Table 11. Bristlegrass Seed Harvest Yield – Beeville Seed, 2005**

| Accession Number | Harvest Date | Seed Harvest (lbs) | Harvest (lbs/ac) | Percent PLS | PLS Pounds |
|---|---|---|---|---|---|
| 9029677 | 2005 | 54 | 108 | 43 | 25 |
| 9038715 | 2005 | 25 | 175 | 44 | 10 |
| 9038819 | 2005 | 50 | 275 | 32 | 12 |
| 9038820 | 2005 | 126 | 544 | 31 | 30 |

Indeterminate seed maturity, seed shattering and lodging are factors that may influence economical seed yields of streambed bristlegrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Kingsville, Texas ranged from 31% to 65% in 2005. However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from Knox City (Table 8) for both month of harvest as well as storage location shows variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where bristlegrass can be most economically grown for seed production.

Seed shattering is a problem with bristlegrass species. However, one attribute to an indeterminate seed development is that all the seed is not lost at maturity if a storm or high winds occur. Furthermore, with the use of a Shelborne header it is possible to get multiple harvests when the seed reaches maturity without cutting off the inflorescence.

Lodging, while seen at the PMC in Kingsville, never occurred at Beeville. We are unsure of the cause of this. It may be a result of growing the bristlegrass on the heavy textured soils at Kingsville versus the coarse textured soils at Beeville. Though more likely, it is a result of growing it on raised beds spaced 36 inches apart at Kingsville whereas at Beeville it was on flat ground. Even in our fist year's evaluation at Beeville, with the plants grown in wide rows with weed mat rolled out between the rows, no lodging was observed. An experiment starting in 2005 at Beeville is evaluating 5 rates of N fertilizer application on bristlegrass. The first year's results show no indication that any of the bristlegrasses are going to lodge, even with high rates of N fertilizer.

Rice stinkbugs and ergot have been observed on our bristlegrasses. Appropriate use and timeliness of applications of insectides or fungicides can control these infestations. However, inattention to these outbreaks can affect both the quantity and the quality of the seed harvest. Rice stinkbugs are known to destroy the endosperm of developing grass seeds (Drees and Jackman, 1999). Fields treated with Sevin XLR at 3 quarts/acre have effectively controlled rice stinkbugs.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a forage harvester (clipping the heads, and air drying on tarps) then keeping only the seed that shattered onto the tarp at Beeville in 2005 and then run through Clipper seed cleaner has produced 59 % pure seed.

**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 Kika819 Germplasm Germplasm streambed bristlegrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that streambed bristlegrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Kika819 Germplasm streambed bristlegrass will provide a native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has good germination, while retaining some dormant seed to deal with unpredictable weather conditions. Its bunch growth habit and good seed size make it particularly suitable for upland-bird habitat.

**Area of Adaptation:** Kika819 Germplasm streambed bristlegrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. Test sites in Texas have been established in Knox City and Stephenville, and additional sites are planned for in Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

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**Signatures for release of:**

**Kika819 Germplasm streambed bristlegrass**
**(*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**

Salvador Salinas Acting SEP 0 5 2006

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

Mark C Hussey 8-28-2006

Texas Agricultural Experiment Station
College Station, Texas

Date

Fred Bryant 9/8/06

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Date

Robert T Escheman 9-18-06

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Streambed bristlegrass (*Setaria luecopila*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika677 streambed bristlegrass**
   **Kika819 streambed bristlegrass**
   **Kika820 streambed bristlegrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: **joint release with USDA-NRCS**
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **Streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**
   Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika819 streambed bristlegrass**

3. Designation or name in development stages: **9038819 or 819**

4. Primary features or advantages:

   - **Native to and adapted to southern Texas**
   - **Good harvestable seed production**
   - **Large seed size**
   - **Good long-term survival**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **49 lbs by November 2005, 100 lbs more by November 2006**

7. Proposed seed distribution: Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service. Foundation seed will be released to commercial growers to be grown as monocultures for seed production.

All seed shall be produced in Texas. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| 5-26-06 | 5-30-06 |

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF KIKA677 GERMPLASM STREAMBED BRISTLEGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material of streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.) for the south Texas ecoregion. Kika677 Germplasm was tested under the accession number 9029677 and 677.

This plant will be referred to as Kika677 Germplasm streambed bristlegrass and is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted streambed bristlegrass. The potential for immediate use is high especially for upland wildlife plantings and for range seeding mixes.

**Collection Site Information:** Accession 9029677 was collected in 1982 from native plants located near Karnes City, Texas, at 28° 53' N. latitude and 98° 06' W. longitude (MLRA 83). It was growing on a Monteola clay soil type with a 3% slope. Collection site elevation was 121.9 meters (400 feet) and average annual precipitation for this location is 73.7 centimeters (29.0 inches).

**Description:** Streambed bristlegrass is a native perennial bunch grass with stiffly erect stems. Mature foliage height ranges from 60 to 120 centimeters (2 to 4 feet) tall and is usually pale or with a whitish or grayish color. Stems are in dense clumps, infrequently branched, and rough. It has a short tufted ligule that is 1 mm in length. The leaf blades are flat or folded 8 to 25 centimeters (3 to 9.8 inches) long and typically 2 to 5 millimeters wide but occasionally broader, hairless or sparsely pilose. The inflorescence is densely flowered in a compressed panicle 3 to 11 centimeters long and 0.7 to 1.5 cm thick. The bristles, by which it gets its common name, are 5 to 15 mm long and are usually solitary below each spikelet. Spikelets are small and globose at maturity, 2 to 2.5 mm in length. Stigmas exude first from the floret and are purple in color. The chromosome number is $2n=72$. The plants produce seed from May through November.

Streambed bristlegrass is found mainly in the western, drier portions of the State. It is absent from the eastern areas extending from the Blackland prairie to the Pineywoods.

**Potential Uses:** Kika677 Germplasm is recommended for upland wildlife plantings and in range seeding mixes. It provides good grazing for livestock and fair grazing for wildlife. It can be used in many types of conservation plantings, such as streamside buffers and filter strips.

**Method of Breeding and Selection:**

***Initial evaluation*:** Initial evaluations of Kika677 Germplasm began in 1984 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 96 accessions of bristlegrass (*Setaria* spp.) were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9038819 and 9038820 were determined to be the best accessions of bristlegrass for survival, vigor, growth form and development, and disease resistance.

An advanced evaluation plot was established at the PMC in 1994 that consisted of 4 replications of ten plants each of 9038819, 9038820, 9003939 (Arizona release) and a Texas "common" commercial source. In 1996, we took biweekly seed harvests to determine total seed yield. We also evaluated the plots for total biomass production and survival in October 1996 (data not shown). However, despite numerous trials to get active germination above 10%, work with bristlegrass was abandoned due to poor germination results.

In 2001, in conjunction with the development of the South Texas Natives Project, interest was revived in plains bristlegrass and a new initial evaluation was started. Nine collections of bristlegrass were transplanted to field plots at the PMC in April and May 2001. Seed was collected from these nine accessions at the end of 2001 and germination tests were performed in June 2002 (data not shown). All nine accessions exhibited very poor germination results. Another 5 accessions were added to the field nursery in November 2001. Thirteen of the fourteen accessions had good field survival and growth through the winter of 2001. Seed was collected from all fourteen of the 2001 plantings during the summer of 2002. A germination test was run on this harvest in March 2003 (Table 1). All accessions again exhibited poor germination.

The field plot was evaluated for plant performance from May to December of 2002. Only five of the fourteen collections planted in the plot exhibited above average performance in field characteristics (Table 2). Only accession 9038819-Bexar exhibited above average seed retention, but it also exhibited above average lodging problems. All accessions exhibited average seed shattering problems. In addition, all seedheads in the field plot became infested with fungi in October 2002.

Sixteen more collections were added to the field evaluation plot in April 2003, increasing the total number of field accessions to 30. The field plot of plains bristlegrass was evaluated for plant performance from May to August of 2003 (Table 3). Two of the collections planted in 2001 in the field plot exhibited above average seed production (Accessions 9038708-Goliad & 9029667-La Salle), and two of the new accessions planted in 2003 (Accessions 9088932-Duval

& 9086210-Kenedy) exhibited above average disease resistance and vigor. All accessions exhibited average seed shattering problems. All seed heads in the entire field plot became infested with fungi again in October 2003.

**Table 1. Bristlegrass 2002 Harvest Germination, Kingsville, Texas**

| Accession Number | Origin (County) | Grams Harvested | 5 Days % | 15 Days % | 28 Days % |
|---|---|---|---|---|---|
| 9029587 | Webb | 293 | 0 | 0 | 0 |
| 9029605 | Val Verde | 402 | 0 | 0 | 0 |
| 9029636 | Live Oak | 144 | 0 | 2 | 2 |
| 9029648 | Webb | 139 | 0 | 2 | 2 |
| 9029667 | La Salle | 365 | 0 | 0 | 0 |
| 9029677 | Karnes | 123 | 0 | 4 | 4 |
| 9029678 | Mc Mullen | 105 | 0 | 0 | 0 |
| 9029679 | Mc Mullen | 310 | 0 | 0 | 2 |
| 9038708 | Goliad | 204 | 0 | 0 | 0 |
| 9038713 | Duval | 108 | 0 | 0 | 0 |
| 9038715 | Duval | 488 | 0 | 0 | 0 |
| 9038819 | Bexar | 189 | 0 | 0 | 0 |
| 9038820 | Willacy | 199 | 0 | 0 | 0 |
| 9038833 | Frio | 125 | 0 | 0 | 0 |

* 24 hours dark, 16 hours 10°C (50°F) / 8 hours 30°C (86°F).

**Table 2. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2002**

| Accession Number | Origin (County) | % Survival | Foliage Density* | Disease Resistance* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|
| 9029587 | Webb | 96 | 6.0 | 5.5 | 5.6 | 6.2 |
| 9029605 | Val Verde | 78 | 6.0 | 6.7 | 4.0 | 7.2 |
| 9029636 | Live Oak | 96 | 5.2 | 6.0 | 4.6 | 5.4 |
| 9029648 | Webb | 92 | 5.0 | 5.0 | 6.2 | 6.2 |
| 9029667 | La Salle | 90 | 6.3 | 6.3 | 6.8 | 7.8 |
| 9029677 | Karnes | 100 | 5.8 | 6.2 | 6.0 | 5.0 |
| 9029678 | Mc Mullen | 90 | 5.3 | 5.8 | 5.8 | 6.8 |
| 9029679 | Mc Mullen | 90 | 6.3 | 6.0 | 5.2 | 5.4 |
| 9038708 | Goliad | 96 | 5.5 | 6.8 | 5.0 | 7.0 |
| 9038713 | Duval | 42 | 6.5 | 7.0 | 5.2 | 6.0 |
| 9038715 | Duval | 88 | 5.0 | 5.7 | 4.0 | 7.8 |
| 9038819 | Bexar | 94 | 5.8 | 5.8 | 5.8 | 4.4 |
| 9038820 | Willacy | 96 | 7.3 | 7.5 | 6.8 | 6.0 |
| 9038833 | Frio | 96 | 6.5 | 7.8 | 4.0 | 5.4 |

*Ocular estimate (1 = Best)

In February of 2003, South Texas Natives took half of the 2002 seed harvest from the 14 accessions in the PMC field evaluation plot and seeded it in the greenhouse. The resulting plants were taken to the Texas Agricultural Experiment Station at Beeville and planted out that spring on weed mat. Seed was harvested from these accessions in 2003 by three different methods: (1) fallen seed was swept off the weed mat (referred to as mat harvest), (2) the seed heads were cut off the plants and allowed to dry on tarps, then fallen seed was collected (referred to as tarp harvest), and (3) seed that still remained on the plants after drying on the tarp was stripped off the plants using a brush machine (referred to as plant harvest). Dr. Ocumpaugh evaluated these accessions at Beeville and chose 6 accessions he thought warranted further study (Accessions 9038820-Willacy, 9038715-Duval, 9029677-Karnes, 9029667-LaSalle, 9038819-Bexar, and 9029648-Webb).

In order to test which harvesting method collected the highest quality seed, a germination chamber and greenhouse experiment was run on two accessions. Germination of both experiments was low (0-6% and 0-13% respectively). A tetrazolium viability test was done on the seeds from the germination chamber experiment (Table 6). Seeds collected from either the tarp or weed mat had much better germ and viability than the seeds stripped off the plants. One sample had 42% viability with no germination, and all of the samples had higher viability than germination.

A germination experiment was also conducted on seed harvested at the PMC in 2003 and stored only in the office (Table 5). There were indications that cold storage (50% humidity and 50$^{o}$F) was causing the seed to go into greater dormancy. Accessions 9029677 had a germination rate of 24%.

**Table 3. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2003**

| Accession Number | Origin (County) | % Survival | % Regrowth | Plant Vigor* | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|---|
| 9029648 | Webb | 100 | 50 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029677 | Karnes | 98 | 50 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9038820 | Willacy | 98 | 50 | 5.7 | 5.0 | 5.0 | 5.0 |
| 9038819 | Bexar | 92 | 50 | 5.3 | 6.0 | 5.3 | 5.0 |
| 9029679 | McMullen | 100 | 50 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9038713 | Duval | 98 | 50 | 6.3 | 6.3 | 6.3 | 5.0 |
| 9038833 | Frio | 96 | 50 | 5.3 | 6.0 | 6.7 | 5.0 |
| 9029636 | Live Oak | 98 | 50 | 5.3 | 5.7 | 5.3 | 5.0 |
| 9038708 | Goliad | 98 | 50 | 6.0 | 5.0 | 4.7 | 5.0 |
| 9029667 | La Salle | 94 | 50 | 5.7 | 5.0 | 4.7 | 5.0 |
| 9038715 | Duval | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9029605 | Val Verde | 88 | 50 | 6.0 | 6.0 | 5.7 | 5.0 |
| 9029587 | Webb | 96 | 50 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029678 | McMullen | 92 | 50 | 6.3 | 6.3 | 5.3 | 5.0 |
| 9086153 | Zavala | 94 | - | 5.0 | 5.0 | 5.0 | 5.0 |
| 9086163 | Zavala | 90 | - | 6.3 | 6.3 | 6.5 | 5.0 |
| 9088606 | Zavala | 92 | - | 5.3 | 5.7 | 6.5 | 5.0 |
| 9088574 | Zavala | 87 | - | 6.7 | 6.7 | 6.5 | 5.0 |
| 9089041 | Live Oak | 92 | - | 6.7 | 6.7 | 7.0 | 5.0 |
| 9089116 | Medina | 80 | - | 7.0 | 7.0 | 7.0 | 5.0 |
| 9089207 | Uvalde | 68 | - | 7.0 | 7.0 | 6.0 | 5.0 |
| 9089209 | Uvalde | 93 | - | 6.0 | 5.7 | 6.5 | 5.0 |
| 9086280 | Atascosa | 90 | - | 5.3 | 5.0 | 6.0 | 5.0 |
| 9086980 | Frio | 95 | - | 5.7 | 5.3 | 5.5 | 5.0 |
| 9088959 | Atascosa | 98 | - | 6.0 | 5.7 | 6.5 | 5.0 |
| 9088928 | Dimmit | 94 | - | 5.7 | 5.3 | 5.5 | 5.0 |
| 9088932 | Duval | 100 | - | 4.3 | 4.3 | 4.5 | 5.0 |
| 9089059 | La Salle | 100 | - | 5.7 | 5.3 | 5.0 | 5.0 |
| 9088958 | Atascosa | 98 | - | 5.3 | 5.0 | 5.5 | 5.0 |
| 9086210 | Kenedy | 100 | - | 4.7 | 5.0 | 5.0 | 5.0 |

*Ocular estimate (1 = Best)

**Table 4. Bristlegrass Tetrazolium Viability Test – Beeville Seed, 2003**

| Accession Number | Harvest Type | Harvest Date | Germination | Total Viable |
|---|---|---|---|---|
| 9029677 | Tarp | 8-24-03 | 6% | 16% |
| 9029677 | Mat | 8-25-03 | 5% | 15% |
| 9029677 | Plant | 8-24-03 | 3% | 17% |
| 9038820 | Tarp | 8-4-03 | 0% | 42% |
| 9038820 | Mat | 8-4-03 | 0% | 15% |
| 9038820 | Plant | 8-5-03 | 1% | 9% |
| 9038820 | Tarp | 9-8-03 | 0% | 11% |
| 9038820 | Mat | 9-8-03 | 0% | 14% |
| 9038820 | Plant | 9-8-03 | 0% | 4% |

**Table 5. Bristlegrass Germination Test – 2003 PMC Harvest, Office-Stored Seed**

| Accession Number | Germination (3-Day) | Total Germination | Seed Fill | Viability Test |
|---|---|---|---|---|
| 9029677 | 5% | 24% | 49% | 42% |
| 9029648 | 9% | 33% | 37% | 21% |
| 9038819 | 0% | 17% | 68% | 48% |
| 9038820 | 0% | 5% | 32% | 31% |
| 9038715 | 0% | 7% | 34% | 27% |

***Seed Dormancy:*** In 2003 and early 2004, numerous attempts ranging from moist heat to acid scarification were made to increase the germination or break the seed dormancy of bristlegrass. None of the attempts were very successful (Kika De la Garza PMC, 2003).

In 2004, efforts continued to be focused on evaluating seed production and quality at different locations and at different months of the year. Seed fill and germination was good from accessions 9038819 and 9029677 at Knox City in 2004 (Table 8). Accession 9029677 had exceptional germination from greenhouse-stored seed having 34% and 36% three-day germination from either harvest date. Likewise seed harvested at Beeville for accession 9029677 had germination rates at 80% in June 2004 (Table 7) and germination rates of 72% in September 2004 (Table 8).

**Table 6. Bristlegrass Germination Test – Knox City Seed 2004**

| Accession Number | Storage Type | Harvest Date | Germination 3-day | Germination 9-day | Total Germination | Seed Fill |
|---|---|---|---|---|---|---|
| 677 | Greenhouse | 8-16-04 | 34% | 72% | 76% | 72% |
| | Office | | 2% | 84% | 92% | 66% |
| | Greenhouse | 9-08-04 | 36% | 88% | 90% | 63% |
| | Office | | 2% | 82% | 84% | 83% |
| 819 | Greenhouse | 8-16-04 | 0% | 8% | 14% | 74% |
| | Office | | 0% | 20% | 36% | 91% |
| | Greenhouse | 9-08-04 | 0% | 24% | 37% | 81% |
| | Office | | 0% | 34% | 46% | 79% |
| 820 | Greenhouse | 9-08-04 | 0% | 0% | 2% | 19% |
| | Office | | 0% | 0% | 2% | 27% |
| 715 | Greenhouse | 9-08-04 | 0% | 0% | 0% | 30% |
| | Office | | 0% | 2% | 2% | 29% |

**Table 7. Bristlegrass Germination Test – Beeville Seed, 2004**

| Accession Number | Harvest Type | Harvest Date | Germination | Seeds/Pound |
|---|---|---|---|---|
| 9029677 | Tarp | 6-04-04 | 80% | 504,444 |

**Table 8. Bristlegrass Seed Harvest Yield and Germination – Beeville Seed, 2004**

| Accession Number | Harvest Date | Seed Harvest (grams) | Germination | Total Viable |
|---|---|---|---|---|
| 9029677 | 9-23-04 | 1676 | 72% | 83% |
| 9038715 | 9-30-04 | 783 | 4% | 73% |
| 9038819 | 9-23-04 | 660 | 9% | 50% |
| 9038820 | 9-30-04 | 705 | 3% | 49% |
| 9029677 | 6-04-04 | 2055 | - | - |
| 9038715 | 6-16-04 | 773 | - | - |
| 9038819 | 6-03-04 | 1218 | - | - |
| 9038820 | 6-16-04 | 758 | - | - |

***Seed Production*:** Average annual seed yields of Kika677 Germplasm streambed bristlegrass at Beeville have been 108 pounds to the acre (121 kg $ha^{-1}$) with 43 percent pure live seed (Table 9).

**Table 9. Bristlegrass Seed Harvest Yield – Beeville Seed, 2005**

| Accession Number | Harvest Date | Seed Harvest (pounds) | Harvest (pounds/acre) | Percent PLS | PLS Pounds |
|---|---|---|---|---|---|
| 9029677 | 2005 | 54 | 108 | 43 | 25 |
| 9038715 | 2005 | 25 | 175 | 44 | 10 |
| 9038819 | 2005 | 50 | 275 | 32.0 | 12 |
| 9038820 | 2005 | 126 | 544 | 31.0 | 30 |

Indeterminate seed maturity, seed shattering and lodging are factors that may influence economical seed yields of streambed bristlegrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Kingsville, Texas ranged from 31% to 65% in 2005. However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from Knox City (Table 8) for both month of harvest as well as storage location shows variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where bristlegrass can be most economically grown for seed production.

Seed shattering is a problem with bristlegrass species. However, one attribute to an indeterminate seed development is that all the seed is not lost at maturity if a storm or high winds occur. Furthermore, with the use of a Shelborne header it is possible to get multiple harvests when the seed reaches maturity without cutting off the inflorescence.

Lodging, while seen at the PMC in Kingsville, never occurred at Beeville. We are unsure of the cause of this. It may be a result of growing the bristlegrass on the heavy textured soils at Kingsville versus the coarse textured soils at Beeville. Though more likely, it is a result of growing it on raised beds spaced 36 inches apart at Kingsville whereas at Beeville it was on flat ground. Even in our fist year's evaluation at Beeville, with the plants grown in wide rows with weed mat rolled out between the rows, no lodging was observed. An experiment starting in 2005 at Beeville is evaluating 5 rates of N fertilizer application on bristlegrass. The first year's results show no indication that any of the bristlegrasses are going to lodge, even with high rates of N fertilizer.

Rice stinkbugs and ergot have been observed on our bristlegrasses. Appropriate use and timeliness of applications of insectides or fungicides can control these infestations. However, inattention to these outbreaks can affect both the quantity and the quality of the seed harvest. Rice stinkbugs are known to destroy the endosperm of developing grass seeds (Drees and Jackman, 1999). Fields treated with Sevin XLR at 3 quarts/acre have effectively controlled rice stinkbugs.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a forage harvester (clipping the heads, and air drying on tarps) then keeping only the seed that shattered onto the

tarp at Beeville in 2005 and then run through a *Clipper* seed cleaner has produced 59% pure seed.

**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 Kika677 Germplasm streambed bristlegrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that streambed bristlegrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Kika677 Germplasm streambed bristlegrass will provide a native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has good germination, while retaining some dormant seed to deal with unpredictable weather conditions. Its bunch growth habit and good seed size make it particularly suitable for upland-bird habitat.

**Area of Adaptation:** Kika677 Germplasm streambed bristlegrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation, so it may be adapted in more northern zones. Test sites in Texas have been established in Knox City and Stephenville, and additional sites are being planted in Ardmore, Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

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**Prepared by:**

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**Signatures for release of:**

**Kika677 Germplasm streambed bristlegrass**
**(*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**

Salvador Salinas

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Acting

SEP 0 5 2006
Date

/s/ Mark A. Hussey

Texas Agricultural Experiment Station
College Station, Texas

8-28-2006
Date

Fredd Bryant

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

9/8/06
Date

Robert T Escheman

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

9-18-06
Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Streambed bristlegrass (*Setaria luecopila*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika677 streambed bristlegrass**
   **Kika819 streambed bristlegrass**
   **Kika820 streambed bristlegrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: **joint release with USDA-NRCS**
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **Streambed bristlegrass (*Setaria leucopila* (Scribn. & Merr.) K. Schum.)**
Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika677 streambed bristlegrass**

3. Designation or name in development stages: **9029677 or 677**

4. Primary features or advantages:

- **Native to and adapted to southern Texas**
- **Selected for superior harvestable seed production.**
- **Excellent seed germination and good 3-day germination**
- **Good long-term survival**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **54 lbs by November 2005, 100 lbs more by November 2006**

7. Proposed seed distribution: Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service. Foundation seed will be released to commercial growers to be grown as monocultures for seed production.

All seed shall be produced in Texas. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

Breeders and Scientists – Date

Unit Heads – Date

W M Ocampo 5-26-06

Bobby R. Eddleman 5-30-06

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF KIKA648 GERMPLASM PLAINS BRISTLEGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material of plains bristlegrass (*Setaria vulpiseta* (Lam.) Roemer & J.A. Schultes) for the south Texas ecoregion. Kika648 Germplasm was tested under the accession number 9029648 and 648.

As a selected plant material, this plant will be referred to as Kika648 Germplasm plains bristlegrass. Kika648 Germplasm is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted plains bristlegrass. The potential for immediate use is high especially for upland wildlife plantings and for range seeding mixes.

**Collection Site Information:** Accession 9029648 was originally collected from Webb county in 1982 from native plants located near Laredo, Texas, at 27° 42' N. latitude and 99° 24' W. longitude (MLRA 83). It was growing on a Catarina clay soil type with a 1% slope. Collection site elevation was 152 meters (500 feet) and average annual precipitation for this location is 50 centimeters (19.5 inches).

**Description:** Plains bristlegrass is a native perennial bunch grass with stiffly erect stems. Mature foliage height ranges from 60 to 120 centimeters (2 to 4 feet) tall, turning a pale yellow color. Stems are in dense clumps. The leaf blades are narrow, 5 to 6 millimeters wide and 8 to 25 centimeters long, with abundant pilose hairs on the upper surface. It has a ligule that is densely hirsute with hairs 2 to 4 mm long. The inflorescence is densely flowered in a compressed panicle commonly 7 to 12 centimeters long and 0.7 to 1.5 cm thick. The bristles, by which it gets its common name, are 6 to 7 mm long. Anthers exude first from the floret, and the anthers and stigmas appear white in color. Spikelets are small and globose at maturity, seldom longer than 2 mm. The chromosome number is *2n=54*. The plants produce seed from May

through November. Plains bristlegrass is found mainly in the southern portions of the state of Texas.

Potential Uses: Kika648 Germplasm is recommended for upland wildlife plantings and in range seeding mixes. It can be used in many types of conservation plantings, such as streamside buffers and filter strips.

**Method of Breeding and Selection:**

***Initial evaluation***: Initial evaluations of Kika648 Germplasm began in 1984 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 96 accessions of bristlegrass (*Setaria* spp.) were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9038819 and 9038820 were determined to be the best accessions of bristlegrass for survival, vigor, growth form and development, and disease resistance.

An advanced evaluation plot was established at the PMC in 1994 that consisted of four replications of ten plants each of 9038819, 9038820, 9003939 (Arizona release) and a Texas "common" commercial source. In 1996, we took biweekly seed harvests to determine total seed yield. We also evaluated the plots for total biomass production and survival in October 1996. However, despite numerous trials to get active germination above 10%, work with bristlegrass was abandoned due to poor germination results.

In 2001, in conjunction with the development of the South Texas Natives Project, interest was revived in plains bristlegrass and a new initial evaluation was started. Nine collections of bristlegrass were transplanted to field plots at the PMC in April and May 2001. Seed was collected from these nine accessions at the end of 2001 and germination tests were performed in June 2002. All nine accessions exhibited very poor germination results. Another 5 accessions were added to the field nursery in November 2001. Thirteen of the fourteen accessions had good field survival and growth through the winter of 2001.

Seed was collected from all fourteen of the 2001 plantings during the summer of 2002. A germination test was run on this harvest in March 2003. All accessions again exhibited poor germination (data not shown).

The field plot was evaluated for plant performance from May to December of 2002. Only five of the fourteen collections planted in the plot exhibited above average performance in field characteristics (Table 1). Only accession 9038819-Bexar exhibited above average seed retention, but it also exhibited above average lodging problems. All accessions exhibited average seed shattering problems. In addition, all seedheads in the field plot became infested with fungi in October 2002.

**Table 1. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2002**

| Accession Number | Origin (County) | % Survival | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|
| 9029587 | Webb | 96 | 6.0 | 5.6 | 6.2 |
| 9029605 | Val Verde | 78 | 6.0 | 4.0 | 7.2 |
| 9029636 | Live Oak | 96 | 5.2 | 4.6 | 5.4 |
| 9029648 | Webb | 92 | 5.0 | 6.2 | 6.2 |
| 9029667 | La Salle | 90 | 6.3 | 6.8 | 7.8 |
| 9029677 | Karnes | 100 | 5.8 | 6.0 | 5.0 |
| 9029678 | Mc Mullen | 90 | 5.3 | 5.8 | 6.8 |
| 9029679 | Mc Mullen | 90 | 6.3 | 5.2 | 5.4 |
| 9038708 | Goliad | 96 | 5.5 | 5.0 | 7.0 |
| 9038713 | Duval | 42 | 6.5 | 5.2 | 6.0 |
| 9038715 | Duval | 88 | 5.0 | 4.0 | 7.8 |
| 9038819 | Bexar | 94 | 5.8 | 5.8 | 4.4 |
| 9038820 | Willacy | 96 | 7.3 | 6.8 | 6.0 |
| 9038833 | Frio | 96 | 6.5 | 4.0 | 5.4 |

*Ocular estimate (1 = Best)

Sixteen more collections were added to the field evaluation plot in April 2003, increasing the total number of field accessions to 30. The field plot of plains bristlegrass was evaluated for plant performance from May to August of 2003 (Table 2). Two of the collections planted in 2001 in the field plot exhibited above average seed production (Accessions: 9038708-Goliad & 9029667-La Salle), and two of the new accessions planted in 2003 (Accessions: 9088932-Duval & 9086210-Kenedy) exhibited above average vigor. All accessions exhibited average seed shattering problems. All seed heads in the entire field plot became infested with fungi again in October 2003.

In February of 2003, South Texas Natives took half of the 2002 seed harvest from the 14 accessions in the PMC field evaluation plot and seeded it in the greenhouse. The resulting plants were taken to the Texas Agricultural Experiment Station at Beeville and planted out that spring on weed mat. Seed was harvested from these accessions in 2003 by three different methods: (1) fallen seed was swept off the weed mat (referred to as mat harvest), (2) the seed heads were cut off the plants and allowed to dry on tarps, then fallen seed was collected (referred to as tarp harvest), and (3) seed that still remained on the plants after drying on the tarp was stripped off the plants using a brush machine (referred to as plant harvest). Dr. Ocumpaugh evaluated these accessions at Beeville and chose 6 accessions he thought warranted further study (Accessions: 9038820-Willacy, 9038715-Duval, 9029677-Karnes, 9029667-LaSalle, 9038819-Bexar, and 9029648-Webb).

**Table 2. Bristlegrass Initial Field Evaluation at Kingsville, Texas in 2003**

| Accession Number | Origin (County) | % Survival | % Regrowth | Plant Vigor* | Foliage Density* | Uniformity* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|---|---|
| 9029648 | Webb | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029677 | Karnes | 98 | 50 | 5.0 | 5.0 | 6.7 | 5.3 | 5.0 |
| 9038820 | Willacy | 98 | 50 | 5.7 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9038819 | Bexar | 92 | 50 | 5.3 | 6.0 | 5.0 | 5.3 | 5.0 |
| 9029679 | McMullen | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9038713 | Duval | 98 | 50 | 6.3 | 6.3 | 5.3 | 6.3 | 5.0 |
| 9038833 | Frio | 96 | 50 | 5.3 | 6.0 | 5.0 | 6.7 | 5.0 |
| 9029636 | Live Oak | 98 | 50 | 5.3 | 5.7 | 5.0 | 5.3 | 5.0 |
| 9038708 | Goliad | 98 | 50 | 6.0 | 5.0 | 5.0 | 4.7 | 5.0 |
| 9029667 | La Salle | 94 | 50 | 5.7 | 5.0 | 5.0 | 4.7 | 5.0 |
| 9038715 | Duval | 100 | 50 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9029605 | Val Verde | 88 | 50 | 6.0 | 6.0 | 5.0 | 5.7 | 5.0 |
| 9029587 | Webb | 96 | 50 | 5.0 | 5.0 | 5.0 | 5.3 | 5.0 |
| 9029678 | McMullen | 92 | 50 | 6.3 | 6.3 | 5.0 | 5.3 | 5.0 |
| 9086153 | Zavala | 94 | - | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9086163 | Zavala | 90 | - | 6.3 | 6.3 | 5.0 | 6.5 | 5.0 |
| 9088606 | Zavala | 92 | - | 5.3 | 5.7 | 5.0 | 6.5 | 5.0 |
| 9088574 | Zavala | 87 | - | 6.7 | 6.7 | 6.0 | 6.5 | 5.0 |
| 9089041 | Live Oak | 92 | - | 6.7 | 6.7 | 5.0 | 7.0 | 5.0 |
| 9089116 | Medina | 80 | - | 7.0 | 7.0 | 5.0 | 7.0 | 5.0 |
| 9089207 | Uvalde | 68 | - | 7.0 | 7.0 | 5.3 | 6.0 | 5.0 |
| 9089209 | Uvalde | 93 | - | 6.0 | 5.7 | 6.7 | 6.5 | 5.0 |
| 9086280 | Atascosa | 90 | - | 5.3 | 5.0 | 6.7 | 6.0 | 5.0 |
| 9086980 | Frio | 95 | - | 5.7 | 5.3 | 6.7 | 5.5 | 5.0 |
| 9088959 | Atascosa | 98 | - | 6.0 | 5.7 | 5.7 | 6.5 | 5.0 |
| 9088928 | Dimmit | 94 | - | 5.7 | 5.3 | 5.0 | 5.5 | 5.0 |
| 9088932 | Duval | 100 | - | 4.3 | 4.3 | 5.0 | 4.5 | 5.0 |
| 9089059 | La Salle | 100 | - | 5.7 | 5.3 | 5.7 | 5.0 | 5.0 |
| 9088958 | Atascosa | 98 | - | 5.3 | 5.0 | 5.7 | 5.5 | 5.0 |
| 9086210 | Kenedy | 100 | - | 4.7 | 5.0 | 5.0 | 5.0 | 5.0 |

*Ocular estimate (1 = Best)

A germination experiment was also conducted on seed harvested at the PMC in 2003 and stored only in the office (Table 3). There was an indication that cold storage (50% humidity and 50$^{o}$F) was causing the seed to go into greater dormancy. Accession 9029648 had a germination rate of 33%.

**Table 3. Bristlegrass Germination Test – 2003 PMC Harvest, Office-Stored Seed**

| Accession Number | Germination (3-Day) | Total Germination | Seed-Fill | Viability Test |
|---|---|---|---|---|
| 9029677 | 5% | 24% | 49% | 42% |
| 9029648 | 9% | 33% | 37% | 21% |
| 9038819 | 0% | 17% | 68% | 48% |
| 9038820 | 0% | 5% | 32% | 31% |
| 9038715 | 0% | 7% | 34% | 27% |

***Seed Dormancy:*** In 2003 and early 2004, numerous attempts ranging from moist heat to acid scarification were made to increase the germination or break the seed dormancy of bristlegrass. None of the attempts were very successful (Kika de la Garza PMC, 2003).

In 2004, efforts continued to be focused on evaluating seed production and quality at different locations and at different months of the year. Seed fill and germination was good from accession 9029648 at Knox City in 2004 (Table 4). Seed harvested in June 2004 at Beeville had germination rates of 44% (Table 5) and germination rates of 48% from seed harvested in September 2004 (Table 6).

**Table 4. Bristlegrass Germination Test – Knox City Seed, 2004**

| Accession Number | Storage Type | Harvest Date | Germination 3-day | Germination 9-day | Total Germination | Seed-Fill |
|---|---|---|---|---|---|---|
| 648 | Greenhouse | 8-16-04 | 8% | 56% | 76% | 78% |
| 648 | Office | 8-16-04 | 2% | 52% | 66% | 63% |
| 648 | Greenhouse | 9-08-04 | 6% | 74% | 86% | 52% |
| 648 | Office | 9-08-04 | 4% | 60% | 88% | 66% |

**Table 5. Bristlegrass Germination Test – Beeville Seed, 2004**

| Accession Number | Harvest Type | Harvest Date | Germination | Seeds/Pound |
|---|---|---|---|---|
| 9029648 | Tarp | 6-03-04 | 44% | 567,500 |

**Table 6. Bristlegrass Seed Harvest Yield and Germination – Beeville Seed, 2004**

| Accession Number | Harvest Date | Seed Harvest (grams) | Germination | Total Viable |
|---|---|---|---|---|
| 9029648 | 9-30-04 | 1113 | 48% | 60% |
| 9029648 | 6-03-04 | 1040 | - | - |

***Seed Production*:** Seed yield of Kika648 Germplasm plains bristlegrass at Beeville have been 108 lb/ac (121 kg $ha^{-1}$) with 41% pure live seed (Table 7). This was the year of establishment, and the seed production off of the same land area was nearly that much for the first harvest in 2006 (data not shown).

**Table 7. Bristlegrass Seed Harvest Yield – Beeville Seed, 2005**

| Accession Number | Harvest Date | Seed Harvest (lbs.) | Harvest (lbs./ac) | % PLS | PLS Pounds |
|---|---|---|---|---|---|
| 9029648 | 2005 | 48.8 | 108 | 41 | 27.8 |

Indeterminate seed maturity, seed shattering and lodging are factors that may influence economical seed yields of plains bristlegrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Beeville, Texas ranged from 21% in 2003 to 60% in 2004. However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from Knox City (Table 4) for both month of harvest as well as storage location shows variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where bristlegrass can be most economically grown for seed production.

Seed shattering is a problem with bristlegrass species. However, one attribute to an indeterminate seed development is that all the seed is not lost at maturity if a storm or high winds occur. Furthermore, with the use of a Shelborne header it is possible to get multiple harvests when the seed reaches maturity without cutting off the inflorescence.

Lodging, while seen at the PMC in Kingsville, never occurred at Beeville. We are unsure of the cause of this. It may be a result of growing the bristlegrass on the heavy textured soils at Kingsville versus the coarse textured soils at Beeville. Though more likely, it is a result of growing it on raised beds spaced 36 inches apart at Kingsville whereas at Beeville it was on flat ground. Even in our fist year's evaluation at Beeville, with the plants grown in wide rows with weed mat rolled out between the rows, no lodging was observed. An experiment starting in 2005 at Beeville is evaluating 5 rates of N fertilizer application on bristlegrass. The first year's results show no indication that any of the bristlegrasses are going to lodge, even with high rates of N fertilizer.

Rice stinkbugs and ergot have been observed on our bristlegrasses. Appropriate use and timeliness of applications of insectides or fungicides can control these infestations. However, inattention to these outbreaks can affect both the quantity and the quality of the seed harvest. Rice stinkbugs are known to destroy the endosperm of developing grass seeds (Drees and Jackman, 1999). Fields treated with Sevin XLR at 3 quarts/acre have effectively controlled rice stinkbugs.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a forage harvester (clipping the heads, and air drying on tarps) then keeping only the seed that shattered onto the tarp at Beeville in 2005 and then run through a *Clipper* seed cleaner has produced 59% pure seed.

**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 Kika648 Germplasm plains bristlegrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that plains bristlegrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies. Bob White Quail are frequently observed in our bristlegrass plots at Beeville.

**Conservation Use:** Kika648 Germplasm plains bristlegrass will provide a native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has good germination, while retaining some dormant seed to deal with unpredictable weather conditions. Its bunch growth habit and good seed size make it particularly suitable for upland-bird habitat.

**Area of Adaptation:** Kika648 Germplasm plains bristlegrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. A test site has been established at Stephenville and Knox City, TX, and additional sites are currently being planted in Ardmore, Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

**References:**


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**Signatures for release of:**

**Kika648 Germplasm Plains bristlegrass (*Setaria vulpiseta* (Lam.) Roemer & J.A. Schultes)**

John W. Mueller Acting

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

SEP 01 2006
Date

Texas Agricultural Experiment Station
College Station, Texas

8-23-2006
Date

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

9/8/06
Date

Robert Escheman

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

9-16-06
Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Plains bristlegrass (*Setaria valpiseta*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika648 plains bristlegrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations:
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **Plains bristlegrass (*Setaria vulpiseta* (Lam.) Roemer & J.A. Schultes)**
Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika648 plains bristlegrass**

3. Designation or name in development stages: **9029648 or 648**

4. Primary features or advantages:

- **Native to and adapted to southern Texas**
- **Selected for harvestable seed production**
- **Excellent seed germination and good 3-day germination**
- **Good long-term survival**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **48 lbs by November 2005, 100 lbs more by November 2006**

7. Proposed seed distribution: Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service. Foundation seed will be released to commercial growers to be grown as monocultures for seed production.

All seed shall be produced in Texas. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| 5-26-06 | Bobby R. Eddleman 5-30-06 |

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF WELDER GERMPLASM SHORTSPIKE WINDMILLGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material of shortspike windmillgrass (*Chloris subdolichostachya* Muller) for the south Texas ecoregion. Welder Germplasm was tested under the accession number 9085260 or 260.

As a selected plant material release, this plant will be referred to as Welder Germplasm shortspike windmillgrass. Welder Germplasm is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing commercial sources of shortspike windmillgrass. The potential for immediate use is high especially for roadside plantings and critical site revegetation.

**Collection Site Information:** Accession 9085260 was collected in 1999 from native plants located near the Welder Wildlife Refuge, Sinton Texas, at 26° 06' N. latitude and 97° 25' W. longitude (MLRA 150A). It was growing on an Orelia sandy clay loam soil type with a 1% slope. Collection site elevation was 21 meters (69 feet) and average annual precipitation for this location is 76 centimeters (30 inches).

**Description:** Shortspike windmillgrass is a native grass hybrid that according to Gould (1975) is formed when hooded windmillgrass (*Chloris cucullata*) hybridizes with *Chloris verticillata* or *Chloris andropogonoides* in areas where their ranges overlap. The hybrids are generally intermediate morphologically between the parents. Tetraploid populations with regular meiosis and good seed set have been sampled in San Patricio and Brazos counties (*2n=40*). This species is a strongly stoloniferous perennial grass. Mature foliage height ranges from 30 to 90 centimeters (1.0 to 3.0 feet) tall. Leaves are glabrous and crowded towards the culm base with keeled and laterally compressed sheaths. The leaf blades are linear 10 to 30 centimeters (4 to 12 inches) long and 1.5 to 4 millimeters wide. Flowers can be produced from May to October but

are more prevalent from September to October. The inflorescence is variable in length, thickness, and arrangement of branches. Branches can be five or more, 3 to 17 centimeters long, bearing closely-placed spikelets to the base. Spikelets have a single rudiment, which is variable in length and width but is usually 0.5 to 1.4 millimeters wide with a truncate, cuneate or rounded apex. The lemma of the lower floret is 2.2 to 2.9 millimeters long and appressed-pilose on midnerve and margins with an awn 2 to 5 millimeters long. Mature florets are black or sometimes remaining light-colored at maturity. Shortspike windmillgrass is found in northeastern Mexico and throughout Texas except in the Pineywoods and Panhandle ecoregions.

**Potential Uses:** Welder Germplasm is recommended for roadside plantings, critical site revegetation and in range seeding mixes. It can be used in many types of conservation plantings, such as grassed waterways, streamside buffers, and pond embankments.

**Method of Breeding and Selection:**

***Initial evaluation***: Welder Germplasm was initially evaluated at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas, from 2000 through 2001. A total of 43 accessions of windmillgrass were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9085260 and 9085283 were determined to be the best accessions of shortspike windmillgrass for vigor, growth form and development (Table 1 and 2).

**Table 1. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on Clay Soils at Kingsville, Texas**

| Accession Number | Source (County) | Percent Survival | Foliage Density* | Seed Production* |
|---|---|---|---|---|
| 9076951 | Frio | 100 | 5.2 | 3.9 |
| 9076977 | Palo Pinto | 95 | 6.5 | 4.5 |
| 9076946 | Kleberg | 100 | 5.3 | 5.4 |
| 9085229 | Coleman | 95 | 6.9 | 5.0 |
| 9085308 | Lampasas | 100 | 6.6 | 5.1 |
| 9085235 | Lubbock | 100 | 7.0 | 5.5 |
| 9085300 | Bee | 100 | 5.3 | 5.1 |
| 9085289 | San Patricio | 100 | 4.4 | 4.0 |
| 9085316 | Kenedy | 100 | 4.3 | 4.9 |
| 9085243 | Burnet | 100 | 6.1 | 3.7 |
| 9085285 | Howard | 100 | 6.2 | 4.8 |
| 9085288 | Burleson | 100 | 5.4 | 3.6 |
| 9085242 | Austin | 100 | 4.5 | 3.7 |
| 9085309 | Kleberg | 100 | 5.5 | 5.0 |
| 9085258 | Goliad | 100 | 4.6 | 4.8 |
| 9076968 | Knox | 100 | 7.0 | 4.3 |
| 9085264 | DeWitt | 100 | 4.4 | 4.8 |
| 9085260 | San Patricio | 100 | 3.1 | 3.8 |
| 9085240 | Dimmit | 95 | 5.3 | 4.5 |
| 9085234 | Lubbock | 100 | 7.4 | 4.8 |
| 9085301 | Duval | 100 | 5.4 | 4.7 |
| 9076971 | Brown | 100 | 6.5 | 4.3 |
| 9085313 | Kenedy | 100 | 4.6 | 5.0 |
| 9085245 | Burnet | 100 | 5.8 | 4.8 |
| 9076955 | Kleberg | 100 | 4.8 | 4.9 |
| 9085262 | Refugio | 100 | 2.9 | 4.3 |
| BELL | - | 100 | 3.3 | 4.2 |
| 9085265 | DeWitt | 100 | 4.1 | 4.8 |
| 9085259 | Kleberg | 100 | 4.4 | 4.8 |
| 9085271 | Hidalgo | 100 | 4.5 | 4.8 |
| 9085233 | Andrews | 100 | 7.4 | 3.8 |
| 9076974 | Lubbock | 100 | 7.7 | 4.5 |
| 9085283 | Calhoun | 100 | 3.7 | 3.8 |
| 9085276 | Starr | 100 | 5.3 | 4.3 |
| 9085291 | Webb | 100 | 4.9 | 4.8 |
| **Means** | **All Counties** | **99** | **5.5** | **4.6** |

*Ocular estimate (1 = Best)

**Table 2. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on Sandy Soils at Kingsville, Texas**

| Accession Number | Source (County) | Percent Survival | Foliage Density* | Seed Production* |
|---|---|---|---|---|
| 9076951 | Frio | 100 | 6.4 | 5.3 |
| 9076977 | Palo Pinto | 85 | 7.1 | 4.7 |
| 9076946 | Kleberg | 95 | 5.5 | 4.5 |
| 9085229 | Coleman | 95 | 6.8 | 4.7 |
| 9085308 | Lampasas | 100 | 7.1 | 5.0 |
| 9085235 | Lubbock | 90 | 6.7 | 5.2 |
| 9085300 | Bee | 100 | 5.4 | 5.4 |
| 9085289 | San Patricio | 95 | 5.2 | 4.0 |
| 9085316 | Kenedy | 100 | 4.8 | 4.6 |
| 9085243 | Burnet | 100 | 6.3 | 4.0 |
| 9085285 | Howard | 80 | 6.6 | 5.5 |
| 9085288 | Burleson | 100 | 5.5 | 4.2 |
| 9085242 | Austin | 100 | 5.9 | 4.8 |
| 9085309 | Kleberg | 83 | 6.5 | 6.5 |
| 9085255 | Jim Hogg | 100 | 5.8 | 4.7 |
| 9076968 | Knox | 85 | 7.2 | 4.6 |
| 9085240 | Dimmit | 90 | 5.0 | 4.7 |
| 9085234 | Lubbock | 65 | 7.1 | 5.0 |
| 9085301 | Duval | 85 | 5.8 | 4.5 |
| 9076971 | Brown | 100 | 7.0 | 4.7 |
| 9085313 | Kenedy | 100 | 5.5 | 5.5 |
| 9085245 | Burnet | 80 | 6.5 | 5.5 |
| 9076955 | Kleberg | 81 | 5.8 | 5.9 |
| 9085262 | Refugio | 100 | 4.0 | 4.8 |
| BELL | - | 100 | 4.0 | 5.0 |
| 9085258 | Goliad | 100 | 5.3 | 4.6 |
| 9085265 | DeWitt | 100 | 5.5 | 5.1 |
| 9085259 | Kleberg | 100 | 5.7 | 4.8 |
| 9085271 | Hidalgo | 100 | 5.9 | 4.6 |
| 9085233 | Andrews | 60 | 7.5 | 5.6 |
| 9076974 | Lubbock | 100 | 7.5 | 4.4 |
| 9085283 | Calhoun | 100 | 4.5 | 5.0 |
| 9085276 | Starr | 100 | 5.8 | 4.9 |
| 9085291 | Webb | 80 | 6.1 | 5.0 |
| 9085264 | DeWitt | 100 | 5.3 | 5.3 |
| 9085260 | San Patricio | 100 | 3.8 | 5.1 |
| **Means** | **All Counties** | **95** | **6.1** | **4.9** |

*Ocular estimate (1 = Best)

***Advanced Evaluations**:* Advanced evaluation plots were established in 2002 at both the PMC in Kingsville and the Texas Agricultural Experiment Station (TAES) in Beeville. The Advanced evaluation plots at the PMC consisted of accessions 9085260, 9085283, 9085262, 9085289 and 9085316. The advanced evaluation plots at Beeville consisted of accessions 9085260, 9085262, 9085283, 9085300 and 9085289. Accessions 9085260 and 9085283 had the best field performance on these plots at the PMC during 2002 and 2003 (Table 3). Likewise, Dr. Bill Ocumpaugh ranked 9085260 and 9085283 as his top two accessions at Beeville in 2002. Seed production rankings appear to be the lowest for these accessions when one looks at Table 3. However, it became apparent in the following years that the stronger the hybrid was towards a "true" shortspike windmillgrass then it would only produce seed one time during the early Fall. If the hybrid was more like a hooded windmillgrass, then it would produce multiple harvests during the year. However, even with only one harvest, shortspike windmillgrass can produce as much seed as the annual production of hooded windmillgrass (Table 4).

**Table 3. Shortspike Windmillgrass Advanced Evaluation in 2003 at Kingsville, Texas**

| Accession Number | Growth Habit | Percent Survival | Plant Vigor* | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|
| 289 | Bunch, some stolons | 100 | 4.9 | 5.0 | 5.0 | 5.0 |
| 316 | Bunch, some stolons | 100 | 5.0 | 5.1 | 5.9 | 5.0 |
| 260 | Very Spreading | 100 | 5.0 | 5.0 | 6.8 | 5.0 |
| 283 | Spreading | 100 | 5.0 | 5.0 | 5.9 | 5.0 |
| 262 | Spreading | 100 | 5.0 | 4.9 | 5.1 | 5.0 |

*Ocular estimate (1 = Best)

**Table 4. Shortspike Windmillgrass Seed Harvest and Germination from Beeville, Texas in 2003.**

| Accession Number | Total Grams Harvested | 2-Day Germination % | Total Germination % |
|---|---|---|---|
| 260 | 202 | 57 | 72 |
| 262 | 127 | 36 | 58 |
| 283 | 101 | 35 | 58 |
| 289 | 226 | 48 | 59 |

- 12 hours dark 20°C (68°F) / 12 hours light 30°C (86°F).

Initial seed germination results indicated low germination from harvested seed at the PMC (ATR, 2001). In order to understand the cause of the low germination results from harvested seed, samples of the 2002 harvest from accession 9085260 was sent to two seed labs. Hulsey Seed Lab got 58% germination and 26% dormancy and Giddings TDA Seed Lab got 37% germination and 15% dormancy. Upon further investigation it was discovered that the majority of the harvested seed did not contain filled seed. Germination tests previously had been run on spikelets (apparently mostly empty), not bare caryopsis. Seed was collected from each plant of the advanced evaluation plots at Beeville in 2003. This harvest was tested in 2004 (Table 4). All of the accessions appear to have good germination. Hooded windmillgrass appears to have a very high active germination (>90%) whereas shortspike windmillgrass will have an active germination of 60-70% and 20-30% dormant seed.

A field emergence study was established in May 2004 on a Victoria clay soil at the PMC. Ten by twenty foot flat plots were seeded at a rate of 20 PLS/ft$^2$ and replicated three times for accessions 9085260 and 9085283 and 9085313. These plots were not irrigated. Evaluation of these plots in November of 2004 (Table 5) indicated that accession 9085260 had the densest cover and foliage production based on ocular estimates with an average 60% cover.

**Table 5. Windmillgrass Field Emergence Evaluation in 2004 at Kingsville, Texas**

| Accession Number | Rep | % Cover | Plant Vigor* | Foliage Density* | Foliage Production* | Uniformity * | Development Stage |
|---|---|---|---|---|---|---|---|
| 260 | 1 | 50 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 260 | 2 | 60 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 260 | 3 | 70 | 2.0 | 2.0 | 2.0 | 2.0 | Seed |
| 283 | 1 | 35 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 283 | 2 | 30 | 5.0 | 5.0 | 5.0 | 5.0 | Seed |
| 283 | 3 | 70 | 3.0 | 3.0 | 3.0 | 3.0 | Seed |
| 313 | 1 | 15 | 6.0 | 6.0 | 6.0 | 6.0 | Seed |
| 313 | 2 | 35 | 5.0 | 6.0 | 6.0 | 5.0 | Seed |
| 313 | 3 | 15 | 6.0 | 6.0 | 6.0 | 6.0 | Seed |

*Ocular estimate (1= Best)

A second field emergence study was established in March 2005 into a treated buffelgrass pasture at the Bomer Wildlife Area in Duval County, Texas. Ten meter by ten meter plots were divided in half and random halves were sprayed with 64 ounces per acre of imazapyr in November, 2004. In March 2005, both the sprayed and the unsprayed plots were seeded with a seed mix of shortspike windmillgrass (Accession 9085260), switchgrass (*Panicum virgatum*), and 4-flower trichloris (*Trichloris pluriflora*) at a rate of 10 PLS/ft2 per species, replicated three times. These

plots on a sandy loam soil were not irrigated. Evaluation of these plots in November of 2005 (Table 6) indicated that shortspike windmillgrass was the only seeded species that became established.

**Table 6. Species Evaluation of Imazapyr Treated Plots in November 2005 at the Bomer Wildlife Area, Duval County, Texas.**

| Rep | Species | % Cover on Sprayed Plots | % Cover on Unsprayed Plots |
|---|---|---|---|
| 1 | Buffelgrass | 91 | 100 |
| | Shortspike | 41 | 0 |
| | Annual forbs | 0.3 | 0 |
| 2 | Buffelgrass | 90 | 97 |
| | Shortspike | 24 | 0 |
| | Annual forbs | 19 | 31 |
| 3 | Buffelgrass | 71 | 99 |
| | Shortspike | 27 | 2 |
| | Annual forbs | 18 | 11 |

***Seed Production***: Average annual seed yields of Welder Germplasm shortspike windmillgrass at Kingsville has been 245 pounds per acre (280 kg $ha^{-1}$) (Table 7). Unlike hooded windmillgrass (data not shown), shortspike produces seed only one time a year in late September or early October. Seed retention is fairly good reducing the risk somewhat for a single harvest species. Highway departments and landscapers will appreciate the lack of seed heads throughout most of the year.

Indeterminate seed maturity is a factor that may influence economical seed yields of shortspike windmillgrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Beeville, Texas ranged from 2% to 4% in 2003 (Table 8) and from 3% to 6% from an early May harvest in 2003 from Kingsville, Texas (Table 9). However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from hooded windmillgrass, accession 9085313, for both month of harvest as well as location shows a large variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where seed production fields of windmillgrass can be most economically grown.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a combine at the PMC in Kingsville and then run through a *Westrup Laboratory* brush machine (used for

polishing, hulling or scarifing seed), a hammermill, and a tabletop C*lipper* seed cleaner produced 95% pure seed.

**Table 7. Seed Attributes for Shortspike Windmillgrass Harvested in Kingsville**

| Acc # | Year Harvested | Harvest Weight (pounds/acre) | Clean Seed (pounds/acre) | Number of Seeds/Pound | Seed Rate (PLS pounds/acre) | Available Seed (pounds) |
|---|---|---|---|---|---|---|
| 260 | 2004 | 250 | 12 | 3,060,414 | 0.25 | 1.6 |
| 260 | 2005 | 240 | 5 | 3,285,598 | 0.25 | |
| 283 | 2004 | - | 10 | 3,630,638 | 0.25 | 2 |
| 283 | 2005 | 227 | 3 | 2,662,256 | 0.25 | |

**Table 8. Seed-Fill Percentages from Windmillgrass Harvest in 2003 from Beeville, Texas**

| Species | Acc# | Harvest Weight | Total Grams Clean | Seeds/ Gram | Germ Average | Seed-Fill |
|---|---|---|---|---|---|---|
| Shortspike | 260 | 202 | 6 | 7237 | 72% | 3% |
| Shortspike | 262 | 127 | 2 | 8445 | 58% | 2% |
| Shortspike | 283 | 101 | 2 | 7997 | 58% | 2% |
| Shortspike | 289 | 226 | 9 | 5358 | 59% | 4% |

**Table 9. Seed-Fill Percentages from Windmillgrass Harvest on May 21, 2003 from Kingsville, Texas**

| Species | Acc# | Harvest Weight | Total Grams Clean | Seeds/ Gram | Germ Average | Seed-Fill |
|---|---|---|---|---|---|---|
| Shortspike | 260 | 56 | 3 | 6741 | 73% | 5% |
| Shortspike | 262 | 86 | 2 | 5858 | 78% | 3% |
| Shortspike | 283 | 78 | 2 | 5864 | 73% | 3% |
| Shortspike | 289 | 179 | 10 | 5548 | 75% | 6% |

**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 Welder Germplasm shortspike windmillgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that shortspike windmillgrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Welder Germplasm shortspike windmillgrass will provide a new native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has quick germination, typically within the first 3 days, while still retaining some dormant seed to deal with unpredictable weather conditions. Its growth habit and strongly stoloniferous nature make it particularly suitable for competing with non-native species such as King Ranch bluestem (*Bothriochloa ischaemum*) and bermudagrass (*Cynodon dactylon*).

**Area of Adaptation:** Welder Germplasm shortspike windmillgrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. Existing test sites in Texas (outside of the South Texas area) include Knox City, and Nacogdoches. Additional sites are planned in Stephenville, TX and in Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

**References:**


AOSA. 1992. Seedling Evaluation Handbook. Contrib. No. 35. 84-87. Association of Official Seed Analysts, Las Cruces, NM. 130 pp.

Correl, D. S. and M. C. Johnston.1996. Manual of the Vascular Plants of Texas. University of Texas at Dallas. Richardson, Texas. p. 238-242.

Brecke, B. J. and W. B. Duke. 1980. Dormancy, germination, and emergence characteristics of fall panicum (*Panicum dichotomiflorum*) seed. Weed Science. 28: 683-685.

Fulbright, T. E. and K. S. Flenniken. 1988. Causes of dormancy in *Paspalum plicatulum* (Poaceae) seeds. The Southwestern Naturalist 33(1): 35-39.

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Kelly, K. M., J. V. Staden, and W. E. Bell. 1992. Seed coat structure and dormancy. Plant Growth Regulation 11: 201-209.

SAS Institute. 2000. Multiple Comparisons and Multiple Tests Using SAS System: Workbook/Peter H. Westfall, D. Tobias. Cary, NC.

Simpson, G. M. 1990. Seed Dormancy in Grasses. Cambridge University Press, Cambridge, UK.

**Prepared by:**

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Kingsville, TX 78413

**Signatures for release of:**

**Welder Germplasm shortspike windmillgrass (*Chloris subdolichoastachya*, Muller)**

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Acting

John W. Mueller

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

SEP 01 2006
Date

Texas Agricultural Experiment Station
College Station, Texas

8-23-2006
Date

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

9/8/06
Date

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

9-15-06
Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Shortspike Windmillgrass (*Chloris subdolichostachya*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika260 Shortspike Windmillgrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: lead is USDA-NRCS (see back)
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **shortspike windmillgrass (*Chloris subdolichostachya* Muller).**
   Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika260 shortspike windmillgrass**

3. Designation or name in development stages: **9085260 or 260**

4. Primary features or advantages:

   - **Native to and adapted to South Texas**
   - **Strongly stoloniferous**
   - **Good germination and seedling vigor**
   - **Rapid germination (high 3-day germ)**
   - **20-30% dormant seed**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **3.6 lbs in February 2006, expect 25 lbs by November 2006**

7. Proposed seed distribution:

Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service.

There are no restrictions with regard to geographic area of certified seed production. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| W M Ocumpaugh 5-26-06 | Bobby R. Eddleman 5-30-06 |

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

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF MARIAH GERMPLASM HOODED WINDMILLGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected ecotype of hooded windmillgrass (*Chloris cucullata* Bisch.) for the south Texas ecoregion. Mariah Germplasm was tested under the accession number 9085313 or 313.

This plant will be referred to as Mariah Germplasm hooded windmillgrass and is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing commercial sources of hooded windmillgrass. The potential for immediate use is high especially for roadside plantings and critical site revegetation.

**Collection Site Information:** Accession 9085313 was collected in 1999 from native plants located near the headquarters of the La Paloma Ranch in Kenedy county at 27° 15' N. latitude and 97° 54' W. longitude (MLRA 83C). It was growing on a Delfina loamy fine sand soil type with a 1% slope. Collection site elevation was 16 meters (52 feet) and average annual precipitation for this location is 63.5 centimeters (25 inches).

**Description:** Hooded windmillgrass is a native, perennial bunch grass. Mature foliage height ranges from 15 to 60 centimeters (0.5 to 2.0 feet) tall. Leaves are glabrous to scabrous with the sheaths almost always being glabrous. The leaf blades are linear to 20 centimeters (8 inches) long and 2 to 4 millimeters wide. It has a ligule that is a short-ciliate crown. Hooded windmillgrass will flower multiple times over the growing season, and flowers can be produced from May through October. The inflorescence will have 10 to 20 branches that are 2 to 5 centimeters long. The branches are flexuous or arcuate, borne in several close radiating verticels. Spikelets are at first straw-colored but later becoming tawny, closely-spaced and widely divergent, with about 14 to 18 spikelets per centimeter of rachis. Glumes are lanceolate

to obovate and glabrous except for the scabrous midnerve. The first glume is 0.5 to 0.7 mm long and the second glume is 1 to 1.5 mm long. The lower lemma is broadly elliptic and glabrous except for the appressed-pilose keel and margins. It is 1.5 to 2.0 mm long with an obtuse apex and an awn that is 0.3 to 1.5 mm long. Spikelets have one sterile floret, markedly inflated, with the upper margins inrolled usually 1.0 to 1.5 mm long, unawned or with an awn to 1.5 mm long. The chromosome number is *2n=40*. Hooded windmillgrass is found in northeastern Mexico and throughout Texas especially in the central and western parts of the state.

**Potential Uses:** Mariah Germplasm is recommended for roadside plantings, critical site revegetation and in range seeding mixes. It can be used in many types of conservation plantings, such as grassed waterways, streamside buffers, filter strips, and pond embankments.

**Method of Breeding and Selection:**

***Initial evaluation***: Mariah Germplasm was initially evaluated at the USDA-NRCS E, "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas, from 2000 through 2001. A total of 43 accessions of windmillgrass were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9085301 and 9085313 were determined to be the best accessions of hooded windmillgrass for vigor, growth form and development, and disease resistance (Table 1 and 2).

**Table 1. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on clay soils at Kingsville, Texas**

| Accession Number | Source (County) | Percent Survival | Foliage Density* | Seed Production* |
|---|---|---|---|---|
| 9076951 | Frio | 100 | 5.2 | 3.9 |
| 9076977 | Palo Pinto | 95 | 6.5 | 4.5 |
| 9076946 | Kleberg | 100 | 5.3 | 5.4 |
| 9085229 | Coleman | 95 | 6.9 | 5.0 |
| 9085308 | Lampasas | 100 | 6.6 | 5.1 |
| 9085235 | Lubbock | 100 | 7.0 | 5.5 |
| 9085300 | Bee | 100 | 5.3 | 5.1 |
| 9085289 | San Patricio | 100 | 4.4 | 4.0 |
| 9085316 | Kenedy | 100 | 4.3 | 4.9 |
| 9085243 | Burnet | 100 | 6.1 | 3.7 |
| 9085285 | Howard | 100 | 6.2 | 4.8 |
| 9085288 | Burleson | 100 | 5.4 | 3.6 |
| 9085242 | Austin | 100 | 4.5 | 3.7 |
| 9085309 | Kleberg | 100 | 5.5 | 5.0 |
| 9085258 | Goliad | 100 | 4.6 | 4.8 |
| 9076968 | Knox | 100 | 7.0 | 4.3 |
| 9085264 | DeWitt | 100 | 4.4 | 4.8 |
| 9085260 | San Patricio | 100 | 3.1 | 3.8 |
| 9085240 | Dimmit | 95 | 5.3 | 4.5 |
| 9085234 | Lubbock | 100 | 7.4 | 4.8 |
| 9085301 | Duval | 100 | 5.4 | 4.7 |
| 9076971 | Brown | 100 | 6.5 | 4.3 |
| 9085313 | Kenedy | 100 | 4.6 | 5.0 |
| 9085245 | Burnet | 100 | 5.8 | 4.8 |
| 9076955 | Kleberg | 100 | 4.8 | 4.9 |
| 9085262 | Refugio | 100 | 2.9 | 4.3 |
| BELL | - | 100 | 3.3 | 4.2 |
| 9085265 | DeWitt | 100 | 4.1 | 4.8 |
| 9085259 | Kleberg | 100 | 4.4 | 4.8 |
| 9085271 | Hidalgo | 100 | 4.5 | 4.8 |
| 9085233 | Andrews | 100 | 7.4 | 3.8 |
| 9076974 | Lubbock | 100 | 7.7 | 4.5 |
| 9085283 | Calhoun | 100 | 3.7 | 3.8 |
| 9085276 | Starr | 100 | 5.3 | 4.3 |
| 9085291 | Webb | 100 | 4.9 | 4.8 |
| **Means** | **All Counties** | **99** | **5.5** | **4.6** |

*Ocular estimate (1 = Best)

**Table 2. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on sandy soils at Kingsville, Texas.**

| Accession Number | Source (County) | Percent Survival | Foliage Density* | Seed Production* |
|---|---|---|---|---|
| 9076951 | Frio | 100 | 6.4 | 5.3 |
| 9076977 | Palo Pinto | 85 | 7.1 | 4.7 |
| 9076946 | Kleberg | 95 | 5.5 | 4.5 |
| 9085229 | Coleman | 95 | 6.8 | 4.7 |
| 9085308 | Lampasas | 100 | 7.1 | 5.0 |
| 9085235 | Lubbock | 90 | 6.7 | 5.2 |
| 9085300 | Bee | 100 | 5.4 | 5.4 |
| 9085289 | San Patricio | 95 | 5.2 | 4.0 |
| 9085316 | Kenedy | 100 | 4.8 | 4.6 |
| 9085243 | Burnet | 100 | 6.3 | 4.0 |
| 9085285 | Howard | 80 | 6.6 | 5.5 |
| 9085288 | Burleson | 100 | 5.5 | 4.2 |
| 9085242 | Austin | 100 | 5.9 | 4.8 |
| 9085309 | Kleberg | 83 | 6.5 | 6.5 |
| 9085255 | Jim Hogg | 100 | 5.8 | 4.7 |
| 9076968 | Knox | 85 | 7.2 | 4.6 |
| 9085240 | Dimmit | 90 | 5.0 | 4.7 |
| 9085234 | Lubbock | 65 | 7.1 | 5.0 |
| 9085301 | Duval | 85 | 5.8 | 4.5 |
| 9076971 | Brown | 100 | 7.0 | 4.7 |
| 9085313 | Kenedy | 100 | 5.5 | 5.5 |
| 9085245 | Burnet | 80 | 6.5 | 5.5 |
| 9076955 | Kleberg | 81 | 5.8 | 5.9 |
| 9085262 | Refugio | 100 | 4.0 | 4.8 |
| BELL | - | 100 | 4.0 | 5.0 |
| 9085258 | Goliad | 100 | 5.3 | 4.6 |
| 9085265 | DeWitt | 100 | 5.5 | 5.1 |
| 9085259 | Kleberg | 100 | 5.7 | 4.8 |
| 9085271 | Hidalgo | 100 | 5.9 | 4.6 |
| 9085233 | Andrews | 60 | 7.5 | 5.6 |
| 9076974 | Lubbock | 100 | 7.5 | 4.4 |
| 9085283 | Calhoun | 100 | 4.5 | 5.0 |
| 9085276 | Starr | 100 | 5.8 | 4.9 |
| 9085291 | Webb | 80 | 6.1 | 5.0 |
| 9085264 | DeWitt | 100 | 5.3 | 5.3 |
| 9085260 | San Patricio | 100 | 3.8 | 5.1 |
| **Means** | **All Counties** | **95** | **6.1** | **4.9** |

*Ocular estimate (1 = Best)

***Advanced Evaluations**:* Advanced evaluation plots were established in 2002 at both the PMC in Kingsville and the Texas Agricultural Experiment Station (TAES) in Beeville. The Advanced evaluation plots at the PMC consisted of accessions 9085300, 9085301, and 9085313. The advanced evaluation plots at Beeville consisted of accessions 9085301, 9085313, and 9085316. Accessions 9085301 and 9085313 had the best field performance on these plots at the PMC during 2002 and 2003 (Table 3). Dr. Bill Ocumpaugh ranked 9085316 and 9085313 as his top two accessions at Beeville in 2002. Seed production rankings appear to favor accession 9085316 (Table 4). However, it became apparent upon looking at the growth form, harvest time and percent active germination that accession 9085316 was an intermediate form between hooded and shortspike windmillgrass. It was therefore eliminated from the hooded evaluations. The goal was a hooded windmillgrass that would have high active germination (>90%), have a high 2-day germination, produce multiple seed crops, and produce a satisfactory seed yield.

**Table 3. Hooded Windmillgrass Advanced Evaluation in 2003 at Kingsville, Texas**

| Accession Number | Growth Habit | Percent Survival | Plant Vigor* | Foliage Density* | Seed Production* | Seed Shatter* |
|---|---|---|---|---|---|---|
| 300 | Bunch | 100 | 5.4 | 5.4 | 5.5 | 5.0 |
| 301 | Bunch | 100 | 5.0 | 5.2 | 4.4 | 5.0 |
| 313 | Very Spreading | 100 | 5.3 | 4.6 | 6.8 | 5.0 |

*Ocular estimate (1 = Best)

**Table 4. Hooded Windmillgrass Seed Harvest and Germination from Beeville, Texas in 2003.**

| Accession Number | Total Grams Harvested | 2 Day Germination | Total Germination |
|---|---|---|---|
| 300 | 65 | 93% | 96% |
| 301 | 118 | 76% | 97% |
| 313 | 97 | 87% | 93% |
| 316 | 318 | 56% | 70% |

- 12 hours dark 20°C (68°F) / 12 hours light 30°C (86°F).

Initial seed germination results indicated low germination from harvested seed at the PMC (ATR, 2001). In order to understand the cause of the low germination results from harvested seed, samples of the 2002 harvest from accession 9085313 was sent to two seed labs. Hulsey Seed Lab got 91% germination and Giddings TDA Seed Lab got 24% germination. Upon further investigation it was discovered that the majority of the harvested seed did not contain filled seed. Germination tests previously had been run on spikelets (apparently mostly empty), not bare caryopsis. Seed was collected from each plant of the advanced evaluation plots at Beeville in 2003. This harvest was tested in 2004 (Table 4). All of the accessions appear to have good

germination. Hooded windmillgrass appears to have a very high active germination (>90%) whereas shortspike windmillgrass will have an active germination of 60-70% and 20-30% dormant seed.

A field emergence study was established in May 2004 on a Victoria clay soil at the PMC. Ten by twenty foot flat plots were seeded at a rate of 20 PLS/ $ft^2$ and replicated three times for accessions 9085260, 9085283 and 9085313. These plots were not irrigated. Evaluation of these plots in November of 2004 (Table 5) indicated that accession 9085313 produced from 15 to 35% foliar cover.

**Table 5. Windmillgrass Field Emergence Evaluation in 2004 at Kingsville, Texas**

| Accession Number | Rep | % Cover | Plant Vigor* | Foliage Density* | Foliage Production* | Uniformity* | Development Stage |
|---|---|---|---|---|---|---|---|
| 260 | 1 | 50 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 260 | 2 | 60 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 260 | 3 | 70 | 2.0 | 2.0 | 2.0 | 2.0 | Seed |
| 283 | 1 | 35 | 4.0 | 4.0 | 4.0 | 4.0 | Seed |
| 283 | 2 | 30 | 5.0 | 5.0 | 5.0 | 5.0 | Seed |
| 283 | 3 | 70 | 3.0 | 3.0 | 3.0 | 3.0 | Seed |
| 313 | 1 | 15 | 6.0 | 6.0 | 6.0 | 6.0 | Seed |
| 313 | 2 | 35 | 5.0 | 6.0 | 6.0 | 5.0 | Seed |
| 313 | 3 | 15 | 6.0 | 6.0 | 6.0 | 6.0 | Seed |

*Ocular estimate (1= Best)

***Seed Production***: Average annual seed yields of Mariah Germplasm hooded windmillgrass at Kingsville have been 225 pounds per acre (252 kg $ha^{-1}$) (Table 6).

Indeterminate seed maturity is a factor that may influence economical seed yields of hooded windmillgrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Beeville, Texas ranged from 1.5 % to 3.7 % in 2003 (Table 7) and from 2.9% to 5.7% from an early May harvest in 2003 from Kingsville, Texas (Table 8). However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from hooded windmillgrass, accession 9085313, for both month of harvest as well as location shows a large variability in percentage of seed fill (Table 9 and 10). Therefore, location and ability to irrigate may dictate where seed production plantings of windmillgrass can be most economically grown.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a combine at the PMC in Kingsville and then run through a *Westrup Laboratory* brush machine (used for

polishing, hulling or scarifing seed), hammermill, and tabletop C*lipper* seed cleaner produced 95% pure seed.

**Table 6. Seed Attributes for Hooded Windmillgrass Harvested in Kingsville**

| Acc # | Year Harvested | Harvest Weight (lb/acre) | Clean Seed (lb/acre) | Seeds/ lb | Seed Rate (PLS lb/acre) | Available Seed (lb) |
|---|---|---|---|---|---|---|
| 313 | 2004 | 310 | 33 | 2,564,646 | 0.33 | 3.3 |
| 313 | 2005 | 143 | 6 | 2,424,360 | 0.33 | 0.6 |
| 301 | 2005 | 423 | 26 | 2,899,244 | 0.33 | 1 |

**Table 7. Seed Fill Percentages from Windmillgrass Harvest in 2003 from Beeville, Texas**

| Species | Acc# | Harvest Weight (grams) | Total Grams Clean | Seeds/ Gram | Germ Average | Seed-Fill |
|---|---|---|---|---|---|---|
| Hooded | 300 | 645 | 6 | 4257 | 96% | 9.5% |
| Hooded | 301 | 118 | 9 | 6386 | 97% | 8.0% |
| Hooded | 313 | 97 | 5 | 5649 | 93% | 5.8% |
| Hooded | 316 | 318 | 11 | 6211 | 70% | 3.5% |

**Table 8. Seed Fill Percentages from Windmillgrass Harvest on May 21, 2003 from Kingsville, Texas**

| Species | Acc# | Harvest Weight (grams) | Total Grams Clean | Seeds/ Gram | Germ Average | Seed-Fill |
|---|---|---|---|---|---|---|
| Hooded | 300 | 331 | 16 | 4539 | 86% | 5% |
| Hooded | 301 | 444 | 21 | 6843 | 90% | 5% |
| Hooded | 313 | 83 | 4 | 5340 | 94% | 5% |
| Hooded | 316 | 100 | 5 | 5447 | 83% | 5% |

**Table 9. Seed Fill Percentages from Hooded Windmillgrass, Accession 313 Harvested in 2004 at Kingsville, Texas**

| Date Harvested | Percent Filled-Seed | | | Average Filled-Seed |
|---|---|---|---|---|
| | Rep 1 | Rep 2 | Rep 3 | |
| 9/21/2004 | 23 | 29 | 26 | 26% |
| 8/25/2005 | 10 | 7 | 8 | 8% |
| 11/08/2005 | 33 | 26 | 30 | 30% |

**Table 10. Seed-Fill Percentages from Hooded Windmillgrass, Accession 313 Harvested at Different Locations and Different Years.**

| Location | Percent Filled Seed by Year | | |
|---|---|---|---|
| | 2003 | 2004 | 2005 |
| Kingsville | 7 | 15 | 8 |
| Beeville | 11 | 19 | - |
| Knox City | - | 15 | 42 |

**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 Mariah Germplasm hooded windmillgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that hooded windmillgrass 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies. It will also provide a native alternative to planting exotics species on highway right of ways.

**Conservation Use:** Mariah Germplasm hooded windmillgrass will provide a new native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has high active germination (>90%), has a high 2-day germination, and produces multiple seed crops. These species characteristics, along with its preferred adaptation to central and western portions of Texas, make it a good complimentary species with Kika260 shortspike windmillgrass.

**Area of Adaptation:** Mariah Germplasm hooded windmillgrass is well adapted for use in the southern and central portions of Texas, coinciding with MLRA 83 (Rio Grande Plain), MLRA 78 (Central Rolling Red Plains), MLRA 80 (Central Prairies), MLRA 81 (Edwards Plateau), MLRA 82 (Texas Central Basin) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. Existing test sites in Texas include Knox City and Nacogdoches. Additional sites will be planted in 2006 in Stephenville, TX, Oklahoma, Louisiana, and New Mexico.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

**References:**


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Simpson, G. M. 1990. Seed Dormancy in Grasses. Cambridge University Press, Cambridge, UK.


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**Signatures for release of:**

**Mariah Germplasm hooded windmillgrass (*Chloris cucullata* Bisch.)**

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John W. Mueller — Acting — SEP 01 2006

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

Mark A. Hussey — 8-23-2006

Texas Agricultural Experiment Station
College Station, Texas

Date

Fred Bryant — 9/8/06

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Date

Robert T Escheman — 7-18-06

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Hooded Windmillgrass (*Chloris cucullata*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika313 Hooded Windmillgrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: lead is USDA-NRCS (see back)
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

**PLANT MATERIALS RELEASE PROPOSAL**

Date: **18 May 2006**

1. Crop: **Hooded windmillgrass (*Chloris cucullata* Bisch.)**
   Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika313 hooded windmillgrass**

3. Designation or name in development stages: **9085313 or 313**

4. Primary features or advantages:

   - **Native to and adapted to southern Texas**
   - **Moderately stoloniferous**
   - **Rapid & good germination (>90%) and good seedling vigor**
   - **Very high 3-day germination**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **50 PLS lbs by November 2006**

7. Proposed seed distribution:

Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service.

There are no restrictions with regard to geographic area of certified seed production. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

| Breeders and Scientists – Date | Unit Heads – Date |
|---|---|
| C R Crumpacker 5-26-06 | Bobby R. Eddleman 5-30-06 |

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
SOUTH TEXAS NATIVES
KINGSVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. "KIKA" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

And

TEXAS AGRILIFE RESEARCH STATION
BEEVILLE, TEXAS

# NOTICE OF RELEASE OF MAVERICK GERMPLASM PINK PAPPUSGRASS SELECTED PLANT MATERIAL

Texas A&M University-Kingsville, Caesar Kleberg Wildlife Research Institute, *South Texas Natives*, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), E."Kika" de la Garza Plant Materials Center and the Texas AgriLife Research Station at Beeville, Texas announce the release of a selected plant material of pink pappusgrass (*Pappophorum bicolor* E. Fourn.) for the South Texas Ecoregion.

This plant will be referred to as Maverick Germplasm pink pappusgrass, and is released as a selected plant material class of certified seed (natural track). Maverick Germplasm was tested under the USDA NRCS accession numbers 9090676, 9089079, 9090405, 9085324, 9088912, 9090481, and 9090520. Seed of the Maverick Germplasm pink pappusgrass release will be identified by USDA NRCS accession number 9093444.

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted pink pappusgrass. The potential for immediate use is high, especially for upland wildlife plantings, highway rights of way and for range seeding mixes.

## *A. Proposed Variety Name and Temporary Designation:*

MAVERICK GERMPLASM PINK PAPPUSGRASS

## *B. Family, kind, genus and species:*

Family: Poaceae

Tribe: Pappophoreae

Kind: pink pappusgrass

Genus and species: *Pappophorum bicolor* E. Fourn.

***C. Origin and breeding history of the variety:***

**Collection Site Information:** Accession 9090676 was collected by Forrest Smith and Cody Lawson on June 26, 2003 from native plants located at the San Pedro Ranch in Maverick County, Texas at 28°13' 59" N. latitude and 100°07' 38" W. longitude (MLRA 83). Soil type of the collection site is Jimenez gravelly loam (USDA NRCS 2009).

Accession 9089079 was collected by Forrest Smith and Cody Lawson on August 11, 2002 from native plants located at the Cerrito Prieto Ranch in Webb County, Texas at 27° 56' 20" N. latitude and 99° 25' 44" W. longitude (MLRA 83). Soil type of the collection site is Moglia clay loam (USDA NRCS 2009).

Accession 9090405 was collected by Forrest Smith and Paula Maywald on December 18, 2002 from native plants located at the Anaconcho Ranch in Kinney County, Texas at 29° 10' 00" N. latitude and 100° 15' 26" W. longitude (MLRA 83). Soil type of the collection site is Ector stony clay loam (USDA NRCS 2009).

Accession 9085324 was collected by John Lloyd-Reilley on July 14, 2000 from native plants located in Uvalde County, Texas (MLRA 83). Soil type of the collection site was reported to be a silty clay loam.

Accession 9088912 was collected by Forrest Smith and Cody Lawson on August 15, 2002 from native plants located at the Piloncillo Ranch in Dimmit County, Texas at 28° 16' 09" N. latitude and 99° 33' 24" W. longitude (MLRA 83). Soil type of the collection site is Brundage fine sandy loam (USDA NRCS 2009).

Accession 9090481 was collected by Forrest Smith, Cody Lawson, and Poncho Ortega on January 8, 2003 from native plants located at the Bentsen Ranch in Starr County, Texas at 26° 35' 59" N. latitude and 98° 38' 55" W. longitude (MLRA 83). Soil type of the collection site is McAllen fine sandy loam (USDA NRCS 2009).

Accession 9090520 was collected by Forrest Smith, Cody Lawson, and Keith Pawelek on June 3, 2003 from native plants located at the Temple Ranch in Duval County, Texas at 27° 57' 56" N. latitude and 98° 26' 30" W. longitude (MLRA 83). Soil type of the collection site is Pernitas fine sandy loam (USDA NRCS 2009).

**Breeding history:** Plants evaluated in all trials were grown from the original seed collection. Breeder seed of each of the seven accessions was also grown from isolated increase plots of the original seed collection. All seed increase plots were grown in isolation from other *Pappophorum* accessions, and wild populations of *Pappophorum.* No intentional breeding, selection or genetic manipulation has been carried out on these

accessions. Combination of accessions for release should have no effect on the genetic makeup of the release, as pink pappusgrass is thought to be an apomictic or self-pollinated species. Each accession in the release should maintain the genetic integrity of the parent population. Plant stature and seed maturation are similar among the selected accessions.

***D. Objective description of the variety:***

**Description:**

Pink pappusgrass is a perrenial grass, similar in vegetative characteristics to *P. vaginatum.* The culms are 30-80 (-100) cm. tall, stiffly erect or somewhat geniculate below, and glabrous. Sheaths have a tuft of long hairs on either side of collar, and the hairs are deciduous with age. The ligule is a ring of short hairs, but base of blade immediately above ligule has hairs 2-4 mm. long. The blades are flat or involute, scabrous on adaxial surface above base, and smooth on the adaxial surface, 10-20 (-30) cm. long and 1.5-5 mm. broad. Panicles are tightly or loosely contracted, most frequently with short but somewhat erect-spreading branches, pink or purple-tinged at maturity, mostly 12-20 cm. long. Spikelets are short pediceled, appressed, 6-8 mm. long with 2-3 perfect florets and 2 reduced florets above. Glumes are broad, glabrous, acute or minutely notched and mucronate at apex, usually 3-4 mm. long. Lemmas have a broad, firm, rounded, many nerved body, and are pubescent on the midnerve and margins from the base to middle, dissected into 11-15 awns of irregular lengths, the longest 2.5-5 mm. long. The body of lower lemmas is 3-4 mm. long. Paleas are slightly longer than lemma bodies, 2-nerved but tapering to an acute or acuminate apex. Rudimentary florets are similar to perfect ones, but smaller. Chromosome number is reported as 2n=100 (Reeder and Toolin 1989). Pink pappusgrass flowers from April through November (Gould 1975). Cleaned seed of pink pappusgrass has an average of 322,400 seeds per pound.

Pink pappusgrass exhibits a self-pollinated mode of reproduction. We have not observed off types or characteristics deviant from the parent population in three generations of propagation. A release of a similar species, *Pappophorum vaginatum,* from Arizona, Pima Germplasm Pima pappusgrass, is also assumed to be self-pollinated or apomictic (Garner et al. 2006). Within accessions, plant morphology and phenology are identical, further supporting the assumption of apomictic reproductive biology. However, without conclusive knowledge that this species is apomictic, we have increased each of the seven accessions in isolation prior to blending as Maverick Germplasm to insure inclusion of genetic diversity representative of the source populations.

**Potential Uses:** Maverick Germplasm pink pappusgrass is recommended for upland wildlife, highway rights of way, and range plantings.

## *E. Evidence*

### Method of Breeding and Selection:

### *Initial Evaluation*

As part of an effort to collect, evaluate, and release germplasms of a variety of plants native to South Texas, personnel from *South Texas Natives* obtained seed of pink and whiplash pappusgrasses from 70 field locations in South Texas from 2001-2004. These species of *Pappophorum* were selected for evaluation of potential use in revegetation plantings on rangelands and highway rights of way, and for use in upland wildlife habitat plantings. Pink and whiplash pappusgrass have considerable overlap in range and habit, and often grow together (Reeder 2008). Of the 70 collections, 55 were determined to be pink pappusgrass, six whiplash pappusgrass, and nine a mixture of the two species. A decision was made to evaluate all 70 accessions concurrently because of the similarity of growth habits, habitat of origin, range of occurrence, and breeding biology (assumed apomictic), despite the two species being heterospecific.

In December 2004, all 70 collections were seeded in greenhouse flats to produce transplants for evaluation. Two accessions had 0% germination in this planting, and were eliminated from consideration. In 2005, transplants of the 68 remaining accessions were planted in a randomized, complete block design with 2-10 plant replications of each accession at three locations (Texas AgriLife Research Station (TARS) Uvalde (Uvalde County), Rio Farms (Hidalgo County), and Rancho Blanco (Webb County)). An additional replication was also planted at the USDA NRCS E. "Kika" De La Garza Plant Materials Center (Kleberg County); this planting consisted of paired row planting of 50 plants of each accession in a complete block design.

Accessions at each location were evaluated monthly throughout the growing season in 2005 under fully irrigated conditions and bi-monthly under rain-fed conditions in 2006. Data was collected on important traits for commercial production and ecological function including: survival, plant vigor, foliage density, uniformity, forage (biomass) production, seed production, and plant height. Each replication of each accession was given a rank of 1 to 9 (1 best, 9 worst) based on visual observation of each characteristic at the given evaluation. Data from each evaluation year was pooled, and mean performance in each category by year was used for selection of superior accessions. In 2005, under fully irrigated conditions, seed was collected from each accession at each location for testing percent active seed germination under favorable production conditions. Accessions were not evaluated in 2006 at TARS-Uvalde because of severe drought conditions, as no appreciable plant growth occurred.

### *Advanced Evaluation*

Following evaluation in 2005 and 2006, 11 accessions were selected for advanced evaluation and initial seed increase. Of these 11 accessions, three were whiplash pappusgrass, and eight pink pappusgrass. One of the 8 selections of pink pappusgrass had no original seed left, and was removed from consideration, leaving seven selected

accessions. Accessions were chosen using a combination of data collected from each evaluation site and active seed germination test results. Accessions that showed greater than mean performance in the greatest number of evaluation categories at all locations were selected. Transplants of these 10 accessions were grown form the original seed collections and planted for isolated seed increase and evaluation of harvest characteristics, seed set and timing, and adaptability to agronomic production in 2007 at Rio Farms. Additional advanced evaluation plots containing 250 plants per accession were planted at the STN Farm, near Kingsville, Texas in the spring of 2008. All accessions performed well in this evaluation, and similar growth rates and seed maturity dates were observed. Similar seed maturation dates and seedhead stature of the selected accessions have been confirmed at four growing locations.

***Selection***

All 10 accessions planted for advanced evaluation showed similar phenology in the onset of flowering, seed-set, and seed maturity. Each accession was harvested successfully using a Flail-Vac seed harvester, and had excellent survival in rowed, fully irrigated setting under intense cultivation and herbicide exposure. The three whiplash pappusgrass accessions were designated for release as Webb Germplasm whiplash pappusgrass, and the seven pink pappusgrass accessions as Maverick Germplasm pink pappusgrass.

***Seeding trials***

Numerous seeding trials have documented good establishment of pappusgrasses from seed in south Texas. Plantings at the Welder Wildlife Refuge near Sinton, Texas had good establishment from seed >1 year after planting, following a severe drought. These plantings indicated good soil seed life and persistence, an important characteristic for range seed mix components in south Texas. A blend of pink and whiplash pappusgrass seed was also planted as part of a highway right of way seeding demonstration in Kleberg County, Texas. Emergence and persistence of pappusgrass in this planting was also documented following a severe drought.

A composite harvest of seed of pink and whiplash pappusgrass seed from evaluation plots was planted in a native grass seeding trial in 2006 at Rancho Blanco, near Laredo, Texas. Three seeding rates (10, 20, and 30 pure live seeds/ft$^2$) were sown in replicated plots at three times throughout the year (May-spring, August-summer, and November-fall) in areas dominated by the exotic grass buffelgrass *(Pennisetum ciliare)*. All plantings were fully irrigated. These plantings showed that seeding in the fall season was superior for establishment of pappusgrass in south Texas. One year after planting, spring plots had 6% cover, summer plots 15% cover, and fall plots 37% cover. By two years following plantings, spring seeded plots had 1% cover, summer plots 0% cover, and fall plots 22% cover. Seeding rates had no significant effect on cover of pappusgrass in these plantings. Of 12 native grass species planted in these trials, pappusgrass was the 4th most competitive species with the exotic buffelgrass.

A blend of the selected accessions of pappusgrass was planted in a research project in the lower Rio Grande Valley of Texas in March 2008. Pappusgrass seedlings did not emerge until the following October, despite above average rainfall and soil

moisture by mid-June of the planting year. These results concur with observations in our evaluations plots at various locations, and the Rancho Blanco plantings where we have also noted a dramatic increase of volunteer pappusgrass seedlings in the fall.

The recommended seeding rate for pure stands of Maverick Germplasm pink pappusgrass is 3 lbs. pure live seed per acre. Seed coatings (talc based) increase the flowability of seed through standard seed drills. Successful establishment has been obtained in both drill and broadcast plantings.

***Seed Increase***

Seed harvested from the 2007 advanced evaluation plantings was used to establish breeder seed increase fields of each accession selected for release in 2008. Seed harvested from this planting will be blended by a specified range of pure live seed (PLS)/accession, and distributed to interested commercial seed producers.

***Seed Production, Harvest, and Cleaning***

Seed increase plots have been planted on 36" bedded rows, however flat plantings may be possible with frequent weeding. Pink pappusgrass produces seed throughout the growing season, whenever adequate soil moisture is present. Seed is harvested with a Flail-Vac or similar brush-type harvester. The use of slow travel and RPM speeds while harvesting results in relatively clean seed, needing little cleaning or processing. Seed harvested in this manner averages 42% pure live seed. To clean stems and chaff from harvests, a clipper seed cleaner has been used when needed. No attempt has been made to clean caryopsis from the bur or glumes, as seed damage or reductions in seed life are likely to occur.

Common pests of pappusgrass seed include fall armyworms (*Spodoptera* spp.), thrips (*Thrips* spp.), and rice stink bugs (*Oebalus pugnax*). Control of the pests may be necessary in order to produce seed crops in dry years under irrigation. Pappusgrass seed fields should be mowed or burned annually to promote vigorous growth. Deep soil tillage or frequent close cultivation is also recommended to promote seed production. Herbicides containing 2, 4-D, Pendamethelin, Atrazine, and Halosulfuron-methyl are safe for weed control once plants are beyond the seedling growth stage. Established plants (>1 yr. age) have shown excellent tolerance to Glyphosate herbicides; discretion should be used to avoid applications during times of vigorous active growth of pappusgrass stands.

Plantings of pink pappusgrass in north central Texas at 2 locations (Stephenville and Breckenridge, TX) have had good winter survival <2 years after seeding. Long-term persistence of this species for seed production in these areas is unknown.

***F. Area of adaptation***

Based on the distribution of *Pappophorum bicolor,* best performance of Maverick Germplasm will likely be in the Gulf Prairies and Marshes, Rio Grande Plain, and Sand Plains of south Texas. Good performance is likely in the southern portions of the

Edwards Plateau, eastern portion of the Trans Pecos Mountains and Basins eco-regions of Texas, and adjacent portions of northern Mexico, but has not been tested.

***G. Procedure for maintaining stock classes of seed***

Breeder seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service.

***H. Description of how variety is to be constituted, etc.***

Maverick Germplasm pink pappusgrass is released as Selected Texas Native Ecotype. Breeder seed will be made up of equal amounts (by percent PLS, +/-7%) of each of the seven accessions. Breeder seed may contain a maximum of 21% PLS of any one accession and a minimum of 7% PLS of any one accession. Foundation seed is that which is grown from plantings of the Breeder seed blend. Certified seed is that which is grown from plantings of the Foundation seed. Increase using certified seed is prohibited.

***I. Additional restrictions, etc.***

Foundation and certified seed fields have a 7 year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO_X__

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO___

Royalty distribution: A royalty per pound of Certified Pure Live Seed sold will be collected by the Texas Foundation Seed Service, and placed in a project account with discretionary spending authority, requiring approval for expenditures by the *South Texas Natives Coordinator* and Manager of the USDA NRCS E. "Kika" de la Garza Plant Materials Center, for the benefit of native seed development for south Texas.

**Ecological Considerations and Evaluation:** An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that Maverick Germplasm pink pappusgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly because pink pappusgrass 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, will provide a good seed source to upland avian wildlife species and provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Maverick Germplasm pink pappusgrass will provide a native plant species for rangeland planting and wildlife habitat improvement.

**Availability of Plant Materials:** Breeder Seed will be maintained by *South Texas Natives*, Kingsville, Texas. Breeder seed will be available by September 2009. At this time release of the germplasm will be distributed to a single commercial grower.

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## TABLES AND FIGURES

**Table 1.** *Pappophorum* collections evaluated in the development of Webb and Maverick Germplasms.

| Accession | Species | County | Location | Soil type |
|---|---|---|---|---|
| PMT 2593 | *P. bicolor* | Webb | Laredo, TX | |
| PMT 3033 | *P. bicolor* | Dimmit | Carrizo Springs, TX | |
| 9076944 | *P. bicolor* | Jim Wells | Hwy 44 | sandy loam |
| 9085241 | *P. bicolor* | Dimmit | Carrizo Springs, TX | Poteet FSL |
| 9085252 | *P. bicolor* | Dewitt | Hwy 87 R.O.W. | loamy sand |
| 9085257 | *P. bicolor* | Starr | | Catarina clay |
| 9085302 | *P. bicolor* | Duval | JD Lopez ranch | |
| 9085324 | *P. bicolor* | Uvalde | Stichler's house | silty clay loam |
| 9086195 | *P. bicolor* | Zavala | Westwind ranch | |
| 9086196 | *P. bicolor* | Zavala | Westwind ranch | |
| 9086272 | *P. vaginatum* | Atascosa | 74 ranch | sandy loam |
| 9086276 | *P. vaginatum* | Atascosa | Peeler ranch | Loam |
| 9088534 | *P. bicolor* | Zavala | | sandy loam |
| 9088540 | *P. bicolor* | Frio | | Loam |
| 9088567 | *P. bicolor* | Zavala | Westwind ranch | sandy loam |
| 9088620 | *P. bicolor* | Dimmit | Dos Amigos ranch | Loam |
| 9088622 | *P. vaginatum* | Dimmit | Dos Amigos ranch | Loamy |
| 9088627 | *Mix* | Dimmit | Dos Amigos ranch | Loam |
| 9088639 | *P. bicolor* | Dimmit | Dos Amigos ranch | Loam |
| 9088710 | *P. bicolor* | Webb | Old Mines rd | gravel loam |
| 9088715 | *P. vaginatum* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088738 | *P. bicolor* | Jim Hogg | | caliche loam |
| 9088785 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088792 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088793 | *P. bicolor* | Webb | | sandy loam |
| 9088855 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088856 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088858 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088904 | *P. bicolor* | Dimmit | Piloncillo ranch | Loam |
| 9088912 | *P. bicolor* | Dimmit | Piloncillo ranch | sandy loam |
| 9088954 | *P. bicolor* | Frio | Shiner ranch | sandy loam |
| 9088970 | *P. bicolor* | Frio | Shiner ranch | sandy loam |
| 9088982 | *P. bicolor* | Uvalde | FM 1022 | Loam |
| 9088995 | *P. bicolor* | Dimmit | Piloncillo ranch | clay loam |
| 9088999 | *P. bicolor* | LaSalle | 7 C's ranch | clay loam |
| 9089000 | *P. bicolor* | LaSalle | Chaparral WMA | sandy clay loam |
| 9089079 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9089171 | *P. bicolor* | Medina | Co. Rd 5232 | Loam |
| 9089176 | *P. bicolor* | Medina | CR 742 | sandy loam |
| 9089239 | *Mix* | LaSalle | Hwy 624 | Loam |
| 9090329 | *P. vaginatum* | LaSalle | Herradura ranch | Loam |
| 9090405 | *P. bicolor* | Kinney | Anaconcho ranch | clay loam |
| 9090407 | *P. bicolor* | Kinney | Anaconcho ranch | Loam |
| 9090416 | *P. bicolor* | Kinney | Anaconcho ranch | gravel-loam |
| 9090469 | *Mix* | McMullen | NE of Tilden | Clay |
| 9090481 | *P. bicolor* | Starr | Benison ranch | sandy loam |
| 9090500 | *Mix* | Frio | CR 189 | sandy loam |
| 9090518 | *P. bicolor* | Frio | FM 3176 | Loam |
| 9090519 | *P. bicolor* | Medina | FM 1343 | red sandy loam |
| 9090520 | *P. bicolor* | Duval | Temple ranch | loamy sand |

| Accession | *Species* | County | Location | Soil type |
|---|---|---|---|---|
| 9090583 | *P. bicolor* | Frio | Half ranch | sandy loam |
| 9090612 | *P. bicolor* | Maverick | Faith ranch | Loam |
| 9090627 | *P. bicolor* | Dimmit | San Pedro ranch | sandy loam |
| 9090635 | *P. bicolor* | Kinney | Hwy 90 | Clay |
| 9090637 | *P. bicolor* | Kinney | Dolan falls | Clay |
| 9090646 | *P. bicolor* | Kinney | Seminole Can. SP | Loam |
| 9090660 | *P. bicolor* | Maverick | Faith ranch | Loam |
| 9090674 | *P. bicolor* | Dimmit | San Pedro ranch | sandy loam |
| 9090676 | *P. bicolor* | Maverick | San Pedro ranch | Loam |
| 9090700 | *P. bicolor* | Frio | Calvert ranch | sandy clay |
| 9090755 | *P. bicolor* | Frio | Calvert ranch | sandy loam |
| 9091841 | *P. vaginatum* | Zapata | Arroyo Velano | sandy clay loam |
| 9091859 | *P. bicolor* | Zapata | Arroyo Velano | gravelly loam |
| 9091869 | *P. bicolor* | Zapata | Noser ranch | clay loam |
| 9091882 | *P. bicolor* | Dimmit | La Bandera | silty clay |
| 9091885 | *P. bicolor* | Zavala | Chaparrosa ranch | Clay |
| 9091895 | *P. bicolor* | Maverick | Comanche Ranch | gravelly clay |
| 9093175 | *P. bicolor* | Duval | Duval co. ranch | sandy clay loam |
| 9093185 | *P. bicolor* | Zapata | Rafael Flores ranch | loamy sand |
| 9093208 | *P. bicolor* | Zavala | Chaparrosa Ranch | Sandy loam |

**Table 2.** Field plantings of *Pappophorum* collections 2005-2009, during the development of Maverick and Webb Germplasms.

| Date | Location | County | Planting type | # accessions |
|---|---|---|---|---|
| 3/2005-2009 | Rancho Blanco | Webb | Transplant (2 x10) | 68 |
| 4/2005-2008 | TAR Uvalde | Uvalde | Transplant (2x10) | 68 |
| 3/2005-2009 | Rio Farms | Hidalgo | Transplant (2x10) | 68 |
| 2005-2007 | PMC | Kleberg | Transplant (1x50) | 52 |
| 2007-2008 | Bladerunner Farms | Atascosa | Seed (irrigated) | 68 |
| 2006-2009 | Rancho Blanco | Webb | Seed (irrigated) | 68 |
| 2007 | US HWY 77 | Kleberg | Seed | 68 |
| 2006 | Welder Refuge | San Patricio | Seed | 68 |
| 2007 | Rio Farms | Hidalgo | Transplant (1x20) | 10 |
| 2008-2009 | Rio Farms | Hidalgo | Seed increase | 10 |
| 2008 | Taormina WMA | Hidalgo | Seed | 10 |
| 2008 | Turner Seed Co. | Stephens | Seed | 10 |
| 2008 | Pogue Seed Co. | Karnes | Seed | 10 |
| 2007 | TAR Stephenville | Erath | Seed | 10 |

**Table 3.** Comparative difference in evaluation scores of selected and non-selected accessions of pink pappusgrass, across all planting sites and evaluation years.

| Category | Selected Accessions | Non Selected Accessions | Difference (%) |
|---|---|---|---|
| **% survival** | 99.00 | 96.00 | 3.03 |
| **plant vigor*** | 2.69 | 2.84 | 5.58 |
| **foliage density*** | 2.70 | 2.83 | 4.47 |
| **uniformity*** | 2.08 | 2.18 | 4.74 |
| **development stage*** | 1.08 | 1.10 | 0.99 |
| **seed production*** | 2.38 | 2.55 | 7.10 |
| **forage production*** | 2.79 | 2.85 | 2.07 |
| **plant height*** | 2.59 | 2.68 | 3.81 |
| **% active seed germ** | 36.08 | 29.17 | 19.15 |

*Ocular estimates with 1 being the best and 9 being the poorest.

**Figure 1.** Collection, evaluation, and experimental planting sites used in development of Maverick Germplasm pink pappusgrass.

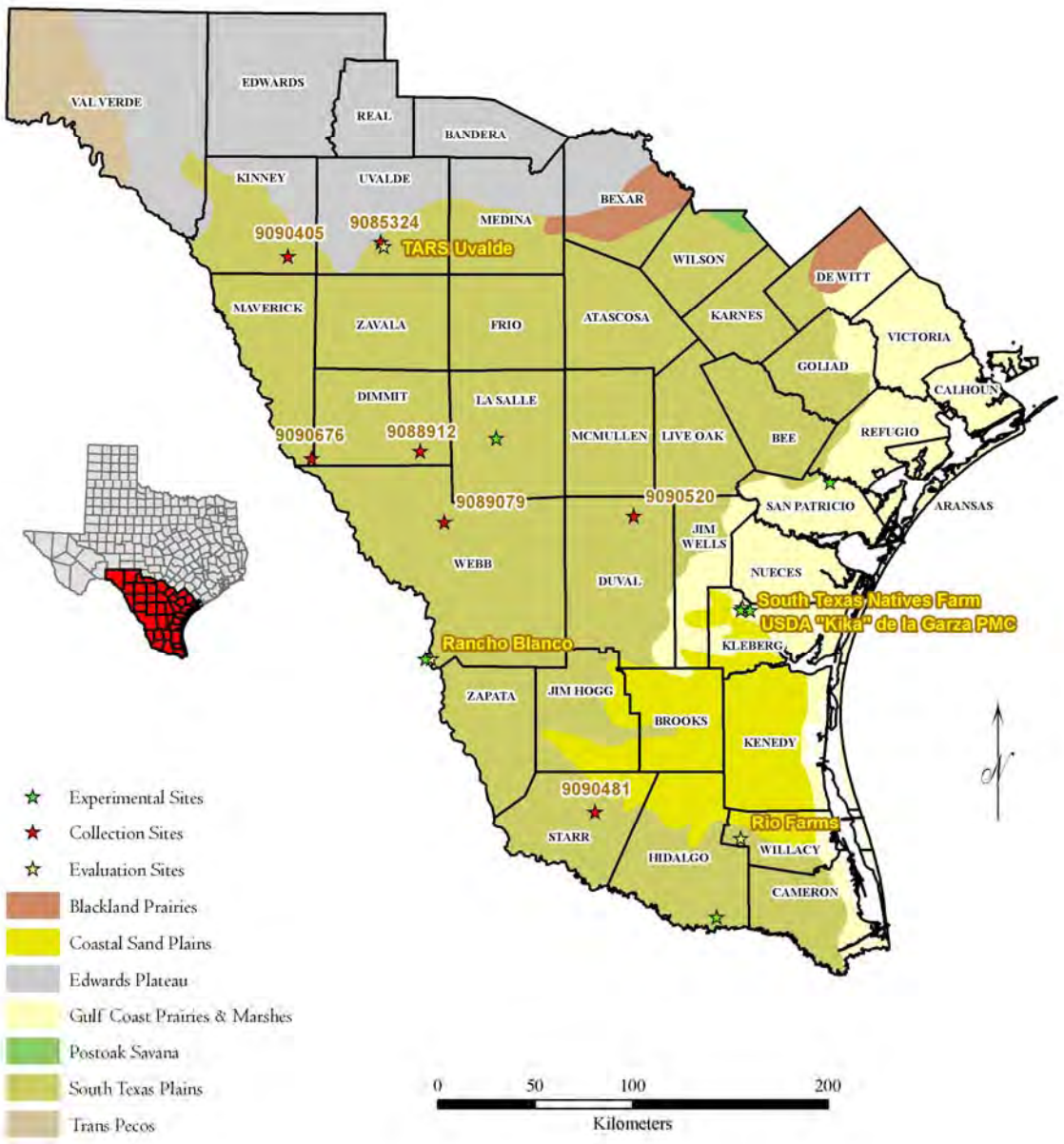

**Figure 2.** Seed increase field of accession 9090481 pink pappusgrass, a component of Maverick Germplasm, 2008 at Rio Farms.

**Figure 3.** Representative plant of Maverick Germplasm pink pappusgrass.

# MARKETING PLAN

## MAVERICK GERMPLASM PINK PAPPUSGRASS

**January 2010**

Distribute breeder seed to commercial grower

**January 2010**

Finalize and obtain approval for release, and print supporting documents (fact sheet & brochure)

**Spring/Summer 2010**

Draft press release and host celebration of release once seed is commercially available to consumers.

Staff information booths at 2 landowner and consumer oriented symposiums or conferences in south Texas

**Winter 2011**

Present results and overview of development process at International Meeting of the Society for Range Management

Publish “notice of release” article in Native Plant Journal

## SEED AVAILABILITY

## MAVERICK GERMPLASM PINK PAPPUSGRASS

As of September 31, 2009, 75 lbs. of pure live seed of Maverick Germplasm is available for distribution to a commercial grower. This will plant approximately 25 acres of commercial production fields by direct seeding. Additional seed for establishment of transplants and renovation of breeder lines comprising the blend is in cold storage at the E. “Kika” de la Garza Plant Materials Center.

## SEED PRODUCTION ESTIMATE/PLAN

## MAVERICK GERMPLASM PINK PAPPUSGRASS

As of August 1, 2009, 0.34 acre (5,000 transplants) isolated seed increase fields of each of the 7 accessions that comprise the blend are established at Rio Farms, Inc. near Monte Alto, Texas. Total production acreage for the blend components is 2.41 acres, which if harvested 3x annually yields an average of 75 pounds pure live seed/year. This production level will be sustained until November 2011, when fields will be reduced to 0.10 acres each, or removed if commercial production has reached an acceptable level, and seed for establishment of at least 50 acres of commercial seed fields is in cold storage. An additional nursery plot containing 250 plants of each of the 7 selected accessions planted in concurrent rows is established at the *South Texas Natives* Irrigated Farm near Kingsville, Texas. This plot is used to produce seed for research and demonstration plantings. Hand harvests of the isolated fields will be obtained annually and stored at the E. "Kika" de la Garza Plant Materials Center in Kingsville to provide material for re-establishment of the germplasm if fields are lost.

**Signatures for release of:**

**Maverick Germplasm pink pappusgrass**

***Pappophorum bicolor* E. Fourn.**

Fred C Bryant — 8/17/10

Dr. Fred C. Bryant
Leroy Denman, Jr. Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

Date

George Allen Rasmussen — 8/17/10

Dr. George Allen Rasmussen
Dean
Dick and Mary Lewis Kleberg College of
Agriculture, Natural Resources and Human Sciences
Texas A&M University-Kingsville
Kingsville, TX

Date

Bill T McCutchen — 8/18/10

Dr. Bill McCutchen
Associate Director
Texas AgriLife Research
College Station, TX

Date

Donald W Gohmert — 8/27/10

Don Gohmert
Texas State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

for — 9-21-2010

Mike Hubbs
Director
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
SOUTH TEXAS NATIVES
KINGSVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. KIKA DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

And

TEXAS AGRILIFE RESEARCH STATION
BEEVILLE, TEXAS

# NOTICE OF RELEASE OF WEBB GERMPLASM WHIPLASH PAPPUSGRASS SELECTED PLANT MATERIAL

Texas A&M University-Kingsville, Caesar Kleberg Wildlife Research Institute, *South Texas Natives*, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), E. "Kika" de la Garza Plant Materials Center, and Texas AgriLife Research Station at Beeville, Texas announce the release of a selected plant material of whiplash pappusgrass (*Pappophorum vaginatum* Buckley) for the South Texas Ecoregion.

This plant will be referred to as Webb Germplasm whiplash pappusgrass, and is released as a selected plant material class of certified seed (natural track). Webb Germplasm was tested under the accession numbers 9088622, 9088715, and 9091841. Seed of the Webb Germplasm whiplash pappusgrass release will be identified by USDA NRCS accession number 9093443.

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted whiplash pappusgrass. The potential for immediate use is high, especially for upland wildlife plantings, highway rights of way, and for range seeding mixes.

## *A. Proposed Variety Name and Temporary Designation:*

WEBB GERMPLASM WHIPLASH PAPPUSGRASS

## *B. Family, kind, genus and species:*

Family: Poaceae

Tribe: Pappophoreae

Kind: whiplash pappusgrass

Genus and species: *Pappophorum vaginatum* Buckley

***C. Origin and breeding history of the variety:***

**Collection Site Information:** Accession 9088662 was collected by Forrest Smith, Cody Lawson, and Jimmy Rutledge on May 15, 2002 from native plants located at the Dos Amigos Ranch in Dimmit County, Texas at 28° 26' 24" N. latitude and 99° 51' 32" W. longitude (MLRA 83). Soil type of the collection site is Brundage fine sandy loam (USDA NRCS 2009).

Accession 9088715 was collected by Forrest Smith and Cody Lawson on June 12, 2002 from native plants located at the Cerrito Prieto Ranch in Webb County, Texas at 27° 57' 10" N. latitude and 99° 26' 25" W. longitude (MLRA 83). Soil type of the collection site is Copita fine sandy loam (USDA NRCS 2009)

Accession 9091841 was collected by Charity Lawson and Cody Lawson on December 8, 2003 from native plants located at the Arroyo Velano Ranch in Zapata County, Texas at 26° 56' 50" N. latitude and 99° 07' 55" W. longitude (MLRA 83). Soil type of the collection site is Catarina clay (USDA NRCS 2009).

**Breeding history:** Plants evaluated in all trials were grown from the original seed collection. Breeder seed of each of the three accessions was also grown from isolated increase plots of the original seed collection. All seed increase plots were grown in isolation from other *Pappophorum* accessions, and wild populations of *Pappophorum.* No intentional breeding, selection or genetic manipulation has been carried out on these accessions. Combination of accessions should have no effect on the genetic makeup of the release, as whiplash pappusgrass is thought to be an apomictic or self-pollinated species. Each accession in the release should maintain the genetic integrity of the parent population. Plant stature, flowering time, and seed maturation are similar among the selected accessions.

***D. Objective description of the variety:***

**Description:**

Whiplash pappusgrass is perennial bunchgrass, similar in vegetative characters to *P. bicolor*. Culms are 30-80 (-100) cm. tall, stiffly erect, or somewhat geniculate below and glabrous. Sheaths have a tuft of long hairs on either side of collar, and the hairs deciduous in age. Ligule is a ring of short hairs, the base of blade immediately above the ligule has hairs 2-4 mm long. Blades are flat or involute, scabrous on the adaxial surface, 10-20 (-30) cm. long and 1.5-5 mm. broad. Panicles are narrow, tightly contracted, whitish or tawny, only rarely with a slight purple tinge, mostly 12-25 cm. long and

averaging longer than in *P. bicolor*. Spikelets with 1, rarely 2, perfect florets and 2 reduced florets above. The lemma of lower floret has a body 2-3 mm. long and awns to 5 mm. long. Chromosome number is 2n=40, or 60 (Reeder and Toolin 1989). Whiplash pappusgrass flowers from April through November. (Gould 1975). Cleaned seed of whiplash pappusgrass contains approximately 436,250 seeds per pound.

Whiplash pappusgrass exhibits a self-pollinated mode of reproduction. We have not observed off types or characteristics deviant from the parent population in 3 generations of propagation. A release of *Pappophorum vaginatum* from Arizona, Pima Germplasm Pima pappusgrass, is also assumed to be self-pollinated or apomictic (Garner et al. 2006). Within accessions, plant morphology and phenology are identical.

**Potential Uses:** Webb germplasm whiplash pappusgrass is recommended for upland wildlife, highway rights of way, and range plantings.

***E. Evidence***

**Method of Breeding and Selection:**

***Initial Evaluation***

As part of an effort to collect, evaluate, and release germplasms of a variety of plants native to South Texas, personnel from *South Texas Natives* obtained seed of pink and whiplash pappusgrass from 70 field locations in South Texas from 2001-2004. These species of *Pappophorum* were selected for evaluation of potential use in revegetation plantings on rangelands and highway rights of way, and for use in upland wildlife habitat plantings. Pink and whiplash pappusgrass have considerable overlap in range and habit, and often grow together (Reeder 2008). Of the 70 collections, 55 were determined to be pink pappusgrass, 6 whiplash pappusgrass, and 9 a mixture of the two species. A decision was made to evaluate all 70 accessions collectively, because of the similarity of growth habits, habitat of origin, range of occurrence, and breeding biology (assumed apomictic), despite the 2 species being heterospecific. (Table 1)

In December 2004, all 70 collections were seeded in greenhouse flats to produce transplants for evaluation. Two accessions had 0% germination in this planting, and were eliminated from consideration. In 2005, transplants of the 68 remaining accessions were planted in a randomized, complete block design with 2-10 plant replications of each accession at 3 separate locations (Texas Agrilife Research Station Uvalde (Uvalde County), Rio Farms (Hidalgo County), and Rancho Blanco (Webb County)). An additional replication was also planted at the E. Kika De La Garza Plant Materials Center (Kleberg County); this planting consisted of paired row planting of 50 plants of each accession in a complete block design.

Accessions at each location were evaluated monthly throughout the growing season in 2005 under fully irrigated conditions and bi-monthly under rain-fed conditions in 2006. Data was collected on important traits for commercial production and ecological function including: survival, plant vigor, foliage density, uniformity, forage (biomass) production, seed production, and plant height. Each replication of each accession was

given a rank of 1 to 9 (1 best, 9 worst) based on visual observation of each characteristic at the given evaluation. Data from each evaluation year was pooled, and mean performance in each category by year used for selection of superior accessions. In 2005, under fully irrigated conditions, seed was collected from each accession at each location for testing of percent active seed germination under favorable production conditions. Accessions were not evaluated in 2006 at TAES-Uvalde because of severe drought conditions, as no appreciable plant growth occurred.

***Advanced Evaluation***

Following evaluation in 2005 and 2006, 10 accessions were selected for advanced evaluation and initial seed increase. Of these 10 accessions, 3 were whiplash pappusgrass, and 7 pink pappusgrass. Selection was made using a combination of data collected from each site and active seed germination. Accessions that showed greater than mean performance in the greatest number of evaluation categories at all locations were selected. Transplants of these 10 accessions were grown from the original seed collections for isolated seed increase and evaluation of harvest characteristics, seed set and timing, and adaptability to agronomic production in 2007 at Rio Farms. Additional advanced evaluation plots containing 250 plants per accession were planted at the STN Farm, near Kingsville, Texas in the spring of 2008. All accessions performed well in this evaluation, and similar growth rates and seed maturity dates observed. Similar seed maturation dates and seedhead stature of the selected accessions have been confirmed at 4 growing locations.

***Selection***

All 10 accessions planted for advanced evaluation showed similar phenology in the onset of flowering, set seed, and seed maturity. Each accession was harvested successfully using a Flail-Vac seed harvester, and had excellent survival in a rowed, fully irrigated setting under intense cultivation and herbicide exposure. The 3 whiplash pappusgrass accessions were subsequently designated for release as Webb Germplasm whiplash pappusgrass, and the 7 pink pappusgrass accessions as Maverick Germplasm pink pappusgrass.

***Seed Increase***

Seed harvested from the 2007 isolated advanced evaluation plantings was used to establish breeder seed increase fields of the accessions selected for release in 2008. Seed harvested from these planting will be blended by equal amounts of pure live seed (PLS) and distributed to interested commercial seed producers.

***Seeding trials***

Numerous seeding trials have documented good establishment of pappusgrasses from seed in south Texas. Plantings at the Welder Wildlife Refuge near Sinton, Texas had good establishment from seed >1 year after planting, following a severe drought. These

plantings indicated good soil seed life and persistence, an important characteristic for range seed mix components in south Texas. A blend of pink and whiplash pappusgrass seed was also planted as part of a highway right of way seeding demonstration in Kleberg County, Texas. Emergence and persistence of pappusgrass in this planting was also documented following a severe drought.

A composite harvest of seed of pink and whiplash pappusgrass seed from evaluation plots was planted in a native grass seeding trial in 2006 at Rancho Blanco, near Laredo, Texas. Three seeding rates (10, 20, and 30 pure live seeds/ft²) were sown in replicated plots at three times throughout the year (May-spring, August-summer, and November-fall) in areas dominated by the exotic grass buffelgrass. All plantings were fully irrigated. These plantings showed that fall seeding was the superior season for establishment of pappusgrass from seed in south Texas. One year after planting, spring plots had 6% cover, summer plots 16% cover, and fall plots 37% cover. By two years following plantings, spring seeded plots had 1% cover, summer plots 0% cover, and fall plots 22% cover. Seeding rates had no significant effect on cover of pappusgrass in these plantings. Of 12 native grass species planted in these trials, pappusgrass was the 4th most competitive species with buffelgrass.

A blend of the selected accessions of pappusgrass was planted in a research project in the lower Rio Grande Valley of Texas in March 2008. Pappusgrass seedlings did not emerge until October, despite above average rainfall and soil moisture by mid-June of the planting year. These results concur with observations in our evaluations plots at various locations, and the Rancho Blanco plantings where we have also noted a dramatic increase of volunteer pappusgrass seedlings in the fall.

The recommended seeding rate for pure stands of Maverick Germplasm pink pappusgrass is 3 lbs. pure live seed per acre. Seed coatings (talc based) increase the flowability of seed through standard seed drills. Successful establishment has been obtained in both drill and broadcast plantings.

***Seed Production, Harvest, and Cleaning***

Seed increase plots have been planted on 36" bedded rows, however flat plantings may be possible with frequent weeding. Whiplash pappusgrass produces seed throughout the growing season, whenever adequate soil moisture is present. Seed is harvested with a Flail-Vac or similar brush-type harvester. The use of slow travel and RPM speeds while harvesting results in relatively clean seed, needing little cleaning or processing. Seed harvested in this manner averages 54% pure lives seed. To clean stems and chaff from harvests when needed, a clipper seed cleaner has been used. No attempt has been made to clean caryopsis from the bur or glumes, as seed damage or reductions in seed life are likely to occur.

Common pests of pappusgrass seed include fall armyworms (*Spodoptera* spp.), thrips (*Thrips* spp.), and rice stink bugs (*Oebalus pugnax*). Control of the pests may be necessary in order to produce seed crops in dry years under irrigation. Pappusgrass seed fields should be mowed, or burned annually to promote vigorous growth. Deep soil tillage or frequent close cultivation is also recommended to promote seed production. Herbicides containing 2, 4-D, Pendamethelin, Atrazine, and Halosulfuron-methyl are safe for weed control once plants are beyond the seedling growth stage. Established plants

(>1 yr. age) have shown excellent tolerance to Glyphosate herbicides; discretion should be used to avoid applications during times of vigorous active growth of pappusgrass stands.

Plantings of pink pappusgrass in north central Texas at 2 locations have had good winter survival < 2 years after seeding. However, persistence of this species for seed production in these areas is unknown.

***F. Area of adaptation***

Based on the distribution of *Pappophorum vaginatum,* best performance of Webb Germplasm will be in the Gulf Prairies and Marshes, Rio Grande Plain, and sand plains. Good performance in the southern portions of the Edwards Plateau and Blackland prairie, and the eastern portions of the Trans Pecos Mountains and Basins and adjacent portions of northern Mexico is possible but this use has not been tested.

***G. Procedure for maintaining stock classes of seed***

Breeder seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service.

***H. Description of how variety is to be constituted, etc.***

Webb Germplasm whiplash pappusgrass is released as Selected Texas Native Ecotype by *South Texas Natives*. Breeder seed will be made up of equal amounts (by % PLS, +/- 10%) of each of the 3 accession. Breeder seed may contain a maximum of 49% PLS of any one accession and a minimum of 16% PLS of any one accession. Foundation seed is that which is grown from harvest of plantings of the Breeder seed blend. Certified seed is that which is grown from plantings of the Foundation seed. Increase using certified seed is prohibited.

***I. Additional restrictions, etc.***

Foundation and certified seed fields have a 7 year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO_X__

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO___

Royalty distribution: A royalty per pound of Certified Pure Live Seed sold will be collected by the Texas Foundation Seed Service, and placed in a project account with discretionary spending authority, requiring approval for expenditures by the *South Texas Natives Coordinator* and Manager of the USDA NRCS E. "Kika" de la Garza Plant Materials Center, for the benefit of native seed development for south Texas.

**Ecological Considerations and Evaluation:** An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that Webb Germplasm whiplash pappusgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that whiplash pappusgrass 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, will provide a good seed source to upland avian wildlife species and provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Webb whiplash pappusgrass will provide a native plant species for rangeland planting and wildlife habitat improvement.

**Availability of Plant Materials:** Breeder Seed will be maintained by *South Texas Natives*, Kingsville, Texas. At this time release of the germplasm will be limited to a single commercial grower.

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# TABLES AN FIGURES

**Table 1.** *Pappophorum* collections evaluated in the development of Webb and Maverick Germplasms.

| Accession | Species | County | Location | Soil type |
|---|---|---|---|---|
| PMT 2593 | *P. bicolor* | Webb | Laredo, TX | |
| PMT 3033 | *P. bicolor* | Dimmit | Carrizo Springs, TX | |
| 9076944 | *P. bicolor* | Jim Wells | Hwy 44 | sandy loam |
| 9085241 | *P. bicolor* | Dimmit | Carrizo Springs, TX | Poteet FSL |
| 9085252 | *P. bicolor* | Dewitt | Hwy 87 R.O.W. | loamy sand |
| 9085257 | *P. bicolor* | Starr | | Catarina clay |
| 9085302 | *P. bicolor* | Duval | JD Lopez ranch | |
| 9085324 | *P. bicolor* | Uvalde | Stichler's house | silty clay loam |
| 9086195 | *P. bicolor* | Zavala | Westwind ranch | |
| 9086196 | *P. bicolor* | Zavala | Westwind ranch | |
| 9086272 | *P. vaginatum* | Atascosa | 74 ranch | sandy loam |
| 9086276 | *P. vaginatum* | Atascosa | Peeler ranch | Loam |
| 9088534 | *P. bicolor* | Zavala | | sandy loam |
| 9088540 | *P. bicolor* | Frio | | Loam |
| 9088567 | *P. bicolor* | Zavala | Westwind ranch | sandy loam |
| 9088620 | *P. bicolor* | Dimmit | Dos Amigos ranch | Loam |
| 9088622 | *P. vaginatum* | Dimmit | Dos Amigos ranch | Loamy |
| 9088627 | *Mix* | Dimmit | Dos Amigos ranch | Loam |
| 9088639 | *P. bicolor* | Dimmit | Dos Amigos ranch | Loam |
| 9088710 | *P. bicolor* | Webb | Old Mines rd | gravel loam |
| 9088715 | *P. vaginatum* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088738 | *P. bicolor* | Jim Hogg | | caliche loam |
| 9088785 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088792 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9088793 | *P. bicolor* | Webb | | sandy loam |
| 9088855 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088856 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088858 | *Mix* | Webb | 7 C's ranch | Loam |
| 9088904 | *P. bicolor* | Dimmit | Piloncillo ranch | Loam |
| 9088912 | *P. bicolor* | Dimmit | Piloncillo ranch | sandy loam |
| 9088954 | *P. bicolor* | Frio | Shiner ranch | sandy loam |
| 9088970 | *P. bicolor* | Frio | Shiner ranch | sandy loam |
| 9088982 | *P. bicolor* | Uvalde | FM 1022 | Loam |
| 9088995 | *P. bicolor* | Dimmit | Piloncillo ranch | clay loam |
| 9088999 | *P. bicolor* | LaSalle | 7 C's ranch | clay loam |
| 9089000 | *P. bicolor* | LaSalle | Chaparral WMA | sandy clay loam |
| 9089079 | *P. bicolor* | Webb | Cerrito Prieto ranch | sandy loam |
| 9089171 | *P. bicolor* | Medina | Co. Rd 5232 | Loam |
| 9089176 | *P. bicolor* | Medina | CR 742 | sandy loam |
| 9089239 | *Mix* | LaSalle | Hwy 624 | Loam |
| 9090329 | *P. vaginatum* | LaSalle | Herradura ranch | Loam |
| 9090405 | *P. bicolor* | Kinney | Anaconcho ranch | clay loam |
| 9090407 | *P. bicolor* | Kinney | Anaconcho ranch | Loam |
| 9090416 | *P. bicolor* | Kinney | Anaconcho ranch | gravel-loam |
| 9090469 | *Mix* | McMullen | NE of Tilden | Clay |
| 9090481 | *P. bicolor* | Starr | Benison ranch | sandy loam |
| 9090500 | *Mix* | Frio | CR 189 | sandy loam |
| 9090518 | *P. bicolor* | Frio | FM 3176 | Loam |
| 9090519 | *P. bicolor* | Medina | FM 1343 | red sandy loam |
| 9090520 | *P. bicolor* | Duval | Temple ranch | loamy sand |

| Accession | *Species* | County | Location | Soil type |
|---|---|---|---|---|
| 9090583 | *P. bicolor* | Frio | Half ranch | sandy loam |
| 9090612 | *P. bicolor* | Maverick | Faith ranch | Loam |
| 9090627 | *P. bicolor* | Dimmit | San Pedro ranch | sandy loam |
| 9090635 | *P. bicolor* | Kinney | Hwy 90 | Clay |
| 9090637 | *P. bicolor* | Kinney | Dolan falls | Clay |
| 9090646 | *P. bicolor* | Kinney | Seminole Can. SP | Loam |
| 9090660 | *P. bicolor* | Maverick | Faith ranch | Loam |
| 9090674 | *P. bicolor* | Dimmit | San Pedro ranch | sandy loam |
| 9090676 | *P. bicolor* | Maverick | San Pedro ranch | Loam |
| 9090700 | *P. bicolor* | Frio | Calvert ranch | sandy clay |
| 9090755 | *P. bicolor* | Frio | Calvert ranch | sandy loam |
| 9091841 | *P. vaginatum* | Zapata | Arroyo Velano | sandy clay loam |
| 9091859 | *P. bicolor* | Zapata | Arroyo Velano | gravelly loam |
| 9091869 | *P. bicolor* | Zapata | Noser ranch | clay loam |
| 9091882 | *P. bicolor* | Dimmit | La Bandera | silty clay |
| 9091885 | *P. bicolor* | Zavala | Chaparrosa ranch | Clay |
| 9091895 | *P. bicolor* | Maverick | Comanche Ranch | gravelly clay |
| 9093175 | *P. bicolor* | Duval | Duval co. ranch | sandy clay loam |
| 9093185 | *P. bicolor* | Zapata | Rafael Flores ranch | loamy sand |
| 9093208 | *P. bicolor* | Zavala | Chaparrosa Ranch | Sandy loam |

**Table 2.** Field plantings of *Pappophorum* collections, 2005-2009 during the development of Maverick and Webb Germplasms.

| Date | Location | County | Planting type | # accessions |
|---|---|---|---|---|
| 3/2005-2009 | Rancho Blanco | Webb | Transplant (2 x10) | 68 |
| 4/2005-2008 | TAR Uvalde | Uvalde | Transplant (2x10) | 68 |
| 3/2005-2009 | Rio Farms | Hidalgo | Transplant (2x10) | 68 |
| 2005-2007 | PMC | Kleberg | Transplant (1x50) | 52 |
| 2007-2008 | Bladerunner Farms | Atascosa | Seed (irrigated) | 68 |
| 2006-2009 | Rancho Blanco | Webb | Seed (irrigated) | 68 |
| 2007 | US HWY 77 | Kleberg | Seed | 68 |
| 2006 | Welder Refuge | San Patricio | Seed | 68 |
| 2007 | Rio Farms | Hidalgo | Transplant (1x20) | 10 |
| 2008-2009 | Rio Farms | Hidalgo | Seed increase | 10 |
| 2008 | Taormina WMA | Hidalgo | Seed | 10 |
| 2008 | Turner Seed Co. | Stephens | Seed | 10 |
| 2008 | Pogue Seed Co. | Karnes | Seed | 10 |
| 2007 | TAR Stephenville | Erath | Seed | 10 |

**Table 3.** Seeding trial data on plantings of *Pappophorum* selections 2006-2009.

| Planting | % seed mix | % cover 1 year from seeding | % cover 2 years from seeding |
|---|---|---|---|
| Welder Refuge-Summer 2006 | 100 | – | – |
| US HWY 77-Summer 2007 | 1.60 | 0.001 | 0.05 |
| Rancho Blanco-Spring 2007 | 100 | 6.26 | 1.25 |
| Rancho Blanco-Summer 2007 | 100 | 15.42 | 0.00 |
| Rancho Blanco-Fall 2007 | 100 | 37.08 | 22.08 |
| TPWD Spring 2008 | 7.31 | 0.62 | 2.17 |

**Table 4.** Comparative difference in evaluation scores of selected and non-selected accessions of whiplash pappusgrass, across all planting sites and evaluation years.

| Category | Selected Accessions | Non Selected Accessions | Difference (%) |
|---|---|---|---|
| **% survival** | 98.47 | 91.16 | 7.42 |
| **plant vigor*** | 2.88 | 3.48 | 20.92 |
| **foliage density*** | 2.79 | 3.49 | 25.25 |
| **uniformity*** | 2.21 | 2.26 | 2.49 |
| **development stage*** | 1.10 | 1.09 | 0.92 |
| **seed production*** | 2.65 | 3.31 | 24.98 |
| **forage production*** | 2.77 | 3.71 | 33.81 |
| **plant height*** | 2.58 | 3.31 | 28.19 |
| **% active seed germ** | 47.04 | 41.04 | 12.76 |

***Ocular estimates with 1 being the best and 9 being the poorest.**

**Figure 1.** Collection, evaluation, and experimental planting sites used in the development of Webb Germplasm whiplash pappusgrass.

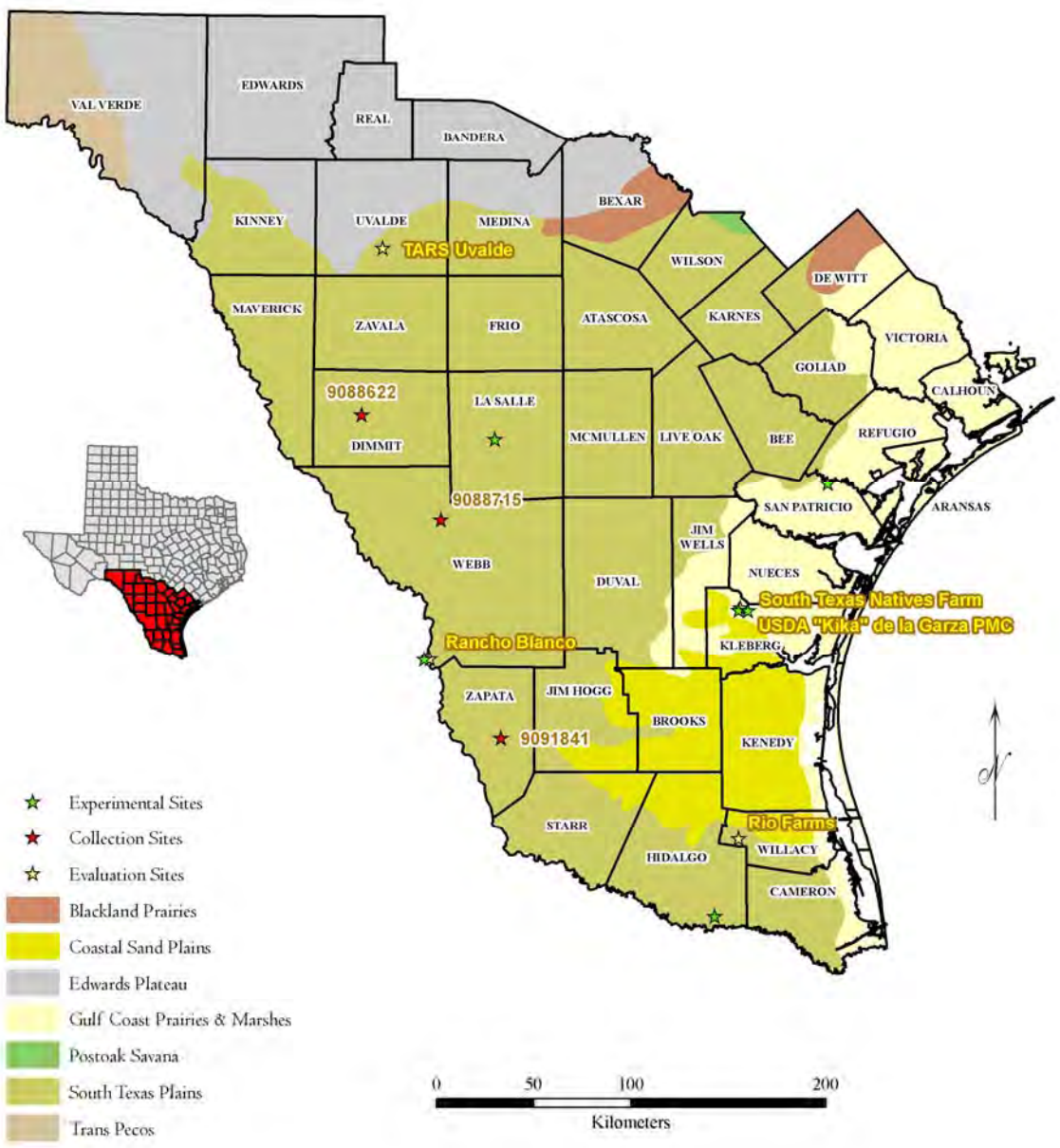

**Figure 2.** Seed increase field of accession 9091841 whiplash pappusgrass, a component of Webb Germplasm, 2009 at Rio Farms.

**Figure 3.** Representative plant of Webb Germplasm whiplash pappusgrass.

# MARKETING PLAN

## WEBB GERMPLASM WHIPLASH PAPPUSGRASS

**January 2010**

Distribute breeder seed to commercial grower

**January 2010**

Finalize and obtain approval for release, and print supporting documents (fact sheet & brochure)

**Spring/Summer 2010**

Draft press release and host celebration of release once seed is commercially available to consumers.

Staff information booths at 2 landowner and consumer oriented symposiums or conferences in south Texas

**Winter 2011**

Present results and overview of development process at International Meeting of the Society for Range Management

Publish “notice of release” article in Native Plant Journal

## SEED AVAILABILITY

## WEBB GERMPLASM WHIPLASH PAPPUSGRASS

As of January 1, 2010, 25 lbs. of pure live seed of Webb Germplasm is available for distribution to a commercial grower. This will plant approximately 5 acres of commercial production fields by direct seeding. Additional seed for establishment of transplants and renovation of breeder lines comprising the blend is in cold storage at the E. “Kika” de la Garza Plant Materials Center.

## SEED PRODUCTION ESTIMATE/PLAN

## WEBB GERMPLASM WHIPLASH PAPPUSGRASS

As of August 1, 2009, 0.34 acre (5,000 transplants) isolated seed increase fields of each of the 3 accessions that comprise the blend are established at Rio Farms, Inc. near Monte Alto, Texas. Total production acreage for the blend components is 1.02 acres, which if harvested 3x annually yields an average of 60 pounds pure live seed/year. This production level will be sustained until November 2011, when fields will be reduced to 0.10 acres each, or removed if commercial production has reached an acceptable level, and seed for establishment of at least 50 acres of commercial seed fields is in cold storage. An additional nursery plot containing 250 plants of each of the 3 selected accessions planted in concurrent rows is established at the *South Texas Natives* Irrigated Farm near Kingsville, Texas. This plot is used to produce seed for research and demonstration plantings, and seed harvested. Hand harvests of the isolated fields will be obtained annually and stored at the E. "Kika" de la Garza Plant Materials Center in Kingsville to provide material for re-establishment of the germplasm if fields are lost.

**Signatures for release of:**

**Webb Germplasm whiplash pappusgrass**

***Pappophorum vaginatum* Buckley**

Fred C. Bryant — 8/17/10

Dr. Fred C. Bryant
Leroy Denman, Jr. Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

Date

George Allen Rasmussen — 8/17/10

Dr. George Allen Rasmussen
Dean
Dick and Mary Lewis Kleberg College of
Agriculture, Natural Resources and Human Sciences
Texas A&M University-Kingsville
Kingsville, TX

Date

Bill F McCutchen — 8/18/10

Dr. Bill McCutchen
Associate Director
Texas AgriLife Research
College Station, TX

Date

Donald W Gohmert — 8/27/10

Don Gohmert
Texas State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

for — 9-21-2010

Mike Hubbs
Director
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
SOUTH TEXAS NATIVES
KINGSVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. "KIKA" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

And

TEXAS AGRILIFE RESEARCH
BEEVILLE, TEXAS

# NOTICE OF RELEASE OF STN-561 HOOKERS PLANTAIN SELECTED PLANT MATERIAL

Texas A&M University-Kingsville, *South Texas Natives*, the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), and Texas Agrilife Research at Beeville, Texas announce the release of a selected plant material of Hookers plantain (*Plantago hookeriana* Fisch. & Mey.) for the south Texas Ecoregion.

This plant will be referred to as STN-561 Germplasm Hookers plantain, and is released as a selected plant material class of certified seed (natural track). STN-561 was tested under the accession number 9088561.

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted Hookers plantain. The potential for immediate use is high, especially for upland wildlife plantings and for range seeding mixes.

STN-561 will be marketed as part of a blend of 2 accessions of *Plantago* called Divot Tallow Weed Blend.

## *A. Proposed Variety Name and Temporary Designation:*

STN-561 GERMPLASM HOOKERS PLANTAIN

## *B. Family, kind, genus and species:*

Family: Plantaginaceae

Kind: Hookers plantain

Genus and species: *Plantago hookeriana* Fisch. & Mey.

***C. Origin and breeding history of the variety:***

**Collection Site Information:** Accession 9088561 was collected on May 5, 2002 by Forrest Smith and Cody Lawson from native plants located along county road 749 in Medina County, Texas at 29° 05' 35" N. latitude and 99° 07' 21" W. longitude (MLRA 83). Soil type of the collection site is Divot clay loam.

**Breeding history:** Plants evaluated in all trials were grown from the original seed collection. Breeder seed was grown from an isolated increase of the original seed collection. No intentional breeding, selection, or genetic manipulation has been carried out on this accession.

***D. Objective description of the variety:***

**Description:** STN-561 Hookers plantain is a is a short-stemmed, cool season annual with a slender taproot; leaves linear to narrowly oblanceolate, entire or with small scattered denticulations, callous-tipped at the acute to obtuse apex, to 3 dm. long and 2 cm. wide, usually much smaller, glabrous to lanate; scapes erect or ascending, shorter than to mostly noticeably exceeding the leaves, glabrate to pubescent; spikes capitate to long-cylindric, to 12 cm. long and 8 mm. thick, rarely reduced to only 2 flowers; bracts broad at base, scarious-margined for one third to the entire length of midrib, equal to or shorter than calyces, glabrate to villous; calyx lobes oblong, about 3 mm. long; corolla lobes suborbicular-ovate, whitish with a brown spot at base of each or brown stripes the entire length of each, to 4 mm. long; seeds 2 cymbiform, dull-brown, finely pitted, about 3 mm. long and 1.3 mm wide (Correll and Johnston, 1996). Cleaned seed of STN-561 germplasm contains 197,816 seeds per pound. Tallow weeds typically take 180 days from planting to seed maturity. The exact mode of reproduction of Hookers plantain is unknown. Many European species of *Plantago* are known to exhibit anemophily, or wind pollination, however the degree of outcrossing is unknown, or varies tremendously by species and population (Sharma et. al., 1993). We have not observed off types or characteristics deviant from the parent population in 3 generations of propagation of 9088561 or other accessions of *Plantago* originating from south Texas. The original evaluation plots at Beeville have shown that offspring from accessions grown adjacent to numerous other accessions of the same species to be identical in morphology and phenology to the parent plants.

**Potential Uses:** STN-561 is recommended for cool season upland wildlife plantings and in range seeding mixes. Hookers plantain seed is consumed by game birds such as bobwhite quail and mourning doves, and the foliage is eaten by bobwhite quail, Rio Grande wild turkeys, white-tailed deer, and cattle (Everitt et. al. 1999).

***E. Evidence***

**Method of Breeding and Selection:**

***Initial Evaluation***

As part of an effort to collect, evaluate, and release germplasms of a variety of plants native to south Texas, personnel from *South Texas Natives* obtained seed of 3 species of Plantago from 27 field locations in South Texas from 2001-2004. These species of *Plantago* were selected for evaluation of potential use in revegetation plantings, and for an addition of annual forbs important to wildlife to seed mixes. (Table 1)

Because little or no information on the propagation or seed quality was available for these species, we conducted initial laboratory germination experiments on these accessions in August 2004. Seed was tested for germination characteristics in controlled climate growth chambers for 30 days (12 hrs. light at 86 F, 12 hrs. dark at 68 F). Germination tests consisted of 4 replications of 100 seeds per accession. Results of these tests of the original seed collections showed excellent seed germination characteristics, including high percent active seed germination, and rapid initiation of germination following the onset of favorable conditions (germination < 36 hours). The original seed collection of STN-561 had 56% active seed germination in this test.

In December 2005 a greenhouse transplant planting was made of all 26 accessions. Severe drought and adverse planting conditions prevented planting the transplants in the field for evaluation. Plants were allowed to mature in the transplant flats, and seed was collected when ripe. STN-561 had 28% active seed germination in this test.

In 2006, another transplant planting was seeded and planted for field evaluation at the Texas Agricultural Experiment Station (TAES) at Beeville. All plots were planted in a split plot spaced plant (1') design (2 replications x 10 plants of each accession). All plots were irrigated to ensure establishment and weeded as needed. STN-561 was selected as one of 7 accessions in this evaluation that showed superior vigor, seed production, and characteristics making mechanical harvest possible. (Table 2)

***Advanced evaluation***

The 7 accessions selected in 2006 evaluation were planted for isolated seed increase at TAES Beeville in the winter of 2006-2007. Observed greenhouse germination in this planting was 56%. Evaluation of the 2006 plot in April 2007 showed that STN-561 had superior regeneration from seed and persistence in comparison to other accession of Hookers plantain. Seed yield tests from the increase plots showed that STN-561 produced the greatest amount of seed of the 2 *Plantago hookeriana* accessions in seed increase. Seed yield was estimated at 288 pounds of bulk seed per acre, which was >2x higher than the other accession of Hookers plantain selected for advanced evaluation. Seed increase in 2007 at TAES Beeville yielded seed with 93 % viability, 90 % seed dormancy (highest of all accessions observed), and 79 % pure live seed. (Table 3) Following the Beeville plantings we selected two accessions of redseed plantain (STN-

496 and STN-507), one accession of Hookers plantain (STN-561), and one accession of bottlebrush plantain (STN-672) for additional seed increase and evaluation.

All accessions performed well in this evaluation. STN-561 showed good seed yields in comparison to STN-496 redseed plantain, the redseed plantain accession chosen for release. STN-672 bottlebrush plantain was eliminated from consideration, despite outstanding performance because of the species' classification as a noxious weed seed by the Texas Department of Agriculture.

Seed harvested from seed increase of STN-561 at Kingsville in June 2008 had 92% viability, 0% dormancy, 94% active germination, and 93.49% pure live seed. Seed yield from Kingsville plantings was 322 lbs. pure live seed per acre (Table 4). Interestingly, 2007 seed produced at TAES Beeville had 90% seed dormancy, while seed produced at Kingsville in 2008 had no dormancy. The mechanism behind initiation of dormancy is not understood, but is likely a result of environmental conditions during seed set. Dormancy may be further induced by laboratory conditions, and be broken by common field conditions.

A trial plot was also planted at the CKWRI wildlife complex in November 2007 to observe emergence of the four accessions selected for advanced evaluation. In this mixed planting STN-496 and STN-561 showed excellent performance and emergence, as well as persistence and seed production in competition with the other accessions and several common cool season weed species. Screenings for efficacy to several grass specific herbicides were conducted, with no effect observed on the STN-561. Seed used in this planting was that harvested from Beeville in 2007, which tested 90% dormant. The stand obtained in the trial plot suggests that this dormancy was broken by field conditions, and not of a significant duration.

Additional transplant plots of STN-561 were planted in December 2007 at 2 locations at Rio Farms near Monte Alto, Texas, to assess plant performance and seed production in the Lower Rio Grande Valley of Texas. Data collected from this planting showed STN-561 to be well adapted to the region, with good survival, vigor and seed production observed.

***Selection***

Two accessions were selected from the advanced evaluation to be released as Divot Tallow Weed Blend. STN-561 was included because of excellent seed establishment characteristics, suitability for mechanical harvest and agronomic production, and high seed yields in comparison to other accessions of *Plantago hookeriana.* The two accessions (STN-561 and STN-496) both have had similar seed yields, which should make formulation of the Divot Tallow Weed Blend feasible, even if separate commercial growers produce each accession.

***Seed Increase***

Seed harvested from the 2007 isolated advanced evaluation planting was used to establish a seed increase field in 2008. Seed harvested from this planting will be designated as Breeder seed and be distributed to commercial seed producers in October 2008.

***F. Area of adaptation***

Based on the native distribution of *Plantago hookeriana,* best performance of STN-561 will likely be in the Gulf Prairies and Marshes, Rio Grande Plain, Edwards Plateau, and southern portions of the Oak Woods and Prairies, and Blackland prairie. A series of 10 rangeland seeding trials were initiated in the fall of 2008, which should further define the area of adaptation of this release.

***G. Procedure for maintaining stock classes of seed***

Breeder seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service.

***H. Description of how variety is to be constituted, etc.***

STN-561 Germplasm Hookers plantain will be marketed as part of a Selected Texas Native Ecotype blend of 2 accessions of plantain released by *South Texas Natives,* collectively called Divot Tallow Weed Blend. STN-496 Germplasm redseed plantain is the other accessions to be marketed as a blend with STN-561. Certified seed will be made up of equal amounts (% PLS) (+/- 10%) of each of the 2 accessions comprising the blend. One accession cannot make up more than 60% (by % PLS), or less than 40% (by % PLS) of the mixture.

***I. Additional restrictions, etc.***

Each of the 2 accessions must be grown and harvested separately in Foundation and Certified seed fields, but accessions can be grown adjacent to one another. Seed harvested from each accession should be blended following harvest and analysis of quality. Only seedlots comprised of the designated mixture of 2 accessions may be certified for sale as Divot Tallow Weed Blend. Surplus seed of STN-561 may be sold alone as Source Identified Seed, but not as a Selected Texas Native Ecotype. Foundation and certified seed fields have a 7 year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO_X__

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO___

Royalty distribution: Distribution of royalties and percentages to be determined at a later time.

**Ecological Considerations and Evaluation:** An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that STN-561 Germplasm Hookers plantain was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that Hookers plantain 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, will provide a good seed source to upland avian wildlife species and provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** STN-561 Hookers plantain will provide a cool season native plant species for rangeland plantings and wildlife habitat improvement.

**Availability of Plant Materials:** Breeder Seed will be maintained by *South Texas Natives*, Kingsville, Texas. Breeder seed will be available by October 2008.

**References:**

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.

Everitt, J.H., D.L. Drawe, and R.I. Lonard. 1999. Field Guide to the Broad-Leaved Herbaceous Plants of South Texas Used by Livestock and Wildlife. Texas Tech University Press. Lubbock, Texas.

Sharma, N., P. Koul, and A.W. Koul. 1993. Pollination biology of some species of genus Plantago L. Botanical Journal of Linnean Society 111-2:129-138.

**Prepared by:**

Forrest S. Smith & Paula Maywald
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Caesar Kleberg Wildlife Research Institute
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MSC 218, 700 Univ. Blvd.
Kingsville, TX 78363

**Signatures for release of:**

**STN-561 Germplasm Hookers plantain**
**(*Plantago hookeriana* Fisch. & Mey.)**

Fred L. Bryant — 10/24/08

Dr. Fred Bryant
Leroy G. Denman, Jr. Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

Date

Dr. G. Allen Rasmussen — 10-24-08

Dr. G. Allen Rasmussen
Dick and Mary Lewis Kleberg College of Agriculture,
Natural Resources and Human Sciences
Texas A&M University-Kingsville,
Kingsville, TX

Date

Dr. Bill McCutchen

Dr. Bill McCutchen
Associate Director
Texas Agrilife Research
College Station, TX

Date

Don Gohmert — 11/13/08

Don Gohmert
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

9-3-09

National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

**Table 1. *Plantago* collections obtained by *South Texas Natives* from 2001-2004.**

| Accession | Species | County | Location | Soil type |
|---|---|---|---|---|
| 9088676 | *Plantago aristata* | San Patricio | Welder Wildlife Refuge | sand |
| 9088672 | *Plantago aristata* | Goliad | David Crow Ranch | sandy loam |
| 9091927 | *Plantago aristata* | Zavala | Chaparrosa Ranch | sand |
| 9088561 | *Plantago hookeriana* | Medina | CR 749 | clay loam |
| 9088735 | *Plantago hookeriana* | Jim Hogg | Tierra Rojo Ranch | sandy loam |
| 9088775 | *Plantago hookeriana* | Jim Hogg | Las Vivaritas Ranch | sandy loam |
| 9090538 | *Plantago hookeriana* | Duval | Temple Ranch | loamy sand |
| 9090543 | *Plantago hookeriana* | Frio | Half Ranch | sandy loam |
| 9090550 | *Plantago hookeriana* | Medina | FM 1343 | sandy loam |
| 9090569 | *Plantago hookeriana* | La Salle | FM 469 | sandy loam |
| 9091847 | *Plantago hookeriana* | Maverick | La Bandera Ranch | sandy loam |
| 9091925 | *Plantago hookeriana* | Jim Hogg | Palangana Ranch | sandy loam |
| 9086292 | *Plantago hookeriana* | Jim Hogg | HWY 16 | sand |
| 9086276 | *Plantago rhodosperma* | Atascosa | 74 Ranch | sandy loam |
| 9088516 | *Plantago rhodosperma* | NA | NA | NA |
| 9088595 | *Plantago rhodosperma* | Victoria | McCan Ranch | sandy loam |
| 9086260 | *Plantago rhodosperma* | Frio | Cato Ranch | loam |
| 9090496 | *Plantago rhodosperma* | Bexar | Briggs Ranch | clay |
| 9090507 | *Plantago rhodosperma* | Frio | Half Ranch | sandy loam |
| 9090521 | *Plantago rhodosperma* | Duval | Sweden Ranch | loam |
| 9090535 | *Plantago rhodosperma* | Duval | Temple Ranch | loam |
| 9090541 | *Plantago rhodosperma* | Duval | Temple Ranch | loam |
| 9093255 | *Plantago rhodosperma* | Medina | Beeville Vetch Plot | clay loam |
| 9090544 | *Plantago rhodosperma* | Frio | CR 189 | sandy loam |
| 9090614 | *Plantago rhodosperma* | Duval | Welder Ranch | clay loam |
| 9090678 | *Plantago rhodosperma* | Dimmit | San Pedro Ranch | loam |
| 9091880 | *Plantago rhodosperma* | Zapata | Dodier Ranch | clay loam |

**Accessions selected for release**

**Table 2. Initial evaluation data collected on 27 accessions of *Plantago* 2004-2006**

| Accession | Species | 2005 Orig. Seed % Germ. | 2006 GH Seed % Germ. | March 2006 Beeville Eval.* |
|---|---|---|---|---|
| 9088676 | *Plantago aristata* | 74 | 38 | Excellent |
| 9088672 | *Plantago aristata* | 76 | 38 | Excellent |
| 9091927 | *Plantago aristata* | 64 | 30 | Fair |
| 9088561 | *Plantago hookeriana* | 71 | 28 | Excellent |
| 9088735 | *Plantago hookeriana* | 78 | 37 | x |
| 9088775 | *Plantago hookeriana* | 78 | 39 | Fair |
| 9090538 | *Plantago hookeriana* | 42 | 21 | x |
| 9090543 | *Plantago hookeriana* | 75 | 37 | Fair |
| 9090550 | *Plantago hookeriana* | 30 | 15 | x |
| 9090569 | *Plantago hookeriana* | 88 | 44 | x |
| 9091847 | *Plantago hookeriana* | 98 | 49 | x |
| 9091925 | *Plantago hookeriana* | 46 | 23 | Fair |
| 9086292 | *Plantago hookeriana* | 74 | 37 | x |
| 9086276 | *Plantago rhodosperma* | x | 50 | x |
| 9088516 | *Plantago rhodosperma* | 99 | x | Good |
| 9088595 | *Plantago rhodosperma* | x | 24 | Fair |
| 9086260 | *Plantago rhodosperma* | x | x | x |
| 9090496 | *Plantago rhodosperma* | 81 | 41 | Excellent |
| 9090507 | *Plantago rhodosperma* | 70 | 35 | Excellent |
| 9090521 | *Plantago rhodosperma* | 70 | 35 | Poor |
| 9090535 | *Plantago rhodosperma* | 28 | 14 | Fair |
| 9090541 | *Plantago rhodosperma* | 62 | 31 | Fair |
| 9093255 | *Plantago rhodosperma* | x | x | Good |
| 9090544 | *Plantago rhodosperma* | 70 | 35 | x |
| 9090614 | *Plantago rhodosperma* | 26 | 15 | x |
| 9090678 | *Plantago rhodosperma* | 40 | 20 | x |
| 9091880 | *Plantago rhodosperma* | x | x | x |

**x indicates no data collected for category due to insufficient original seed amounts or poor greenhouse performance.**

*** March 2006 Beeville Evaluation based on a combination of seed production, biomass production, and suitability for harvest with mechanical equipment. Ratings given are: excellent, good, fair, poor.**

**Accessions selected for release**

**Table 3. Advanced evaluation data collected on 7 accessions of *Plantago* planted at Texas Agrilife Research-Beeville, December 2006-May 2007.**

| Accession | Species | Percent active seed germ. GH | gross seed yield (cleaned lbs./acre) | net seed yield (cleaned lbs. PLS/acre) | Percent viable seed (TZ test %) | Percent active seed germ | Percent dormant seed | % PLS of seedlot | Seed production ranking | Forage production ranking | Re-growth from seed in 2006 plot |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9090496 | *Plantago rhodosperma* | 51 | 432 | 387 | 98 | 53 | 45 | 90 | 2 | 2 | 2 |
| 9090507 | *Plantago rhodosperma* | 71 | 192 | 150 | 94 | 29 | 65 | 78 | 3 | 1 | 1 |
| 9088516 | *Plantago rhodosperma* | 75 | 106 | 89 | 98 | 56 | 42 | 84 | 5 | 5 | 4 |
| 9093255 | *Plantago rhodosperma* | 45 | 67 | 48 | 96 | 72 | 24 | 72 | 8 | 5 | 4 |
| 9088561 | *Plantago hookeriana* | 34 | 288 | 229 | 93 | 3 | 90 | 79 | 2 | 1 | 1 |
| 9088676 | *Plantago hookeriana* | 67 | 125 | x | x | x | x | x | 5 | 5 | 3 |
| 9088672 | *Plantago aristata* | 56 | 537 | 424 | 91 | 26 | 65 | 79 | 1 | 1 | 1 |

**x indicates no data was collected for this category**
**Seed production, forage production and re-growth from seed were evaluated by visual estimation, with scores of 1 given to superior performance, and 5 for poor performance.**
**Accessions selected for release**

**Table 4. Foundation Seed Production data collected on 4 *Plantago* accessions grown at CKWRI Wildlife Complex, Kingsville, Texas, spring 2008. Seed harvested with a combine and cleaned using a Clipper seed cleaner.**

| Accession | Species | Gross seed yield (cleaned lbs./acre) | Net seed yield (lbs. PLS/acre) | Percent viable seed (TZ test) | Percent purity | Percent active seed germination | Percent dormant seed | Percent PLS |
|---|---|---|---|---|---|---|---|---|
| 9090507 | *Plantago rhodosperma* | 124 | 98 | 90 | 99 | 72 | 8.00 | 79 |
| 9090496 | *Plantago rhodosperma* | 458 | 400 | 88 | 99 | 79 | 12.00 | 87 |
| 9088561 | *Plantago hookeriana* | 354 | 322 | 92 | 100 | 94 | 0.00 | 93 |
| 9088672 | *Plantago aristata* | 458 | 425 | 92 | 100 | 93 | 0.00 | 92 |

**Accessions selected for release**

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
SOUTH TEXAS NATIVES
KINGSVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. "KIKA" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

And

TEXAS AGRILIFE RESEARCH
BEEVILLE, TEXAS

# NOTICE OF RELEASE OF STN-496 REDSEED PLANTAIN SELECTED PLANT MATERIAL

Texas A&M University-Kingsville, *South Texas Natives*, the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), and Texas Agrilife Research –Beeville (TAR-B), Texas announce the release of a selected plant material of redseed plantain (*Plantago rhodosperma Dcne*.) for the south Texas ecoregion.

This plant will be referred to as STN-496 Germplasm redseed plantain, and is released as a selected plant material class of certified seed (natural track). STN-496 was tested under the accession number 9090496.

This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted redseed plantain. The potential for immediate use is high, especially for upland wildlife plantings and for range seeding mixes.

STN-496 will be marketed as part of a blend of 2 accessions of *Plantago* called Divot Tallow Weed Blend.

## *A. Proposed Variety Name and Temporary Designation:*

STN-496 GERMPLASM REDSEED PLANTAIN

## *B. Family, kind, genus and species:*

Family: Plantaginaceae

Kind: redseed plantain

Genus and species: *Plantago rhodosperma Dcne.*

***C. Origin and breeding history of the variety:***

**Collection Site Information:** Accession 9090496 was collected by Forrest Smith and Cody Lawson on May 16, 2003 from native plants located at the Briggs Ranch Golf Course in Bexar County, Texas at 29° 23' 27" N. latitude and 98° 45' 23" W. longitude (MLRA 83). Soil type of the collection site was Ekrant cobbly clay.

**Breeding history:** Plants evaluated in all trials were grown from the original seed collection. Breeder seed was also grown from isolated increase of the original seed collection. All seed increase plots were grown in isolation from other *Plantago* accessions, and wild populations of *Plantago.* No intentional breeding, selection or genetic manipulation has been carried out on this accession.

***D. Objective description of the variety:***

**Description:** STN-496 redseed plantain is a cool season, annual with a slender taproot; leaves are oblanceolate, long-cuneate at the base, obtuse to acute at apex, to 35 cm. long and 5 cm. wide, usually much smaller, grayish-green, pubescent, entire to coarsely pectinate or salient-dentate; scapes one to several, hirsute, shorter than to much-exceeding the leaves, hirsute; spikes to 2 dm. long and 1 cm. thick; seeds 2, bright red to reddish black, 2-3 mm. long more than half as wide, nearly flat on both sides, with a thin pale margin, the central hilum less than a third as long as the seed. STN-496 germplasm contains 322,000 seeds per pound. Tallow weeds typically take 180 days from planting to seed maturity. The exact mode of reproduction of redseed plantain is unknown. Many European species of *Plantago* are known to exhibit anemophily, or wind pollination, however the degree of outcrossing is unknown, or varies tremendously by species and population. Plantains in general exhibit a wide variation in pollination system (Sharma et. al., 1993). We have not observed off types or characteristics deviant from the parent population in 3 generations of propagation 9090496, and other accessions of *Plantago* originating from south Texas. The original evaluation plots at Beeville have shown that offspring from accessions grown adjacent to numerous other accessions of the same species to be identical in morphology and phenology to the parent plants.

**Potential Uses:** STN-496 is recommended for upland wildlife plantings and in range seeding mixes. Redseed plantain seed is known to be consumed by game birds such as bobwhite quail and mourning doves, and the foliage is eaten by bobwhite quail, Rio Grande wild turkeys, white-tailed deer, and cattle (Everitt et. al. 1999). Redseed plantain has been shown to be an important component in the diets of both scaled and bobwhite quail in southwest Texas (Cambell-Kissock et. al., 1985).

### *E. Evidence*

### *Initial Evaluation*

As part of an effort to collect, evaluate, and release germplasms of a variety of plants native to south Texas, personnel from *South Texas Natives* obtained seed of 3 species of *Plantago* from 27 field locations in South Texas from 2001-2004. These species of *Plantago* were selected for evaluation of potential use in revegetation plantings, and add annual forbs important to wildlife to seed mixes. (Table 1)

Because little or no information on the propagation or seed quality was available for these species, we conducted initial laboratory germination experiments on these accessions in August 2004. Seed was tested for germination characteristics in controlled climate growth chambers for 30 days (12 hrs. light at 86 F, 12 hrs. dark at 68 F). Germination tests consisted of 4 replications of 100 seeds per accession. Results of these tests of the original seed collections showed excellent seed germination characteristics, including high percent active seed germination, and rapid initiation of germination following the onset of favorable conditions (germination < 36 hours). The original seed collection of STN-496 had 81% active seed germination.

In December 2005 a greenhouse transplant planting was made of all 26 accessions. Severe drought and adverse planting conditions prevented planting the transplants in the field for evaluation. Plants were allowed to mature in the transplant flats, and seed was collected when ripe. STN-496 had 41% active seed germination in this test.

In 2006, another transplant planting was seeded and planted for field evaluation at TAR-B. All plots were planted in a split plot spaced plant (1 foot) design (2 replications x 10 plants of each accession). All plots were irrigated to ensure establishment and weeded as needed. STN-496 was selected as one of 7 superior accessions in this evaluation that showed superior vigor, seed production, and ease of possible mechanical harvest. (Table 2)

### *Advanced evaluation*

The 7 accessions selected in the 2006 evaluation were planted for isolated seed increase at TAR-B in the winter of 2006-2007. Observed greenhouse germination in this planting was 50%. Evaluation of the 2006 plot in April 2007 showed that STN-496 had excellent regeneration from seed and had persisted very well. Seed yield tests showed that STN-496 produced the greatest amount of seed of any of the 4 *Plantago rhodosperma* accessions in seed increase. Seed yield was 387 lbs. pure live seed per acre. Seed harvested from Beeville in May 2007 had 98% viability, 45% dormancy, 53% active germination, and 89% pure live seed. (Table 3) Following the Beeville plantings we selected two accessions of redseed plantain (STN-496 and STN-507), one accession of Hookers plantain (STN-561), and one accession of bottlebrush plantain (STN-672) for additional seed increase and evaluation.

All accessions performed well in this evaluation. Of the two redseed plantains in this evaluation, STN-496 showed significantly higher seed yields in comparison to STN-507 redseed plantain. STN-496 was chosen for release and STN-507 dropped from consideration because of this data. STN-561 Hookers plantain was also selected for release. STN-672 bottlebrush plantain was eliminated from consideration, despite outstanding performance because of the species' classification as a noxious weed seed by the Texas Department of Agriculture.

Seed harvested from seed increase of STN-496 at Kingsville in June 2008 had 88% viability, 12% dormancy, 79% active germination, and 87.43% pure live seed. Seed yield from Kingsville plantings was 400 lbs. pure live seed per acre (Table 4).

A trial plot was also planted at the CKWRI wildlife complex in November 2007 to observe emergence of the four accessions selected for advanced evaluation. In this mixed planting STN-496 and STN-561 showed excellent performance and emergence, as well as persistence and seed production in competition with the other accessions and several common cool season weed species. Screenings for efficacy to several grass specific herbicides were conducted, with no effect observed on the STN-496.

Additional transplant plots were established at two locations in December 2007 at Rio Farms, near Monte Alto, Texas, to determine plant performance and seed production in the Lower Rio Grande Valley of Texas. STN-496 performed poorly in this evaluation. High transplant mortality, poor vigor and poor seed production was observed. We hypothesize that a combination of poor adaptability to soil conditions and a relatively warm winter contributed to this.

***Selection***

Two accessions were selected from the advanced evaluation to be released as Divot Tallow Weed Blend. STN-496 was included because of the excellent observed forage characteristics, ease of mechanical harvest and agronomic production, good active seed germination to dormancy ratio, and extremely high seed yields in comparison to other South Texas collected accessions of *Plantago rhodosperma.* STN-496 was also chosen because it originates from and should be adapted to clay soils which are widespread in south Texas. STN-496 was selected over STN-507 principally because of a 300% greater seed yield. The two accessions (STN-561 and STN-496) both have had similar seed yields, which should make formulation of the Divot Tallow Weed Blend feasible, even if separate commercial growers produce each accession.

***Seed Increase***

Seed harvested from the 2007 advanced evaluation plantings was used to establish a seed increase field in 2008. Seed harvested from this planting will be designated as Breeder seed and be distributed to interested commercial seed producers in October 2008.

***F. Area of adaptation***

Based on the distribution of *Plantago rhodosperma* best performance of STN-496 will be in the Gulf Prairies and Marshes, Rio Grande Plain, Edwards Plateau, and southern portions of the Oak Woods and Prairies, and Blackland prairie. A series of 10 rangeland seeding trials were initiated in the fall of 2008, which should further define the area of adaptation of this release.

***G. Procedure for maintaining stock classes of seed***

Breeder seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service.

***H. Description of how variety is to be constituted, etc.***

STN-496 Germplasm redseed plantain will be marketed as part of a Selected Texas Native Ecotype blend of 2 accessions of plantain released by *South Texas Natives,* called Divot Tallow Weed Blend. STN-561 Germplasm Hookers plantain is the other accessions to be marketed as a blend with STN-496. Certified seed will be made up of equal amounts (% PLS) (+/- 10%) of each of the 2 accessions comprising the blend. One accession cannot make up more than 60% (by % PLS), or less than 40% (by % PLS) of the mixture.

***I. Additional restrictions, etc.***

Each of the two accessions must be grown and harvested separately in Foundation and Certified Seed Fields, but accessions can be grown adjacent to one another. Seed harvested from each accession should be blended following harvest and analysis of seed quality. Only seedlots comprised of the designated mixture of 2 accessions may be certified for sale as Divot Tallow Weed Blend. Surplus seed of STN-496 may be sold as Source Identified Seed, but not as a Selected Native Texas Ecotype. Foundation and certified seed fields have a 7 year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO_X__

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO___

Royalty distribution: Distribution of royalties and percentages to be determined at a later time.

**Ecological Considerations and Evaluation:** An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that STN-496 Germplasm redseed plantain was suitable for release based on the criterion contained

in this document. This conclusion is mainly due to the fact that redseed plantain 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, will provide a good seed source to upland avian wildlife species and provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** STN-496 redseed plantain will provide a native plant species for rangeland planting and wildlife habitat improvement.

**Availability of Plant Materials:** Breeder Seed will be maintained by South Texas Natives, Kingsville, Texas.

**References:**

Cambell-Kissock, L., L.H. Blankenship, and J.W. Stewart. 1985. Plant and Animal Foods of Bobwhite and Scaled Quail in Southwest Texas. The Southwestern Naturalist 30(4):543-553.

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.

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**Prepared by:**

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South Texas Natives
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MSC 218, 700 Univ. Blvd.
Kingsville, TX 78363

**Signatures for release of:**

**STN-496 Germplasm redseed plantain**
**(*Plantago rhodosperma* Dcne.)**

Fred C. Bryant — 10/24/08

Dr. Fred Bryant
Leroy G. Denman, Jr. Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

Date

10-24-08

Dr. G. Allen Rasmussen
Dean
Dick and Mary Lewis Kleberg College of Agriculture,
Natural Resources and Human Sciences
Texas A&M University-Kingsville,
Kingsville, TX

Date

Dr. Bill McCutchen
Associate Director
Texas Agrilife Research
College Station, TX

Date

Don Gohmert — 11/13/08

Don Gohmert
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

9/3/09

National Plant Materials Program Leader
United States Department of Agriculture
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Washington, D.C.

Date

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**Accessions selected for release**

**Table 2. Initial evaluation data collected on 27 accessions of *Plantago* 2004-2006**

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| 9090550 | *Plantago hookeriana* | 30 | 15 | x |
| 9090569 | *Plantago hookeriana* | 88 | 44 | x |
| 9091847 | *Plantago hookeriana* | 98 | 49 | x |
| 9091925 | *Plantago hookeriana* | 46 | 23 | Fair |
| 9086292 | *Plantago hookeriana* | 74 | 37 | x |
| 9086276 | *Plantago rhodosperma* | x | 50 | x |
| 9088516 | *Plantago rhodosperma* | 99 | x | Good |
| 9088595 | *Plantago rhodosperma* | x | 24 | Fair |
| 9086260 | *Plantago rhodosperma* | x | x | x |
| 9090496 | *Plantago rhodosperma* | 81 | 41 | Excellent |
| 9090507 | *Plantago rhodosperma* | 70 | 35 | Excellent |
| 9090521 | *Plantago rhodosperma* | 70 | 35 | Poor |
| 9090535 | *Plantago rhodosperma* | 28 | 14 | Fair |
| 9090541 | *Plantago rhodosperma* | 62 | 31 | Fair |
| 9093255 | *Plantago rhodosperma* | x | x | Good |
| 9090544 | *Plantago rhodosperma* | 70 | 35 | x |
| 9090614 | *Plantago rhodosperma* | 26 | 15 | x |
| 9090678 | *Plantago rhodosperma* | 40 | 20 | x |
| 9091880 | *Plantago rhodosperma* | x | x | x |

**x indicates no data collected for category due to insufficient original seed amounts or poor greenhouse performance.**

*** March 2006 Beeville Evaluation based on a combination of seed production, biomass production, and suitability for harvest with mechanical equipment. Ratings given are: excellent, good, fair, poor.**

**Accessions selected for release**

**Table 3. Advanced evaluation data collected on 7 accessions of *Plantago* planted at Texas Agrilife Research-Beeville, December 2006-May 2007.**

| Accession | Species | Percent active seed germ. GH | gross seed yield (cleaned lbs./acre) | net seed yield (cleaned lbs. PLS/acre) | Percent viable seed (TZ test %) | Percent active seed germ | Percent dormant seed | % PLS of seedlot | Seed production ranking | Forage production ranking | Re-growth from seed in 2006 plot |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9090496 | *Plantago rhodosperma* | 51 | 432 | 387 | 98 | 53 | 45 | 90 | 2 | 2 | 2 |
| 9090507 | *Plantago rhodosperma* | 71 | 192 | 150 | 94 | 29 | 65 | 78 | 3 | 1 | 1 |
| 9088516 | *Plantago rhodosperma* | 75 | 106 | 89 | 98 | 56 | 42 | 84 | 5 | 5 | 4 |
| 9093255 | *Plantago rhodosperma* | 45 | 67 | 48 | 96 | 72 | 24 | 72 | 8 | 5 | 4 |
| 9088561 | *Plantago hookeriana* | 34 | 288 | 229 | 93 | 3 | 90 | 79 | 2 | 1 | 1 |
| 9088676 | *Plantago hookeriana* | 67 | 125 | x | x | x | x | x | 5 | 5 | 3 |
| 9088672 | *Plantago aristata* | 56 | 537 | 424 | 91 | 26 | 65 | 79 | 1 | 1 | 1 |

**x indicates no data was collected for this category**
**Seed production, forage production and re-growth from seed were evaluated by visual estimation, with scores of 1 given to superior performance, and 5 for poor performance.**
**Accessions selected for release**

**Table 4. Foundation Seed Production data collected on 4 *Plantago* accessions grown at CKWRI Wildlife Complex, Kingsville, Texas, spring 2008. Seed harvested with a combine and cleaned using a Clipper seed cleaner.**

| Accession | Species | Gross seed yield (cleaned lbs./acre) | Net seed yield (lbs. PLS/acre) | Percent viable seed (TZ test) | Percent purity | Percent active seed germination | Percent dormant seed | Percent PLS |
|---|---|---|---|---|---|---|---|---|
| 9090507 | *Plantago rhodosperma* | 124 | 98 | 90 | 99 | 72 | 8.00 | 79 |
| 9090496 | *Plantago rhodosperma* | 458 | 400 | 88 | 99 | 79 | 12.00 | 87 |
| 9088561 | *Plantago hookeriana* | 354 | 322 | 92 | 100 | 94 | 0.00 | 93 |
| 9088672 | *Plantago aristata* | 458 | 425 | 92 | 100 | 93 | 0.00 | 92 |

**Accessions selected for release**

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
SOUTH TEXAS NATIVES
KINGSVILLE, TEXAS

and

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. "KIKA" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

# NOTICE OF RELEASE OF ZAPATA GERMPLASM RIO GRANDE CLAMMYWEED SELECTED CLASS OF NATURAL GERMPLASM

Texas A&M University-Kingsville, South Texas Natives and U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), announce the release of a selected ecotype of Rio Grande clammyweed (*Polanisia dodecandra* (L.) DC. ssp. *riograndensis*) for the south Texas ecoregion. Zapata Germplasm was tested under the accession numbers 9089005 and 9091926. The release has been assigned the NRCS accession number 9093442.

This plant will be referred to as Zapata Germplasm Rio Grande clammyweed and 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 Rio Grande clammyweed. The potential for immediate use is high, especially for upland wildlife plantings and for range seeding mixes.

## *A. Proposed Variety Name and Temporary Designation:*

ZAPATA GERMPLASM RIO GRANDE CLAMMYWEED

## *B. Family, kind, genus and species:*

Family: Capperaceae

Kind: Rio Grande clammyweed

Genus and species: *Polanisia dodecandra* (L.) DC. ssp. *riograndensis*

## *C. Origin and breeding history of the variety:*

**Collection Site Information:** Accession 9089005 was collected by Forrest Smith and Cody Lawson in 2002 from a native population located at the Piloncillo Ranch in Dimmitt County, Texas at 28° 15' 32" N. latitude and 99° 33' 13" W. longitude (MLRA 83). Soil type was a Brundage fine sandy loam. Accession 901926 was collected by Cody Lawson, Keith Pawelek, and Forrest Smith in 2004 from a native population located at the Rafael Flores Ranch in Zapata County, Texas, GPS coordinates were not recorded (MLRA 83). Soil type was recorded as loamy sand.

**Breeding history:** Plants evaluated in all trials were grown from the original seed collections. Breeder seed was also grown from the original seed collections. All seed increase plots were grown in isolation from other accessions of Rio Grande clammyweed. No intentional breeding or genetic manipulation was conducted on the accessions.

***D. Objective description of the variety:***

**Description:** Zapata Germplasm Rio Grande clammyweed (clammyweed) is a native annual forb, endemic to southern Texas. It is found in sandy, gravelly (sometimes limestone) or alluvial silty soil, near riverbanks, coastal dunes, open areas in coastal live oak forests, bottoms of washouts, in semi-desert Opuntia-Mesquite scrub and shrub thickets, roadsides, chaparral pastures, fallow fields, or other disturbed areas on both sides of the lower Rio Grande River and adjacent areas of south Texas. Clammyweed flowers from March through November. The botanical description of clammyweed is: sparsely branched or unbranched annual (rarely perrenial) 2-6 dm. tall, glandular-viscid; leaflets 3, leaves rounded or oblanceolate, 2-4 cm long, 5-20 mm wide, petals 5-16 mm long. Petals pink to rose 6-17 mm long longest stamens 12-17 mm long, style 3-5 (-8) mm long; bracts ovate to often nearly orbicular; raceme often dense and flat-topped; capsules narrow (3-) 4-7.5 cm long (3-) 4-5 (-7) mm wide, sparsely glandular; seeds prominently roughly tuberculate-rugose (Correll & Johnston, 1996). Cleaned seed of Rio Grande clammyweed has an average of 154,500 seeds per pound. Seed of Zapata Germplasm Rio Grande clammyweed is easily identified by the pronouncedly ruguose-verruose (covered with blisters and ridges) nature. Flower structure and observations indicate that clammyweed is largely an insect pollinated species. Insect abundance and diversity is exceptionally high in clammyweed stands in comparison to many other native herbaceous plants.

**Potential Uses:** Zapata Germplasm is recommended for upland wildlife plantings and in range seeding mixes. Clammyweed seed is eaten by game birds such as bobwhite quail, scaled quail, mourning doves, white-wing doves, and Rio Grande wild turkeys, as well as many non-game species of birds and mammals. Rio Grande clammyweed is an important nectar plant for many species of butterflies and provides habitat to many other insects. Clammyweed has no grazing value for livestock or wildlife. Rio Grande clammyweed is an early successional plant. It is quick to establish on disturbed soils, grows quickly, and provides a favorable environment for other slow to germinate native species. In mixed species native plantings in south Texas, clammyweed is often the first planted species to emerge and flower. Rio Grande clammyweed readily re-seeds itself with moderate soil

disturbance. Clammyweed is often found in dense stands of non-native grasses, and may be useful in efforts to diversify these stands for wildlife.

### *E. Evidence*

### *Evaluation*

In February 2005, 6 accessions of clammyweed were grown for evaluation at 2 locations in the Rio Grande Plains. Transplants were grown from original seed and planted at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center in Kingsville, Texas (PMC) (soil type Victoria clay) and Rio Farms Inc. near Monte Alto, Texas (soil type Delfina fine sandy loam). In March 2006 transplants were also planted for evaluation at Rancho Blanco, near Laredo, Texas (soil type Lagloria silt loam). All plots were planted in a split plot, spaced plant design with 1 ft. spacing between plants.. All plots were irrigated to ensure establishment and weeded as needed. Plots were evaluated monthly during the growing season for important traits, and seed was collected when ripe. Seed was tested for germination characteristics in controlled climate growth chambers for 30 days (12 hrs. light at 86 F, 12 hrs. dark at 68 F). Germination tests consisted of 4 replications of 100 seeds per accession. 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. Tables 1 and 2 present the field evaluation data, Table 3 presents germination data collected.

**Table 1.** Field Evaluation of six accessions of Rio Grande clammyweed planted at Rio Farms (Monte Alto, Texas) in 2005. Scores given are on a 1-9 scale, with 1 representing superior performance. Survival is given as a percent.

| Accession | Survival | Vigor | Foliage density | Uniformity | Development stage | Seed production | Biomass production | Plant height |
|---|---|---|---|---|---|---|---|---|
| **9089004** | 55.00 | 4.17 | 3.67 | 4.67 | 1.00 | 3.00 | 3.67 | 3.33 |
| **9089005** | 48.75 | 3.00 | 2.75 | 4.13 | 1.00 | 2.75 | 3.13 | 2.63 |
| **9090738** | 82.50 | 3.50 | 5.00 | 4.00 | 1.00 | 3.25 | 4.00 | 3.50 |
| **9091926** | 58.88 | 2.25 | 2.25 | 3.63 | 1.00 | 3.00 | 2.13 | 2.38 |
| **9091944** | 55.00 | 3.38 | 2.88 | 3.88 | 1.00 | 2.50 | 3.25 | 3.00 |
| **9093169** | 43.80 | 2.83 | 2.83 | 4.33 | 1.00 | 2.67 | 2.83 | 2.67 |
| **Mean** | 57.30 | 3.19 | 3.23 | 4.10 | 1.00 | 2.86 | 3.17 | 2.92 |

**Table 2.** Field Evaluation of six accessions of Rio Grande clammyweed planted at Rancho Blanco (Laredo, Texas) in 2006. Scores given are on a 1-9 scale, with 1 representing superior performance. Survival is given as a percent. An "x" is used if no data was collected for those criteria. Means given include only data collected. Survival is given as a percent.

| Accession | Survival | Vigor | Foliage density | Uniformity | Development stage | Seed production | Biomass production | Plant height |
|---|---|---|---|---|---|---|---|---|
| **9089004** | 5.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **9089005** | 0.00 | x | x | x | x | x | x | x |
| **9090738** | x | x | x | x | x | x | x | x |
| **9091926** | 15.00 | 1.00 | 1.50 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **9091944** | 20.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **9093169** | 0.00 | x | x | x | x | x | x | x |
| **Mean** | 8.00 | 1.00 | 1.16 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

**Table 3.** Percent active seed germination of six accessions of Rio Grande clammyweed from 2005 harvest at Rio Farms, and monthly harvests from the E. “Kika” de la Garza Plant Materials Center (PMC) from 2005. An "x" is given when no data was available.

| Accession | 2005 Rio Farms harvest germ 5/2005 harvest | 2005 PMC Annex germ 5/4/2005 harvest | 2005 PMC Annex germ 6/16/05 harvest | 2005 PMC Annex germ 7/28/05 harvest | 2005 PMC Annex germ 9/28/05 harvest |
|---|---|---|---|---|---|
| **9089004** | 12.67 | 66.00 | 2.00 | 1.33 | 1.33 |
| **9089005** | 12.67 | 54.00 | 0.00 | 0.00 | 0.67 |
| **9090738** | x | 12.67 | x | x | x |
| **9091926** | 23.33 | 72.67 | 0.67 | 2.67 | 1.33 |
| **9091944** | 5.33 | 66.67 | 0.00 | 0.00 | 0.67 |
| **9093169** | 6.67 | 52.00 | 0.00 | 0.00 | 0.67 |
| **Mean** | **12.13** | **54.00** | **0.53** | **0.80** | **0.93** |

### *Selection*

Accessions 9089004, 9089005, and 9091926 were selected for advanced evaluation and seed increase because they showed superior active seed germination and good performance in most evaluation categories. Rio Grande clammyweed was selected for release in part because of its broad distribution in south Texas, the need for fast establishing native herbaceous plant material, and its value for wildlife habitat enhancement.

### *Advanced Evaluation and Seed Increase*

In April 2007, 200 transplants of each of the three selected accessions were planted for advanced evaluation and seed increase at Rio Farms, near Monte Alto, Texas. Accession 9089004 showed early plant mortality, lower plant vigor, flower density and seed set than accessions 9089005 and 9091926. By August 29, accession 9089004 had experienced

100% mortality. Both 9089005 and 9091926 were both thriving and re-flowering, producing 2 more seed crops. After the advanced evaluation, accession 9089004 was dropped from the seed increase.

Testing of the seed harvests from the Rio Farms increase in the winter of 2007-2008 showed excellent seed fill and % active germination of both 9089005 and 9091926. Seed harvested in June at Rio Farms had the greatest seed weight and % PLS. Spring seed harvests from Rio Farms have had an average of 67% pure live seed, with 15% seed dormancy. Harvests from later in the growing season typically have poor seed fill, and higher dormancy. Seed yields from June hand harvests (first crop produced) at Rio Farms were 168 lbs. PLS seed/acre. Initial evaluation data collected by the Plant Materials Center (Table 3) also showed highest % active seed germination from spring harvests, with declining % active germination through summer and fall. Commercial seed production of Zapata Germplasm should focus on production of the first seed crop following planting. Plants commonly flower and produce seed beyond the first seed crop, and will set seed until frost; however subsequent seed crops have poor seed fill, lower active germination, and significantly lower seed yields.

Seed increase harvests in June 2008 at Kingsville, Texas (first crop produced) showed hand harvest seed yields averaging 144 lbs. pure live seed/acre under irrigated conditions. Pure live seed of these harvests averaged 83%.

All seed yield data was collected on rowed plantings to facilitate weed free fields; we suspect that seed yields will be much higher in flat plantings with higher plant densities.

**Table 4.** Seed increase data collected on two accessions of Rio Grande clammyweed 2007-2008.

| Accession | 6/2007 Harvest Rio Farms, % active germ | 8/2007 Harvest Rio Farms, % active germ | 10/2007 Harvest Rio Farms, % active germ | 6/2008 Harvest, Kingsville, % active germ | 6/2008 Harvest, Kingsville, % dormancy | 6/2008 Harvest, Kingsville, % PLS |
|---|---|---|---|---|---|---|
| **9091926** | 29.00 | 29.50 | 0.00 | 45.00 | 40.00 | 84.23 |
| **9089005** | 24.50 | 4.00 | x | 22.00 | 62.00 | 83.37 |

x denotes no data collected for category

### *Seeding Trials*

Seeding trials at Kingsville, Texas have shown good establishment from seed in fall (October) and spring (April) plantings. Fall plantings should be made at least 2 months prior to danger of frost so that seed is produced before freezing. Clammyweed should be planted at a rate of 8 lbs. pure live seed per acre for solid stands. Zapata Germplasm Rio Grande clammyweed has also been planted in rowed, irrigated plantings for seed production. Excellent stands have also been established seeding at a rate of 10 active germinating seeds/row ft for seed production. Clammyweed typically requires 45-60 days from emergence to seed maturity.

In plantings of a mixture of 20 native species in the Lower Rio Grande Valley and near Kingsville, Texas, Zapata Germplasm Rio Grande clammyweed was observed to be the first native species to emerge following planting in March 2008. Rio Grande clammyweed has performed well in these plantings despite heavy weed infestations.

A series of one acre field plantings were initiated in August 2008 at ranches in Webb (2 plantings), Jim Hogg (1 planting), and Duval Counties (2 plantings). Of the 8 native species drill seeded, Zapata Germplasm Rio Grande clammyweed was the second most abundant planted species that emerged within 30 days of planting. Clammyweed was seeded at a rate of 0.5 lbs PLS/acre (5% of the total seed mixture), resulting in mean seedling density in the 5 plantings of 0.76 plants/ft².

***F. Area of adaptation***

This release has been tested and shown adaptability in the Rio Grande Plains, Coastal Sand Plains, and Gulf Prairies and Marshes ecological regions of Texas. Adaptation outside of this area is unknown. Zapata Germplasm has been grown in ornamental plantings near Dallas, Uvalde, and McAllen Texas, with good performance under irrigated conditions.

***G. Procedure for maintaining stock classes of seed***

Breeder seed will be produced and maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service.

***H. Description of how variety is to be constituted, etc.***

Breeder seed will be made up of equal amounts (% PLS) (+/- 10 %) of each of the 2 accessions comprising the release. One accession cannot make up more than 60% (by % PLS), or less than 40% (by % PLS) of the mixture.

***I. Additional restrictions, etc.***

Foundation and certified seed fields must be isolated from native or other cultivated stands of clammyweed by 900 ft. Foundation and certified seed fields have a 7 year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO_X__

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO___

Royalty distribution: Distribution of royalties and percentages to be determined at a later time.

**Ecological Considerations and Evaluation:** An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that Zapata Germplasm Rio Grande clammyweed was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that Rio Grande clammyweed 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, will provide a good seed source to upland avian wildlife species and provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Zapata Germplasm Rio Grande Clammyweed will provide a native plant species for rangeland planting and wildlife habitat improvement.

**Availability of Plant Materials:** Breeder Seed will be maintained by South Texas Natives, Kingsville, Texas. Breeder seed will be available by September 2008.

**References:**

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.

Iltis, H.H. 1969. Studies in the Capparidaceae XII: *Polanisia dodecandra riograndensis* ssp. nov. The Southwestern Naturalist 14(1):115-121.

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Kingsville, TX 78363

**Signatures for release of:**

**Zapata Germplasm Rio Grande clammyweed**
**(*Polanisia dodecandra* (L.) DC. ssp. *riograndensis*)**

Fred C. Bryant — 10/24/08

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

Date

G. Allen Rasmussen — 10-24-08

Dr. G. Allen Rasmussen
Dick and Mary Lewis Kleberg
College of Agriculture, Natural Resources and Human Sciences
Texas A&M University-Kingsville,
Kingsville, TX

Date

Don Gohmert — 11/13/08

Don Gohmert
Acting State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

9/3/09

National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

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

**and**

**TEXAS A&M UNIVERSITY**
**KINGSVILLE, TEXAS**

# NOTICE OF RELEASE OF GOLIAD GERMPLASM ORANGE ZEXMENIA SELECTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), United States Department of Agriculture (USDA), and Texas A&M University-Kingsville (South Texas Natives Project) announce the release of a selected ecotype of orange zexmenia [*Wedelia texana* (A. Gray) B.L. Turner] for the south Texas ecoregion. Goliad Germplasm is a composite of 7 collections that were tested under the following accession numbers: 9061276, 9064430, 9064456, 9088799, 9089020, 9091935, and 9091956.

As a selected release, this plant will be referred to as Goliad Germplasm orange zexmenia. It has been assigned the NRCS accession number 9093441. Goliad Germplasm is released as a selected class of certified seed (natural track).

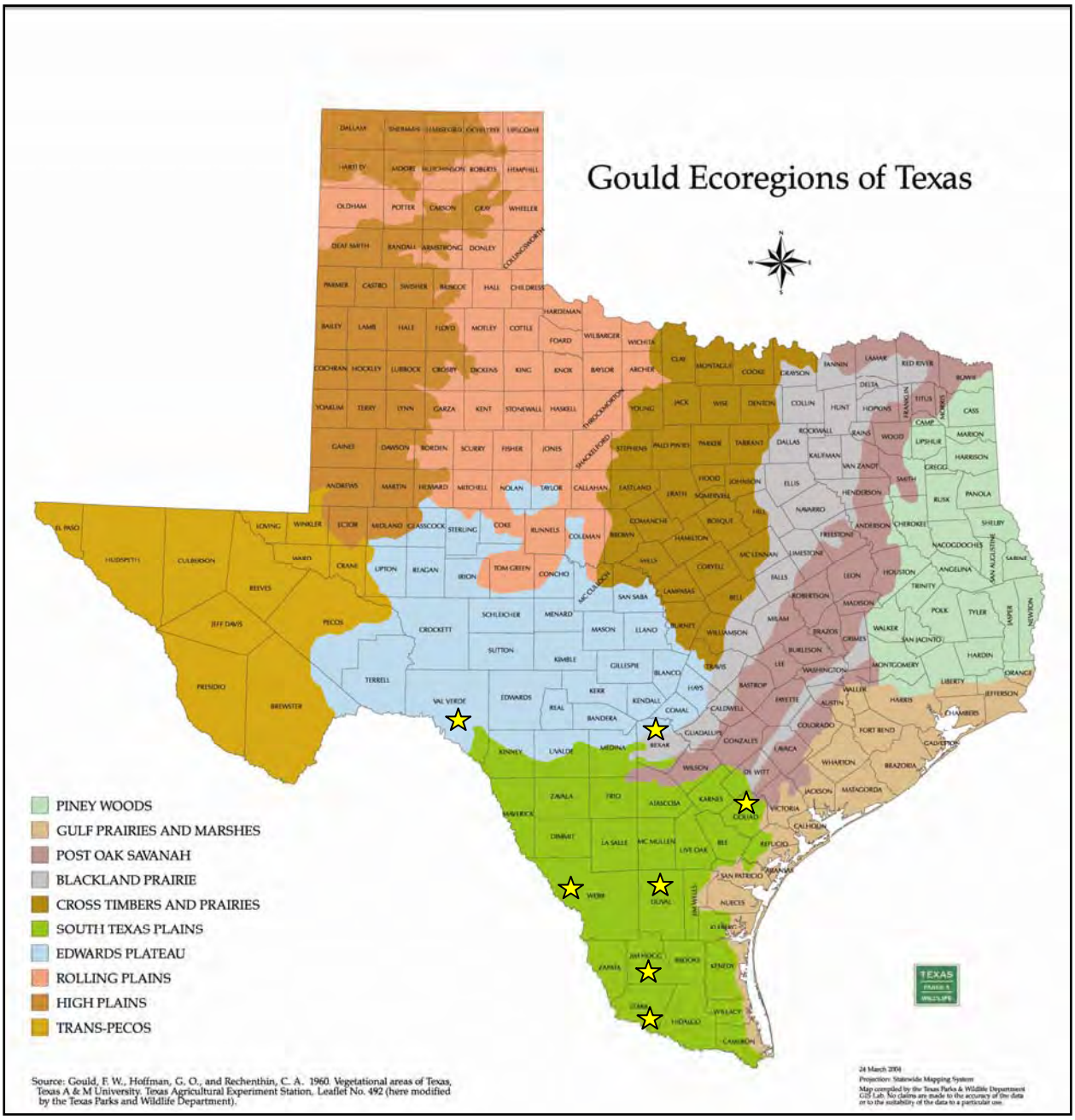
This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted orange zexmenia. The potential for immediate use is high especially in range seeding mixes for restoration, diversification, and wildlife habitat.

**Collection Site Information:** Table 1 shows the origin and collection information of the accessions. Each accession is made up of seed obtained from a single wild population of orange zexmenia (Figure 1). Seed was collected from the wild, then cleaned and stored at the E. "Kika" de la Garza Plant Materials Center (PMC), in Kingsville, TX. Seedlings were grown from these field collections for evaluation.

**Description:** Orange zexmenia is a native Texas sub-shrub 5-10 dm tall. The stems are usually solitary, rather stiff, and woody at the base. The many branches and leaves are covered with rough stiff hairs. The leaves are simple, ovate-lanceolate, sessile or nearly so, mostly opposite, and 5-7.6 cm long. There are a few teeth on either margin of the leaves, the lower pair of which may be more prominent or even lobed. Leaves are generally scabrous or strigose on both sides and turn black after drying.

The flower stems are terminal and solitary or occasionally in a cyme of three. The flower heads are about 3 cm across. The involucre is in 2 rows generally less than 1 cm broad. The outer phyllaries are strigose and lanceolate. The ray flowers are broad, conspicuous, 7-15 in number, with the corollas being yellow or orange. The pappus is spiny with ciliate on the spine margins.

**Figure 1. Source counties of the Goliad Germplasm (not precise location of the collection).**



The disk flowers are yellow to yellow-orange with a pappus of 2 spines about 1/2 to 2/3 the length of disk florets. The fruit is a ciliate, pubescent achene. Achenes of the ray flowers are commonly 3 angled, with 2 or occasionally 3 wings. Achenes of the disk flowers are broadly 2-winged or with the wings reduced to 2 upwardly directed auricles. The plants bloom and produce seed from March to December.

It is frequent on various soils in openings and partially shaded brushy sites in the Edwards Plateau and Rio Grande Plains. It is less frequent in the Trans Pecos and southeast and north central Texas. It can also be found in northeastern Mexico, southeast to Veracruz and Hidalgo. It is browsed by white-tailed deer, cattle, sheep, and goats.

**Potential Uses:** Orange zexmenia occurs throughout southern Texas, but no regionally adapted, commercially available seed stock is available for rangeland restoration in South Texas. Orange zexmenia is recommended for upland wildlife plantings, native landscaping, and in range seeding mixes. It also can be used in many types of conservation plantings, such as stream-side buffers and filter strips.

**Method of Breeding and Selection:**

***Initial evaluation:*** Initial evaluations of orange zexmenia began in 1994 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 42 accessions of orange zexmenia were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accession 9064456 was one of the top performing accessions of orange zexmenia for survival, vigor, growth form and development, and disease resistance (see Table 2).

In conjunction with the development of the South Texas Natives Project, renewed interest and priority status was revived for orange zexmenia. A new initial evaluation was started in the spring of 2001. Fourteen collections of orange zexmenia were transplanted to field plots at the PMC in May 2001. Seed was collected from these accessions and germination tests were performed for both 2001 and 2002 harvests (Table 3).

**Table 1. Origin and collection information for accessions that make up the Selected Plant Material release of orange zexmenia**.

| Accession | Date | County | Soil Type |
|---|---|---|---|
| 9061276 | 10/25/90 | Val Verde | Silty clay loam |
| 9064430 | 05/19/92 | Starr | Clay |
| 9064456 | 07/20/93 | Goliad | Sandy clay loam |
| 9088799 | 07/01/02 | Webb | Clay loam |
| 9089020 | 08/08/02 | Duval | Sandy loam |
| 9091935 | 06/16/04 | Jim Hogg | Sand |
| 9091956 | 11/04/03 | Bexar | Loam |

The field plot was evaluated for plant performance from 2001 through 2003. Plant characteristics evaluated were survival, density, resistance, uniformity, and seed production (Table 3). Based on plant performance during the initial evaluation of 1994 and the initial evaluation of 2001, 3 accessions were selected for release by the PMC: 9061276, 9064430, and 9064456.

South Texas Natives also planted initial evaluation plots in 2005. Seventeen accessions were planted at Rio Farms (4/8/2005, Delfina fine sandy loam soil type) (Table 4) and 22 accessions at AgriLife Research Uvalde (4/6/2005, Uvalde silty clay loam soil type) (Table 5). Seed was collected three times during the summer of 2005 at AgriLife Research Uvalde, bulked by accession and tested for active germination on 6/27/2006. No germination tests were conducted on seed grown at Rio Farms during the evaluation period. White flies severely attacked most of the plants each year in Uvalde between August and September; however despite being completely defoliated all plants survived. Bordered patch butterfly larvae have defoliated the plants at Rio Farms on two occasions from June to July. No other serious insect problems have been associated with orange zexmenia. Bobwhite quail have frequently been flushed out of the plots at both locations. Quail at Rio Farms have been observed foraging and eating seed off of the weedmat. Deer have occasionally browsed the plots at AgriLife Research Uvalde, especially during the winter months.

**Table 2. Orange zexmenia initial evaluation data from the PMC in Kingsville for 1997-1998**.

| Acc# | Location | Rank Veg. F 97 | Rank Seed F 97 | Rank Veg. S 98 | Rank Seed S 98 | Germ % Jan 94 | Seed Year Used | Germ % May 98 | Seed Year Used |
|---|---|---|---|---|---|---|---|---|---|
| 260 | Goliad | 11 | 11 | 6 | 11 | 16 | 90 | 21 | 90 |
| 281 | El Dorado | 7 | 9 | 15 | 14 | 9 | 90 | 10 | 90 |
| 342 | Gonzales | 8 | 12 | 3 | 2 | 9 | 91 | 14 | 91 |
| 351 | Sequin | 14 | 15 | 14 | 9 | 13 | 91 | 11 | 91 |
| 353 | Burnet | 16 | 16 | 9 | 15 | 11 | 91 | 33 | 91 |
| 356 | Hondo | 9 | 8 | 4 | 13 | 8 | 91 | 8 | 91 |
| 357 | Austin | 13 | 7 | 8 | 10 | 5 | 91 | 9 | 91 |
| 358 | Lockhart | 4 | 4 | 5 | 5 | 20 | 91 | 27 | 91 |
| 359 | Lockhart | 10 | 13 | 13 | 8 | 18 | 91 | 17 | 91 |
| 386 | Gonzales | 15 | 10 | 16 | 4 | 21 | 92 | 7 | 92 |
| 414 | Cuero | 5 | 6 | 1 | 1 | 13 | 92 | 1 | 92 |
| 421 | Sanderson | 3 | 3 | 10 | 16 | 7 | 92 | 21 | 92 |
| 423 | Goliad | 6 | 5 | 11 | 12 | 23 | 92 | 23 | 92 |
| 437 | Bandera | 2 | 1 | 12 | 6 | 36 | 93 | 35 | 93 |
| 456 | Goliad | 1 | 2 | 2 | 3 | 24 | 93 | 18 | 93 |
| 784 | Comal | 12 | 14 | 7 | 7 | 9 | 90 | 15 | 90 |

**Table 3. Orange zexmenia initial evaluation data from the PMC in Kingsville for 2001-2003**.

| Acc# | 9064403 | 9064366 | 9064342 | 9064414 | 9061276 | 9064386 | 9064423 | 9064361 | 9064365 | 9064456 | 9064362 | 9064430 | 9064356 | 9061261 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **County** | Frio | Karnes | Gonzales | DeWitt | Val Verde | Gonzales | Goliad | Goliad | Medina | Goliad | McMullen | Starr | Goliad | Goliad |
| **Year Collected** | 1992 | 1991 | 1991 | 1992 | 1990 | 1992 | 1992 | 1991 | 1991 | 1993 | 1990 | 1992 | 1991 | 1990 |
| **Original Seed left** | 0 | 20.9 | 6.2 | 1.8 | 5.7 | 13.8 | 81.2 | 44.2 | 0 | 36.3 | 0 | 0 | 63.2 | 0 |
| **Greenhouse Germ. 01** | 32% | 15% | 29 | 15 | 11 | 38% | 19% | 18% | 15% | 15% | 12% | 9% | 5% | 2% |
| **2001 Harvest-total** | 88.9 | 40.9 | 37.2 | 6.9 | 23.9 | 42.9 | 33.1 | 22.6 | 65.3 | 23.1 | 33.5 | 24.7 | - | - |
| **2001 Harvest-germ** | 52% | 36% | 62% | 18% | 40% | 50% | 30% | 20% | 76% | 54% | 22% | 22% | - | - |
| **2002 Harvest-total** | 167.3 | 106.3 | 233.4 | 72.5 | 113.8 | 217.8 | 46.4 | 50.4 | 146.1 | 51.9 | 72.6 | 131.4 | 13 | 0.3 |
| **2002 Harvest-germ** | 40% | 22% | 32% | 10% | 62% | 44% | 30% | 26% | 56% | 36% | 32% | 22% | 54% | 8% |
| **2003 Harvest-total** | 93.5 | 50.5 | 114 | 59 | 57 | 58 | 46 | 62 | 49 | 59 | 47 | 50 | 140 | 18 |
| **2003 Harvest-germ** | 54% | 39% | 55% | 36% | 29% | 54% | 53% | 32% | 85% | 40% | 43% | 48% | 59% | 47% |
| **2001-Field Obs.** | | | | | | | | | | | | | | |
| **survival** | 92% | 100% | 100 | 100 | 75 | 96% | 88% | 100% | 92% | 100% | 100% | 100% | - | - |
| **density** | 6 | 6.6 | 6.6 | 7 | 6.8 | 6.5 | 7 | 6.8 | 7 | 7.1 | 6.8 | 6.8 | - | - |
| **resistance** | 5.8 | 5.4 | 5.8 | 5.9 | 6.1 | 5.8 | 5.8 | 5.8 | 6.1 | 6 | 5.8 | 5.8 | - | - |
| **uniformity** | 6.1 | 5.8 | 4.5 | 5.9 | 5.9 | 5.5 | 3.9 | 6.5 | 5.5 | 6.3 | 4 | 4.8 | | |
| **seed prod.** | 4.5 | 4.5 | 4.5 | 5.5 | 4 | 3.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4 | 3.5 | - | - |
| **2002-Field Obs.** | | | | | | | | | | | | | | |
| **survival** | 96% | 98% | 100 | 98 | 100 | 100% | 100% | 98% | 97% | 100% | 100% | 100% | 98% | 83% |
| **density** | 6 | 5.2 | 5 | 5.2 | 6.7 | 5.5 | 5.5 | 5 | 6.2 | 5 | 5 | 4.7 | 5.3 | 5.8 |
| **resistance** | 5.5 | 5.5 | 5.2 | 5.7 | 7 | 5.7 | 5.5 | 5 | 6.2 | 5.3 | 5.5 | 5.5 | 5.3 | 5.3 |
| **uniformity** | 5.5 | 5.8 | 5.5 | 5.7 | 6.5 | 5.8 | 6 | 6 | 6.2 | 5.7 | 5.5 | 5.3 | 6 | 5 |
| **seed prod.** | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 5.4 | 6 | 5 | 5 | 5 | 5 | 6.3 |
| **2003-Field Obs.** | | | | | | | | | | | | | | |
| **survival** | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **regrowth** | 100% | 100% | 10 | 100 | 100 | 100% | 100% | 100% | 80% | 100% | 100% | 100% | 100% | 100% |
| **vigor** | 5.75 | 6.75 | 6 | 5.25 | 7 | 7 | 5.25 | 5.5 | 7 | 4.5 | 5.75 | 6.25 | 5.75 | 5.75 |
| **density** | 5.75 | 6.25 | 6.25 | 5 | 7 | 7 | 5.5 | 5.5 | 7.25 | 4.75 | 5.75 | 6.5 | 6 | 5.75 |
| **resistance** | 5.75 | 6.25 | 6 | 5.25 | 7 | 7 | 5.25 | 5.5 | 6.75 | 4.75 | 6 | 6.25 | 5.75 | 5.75 |
| **uniformity** | 6.25 | 6 | 5.75 | 5.25 | 6.25 | 6.25 | 5.25 | 5.75 | 5.75 | 5 | 5.25 | 7 | 5.25 | 5.25 |
| **seed prod.** | 6.5 | 7.5 | 6.75 | 6.5 | 7 | 7 | 6.5 | 6.5 | 6.75 | 5.25 | 6.5 | 6.5 | 6.5 | 6.5 |
| **seed shatter** | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

Field Observations: 1 = best & 10 = worst rank

Indicates above average performance

## Table 4. Orange zexmenia evaluation data from South Texas Natives at Rio Farms for 2005-2006.

| Accession | 9061276 | 9064430 | 9064456 | 9086293 | 9088580 | 9088799 | 9088936 | 9088939 | 9088944 | 9089020 | 9090526 | 9090531 | 9090626 | 9090640 | 9090711 | 9090718 | 9091886 | 9091906 | 9091913 | 9091922 | 9091935 | 9091943 | 9093178 | 9091956 | 9091929 | NAS | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County | Val Verde | Starr | Goliad | Starr | Live Oak | Webb | Frio | Atascosa | Atascosa | Duval | Duval | Duval | Kinney | Kinney | Frio | Bexar | Starr | Jim Hogg | Webb | Dimmit | Jim Hogg | Webb | Bexar | Bexar | Zavala | Kimble | |
| Soil type | silty clay loam | clay | sandy clay loam | sandy loam | clay | clay loam | sandy loam | clay loam | caliche loam | sandy loam | loam (gravelly hill) | loamy sand | loam | gravel | gravel | loam | loam | sand | loam | gravel | sand | sandy loam | loam | loam | sand | ? | |
| 2005-2006 Survival | x | 100 | 100 | 12 | 66 | 83 | 33 | 89 | 66 | 93 | x | 30 | x | 31 | 40 | 61 | x | 57 | 0 | x | 66 | x | 42 | 43 | 26 | 77 | 55.75 |
| 2005 Vigor | x | x | x | 2.14 | 2.25 | 1.86 | 2.43 | 2.29 | 2.29 | 2.00 | x | 2.71 | x | 2.43 | 2.50 | 2.14 | x | 2.14 | 2.00 | x | 1.43 | x | 2.57 | 2.29 | 2.57 | x | 2.24 |
| 2006 Vigor | x | 2.33 | 2.17 | 3.20 | 4.00 | 3.50 | 4.17 | 2.33 | 3.33 | 2.17 | x | 3.80 | x | 4.17 | 2.67 | 4.50 | x | 3.17 | 5.50 | x | 2.00 | x | 3.67 | 4.00 | 4.33 | 3.20 | 3.41 |
| 2005 Foliage density | x | x | x | 2.57 | 3.25 | 2.14 | 3.00 | 2.14 | 2.43 | 2.14 | x | 3.14 | x | 2.57 | 3.25 | 2.43 | x | 2.57 | 3.00 | x | 1.86 | x | 3.43 | 3.14 | 2.86 | x | 2.70 |
| 2006 Foliage density | x | 2.17 | 2.17 | 3.80 | 4.67 | 3.33 | 4.67 | 1.67 | 3.33 | 2.33 | x | 3.20 | x | 3.83 | 2.67 | 5.17 | x | 3.33 | 5.00 | x | 2.83 | x | 4.00 | 4.33 | 3.83 | 3.40 | 3.49 |
| 2005 Uniformity | x | x | x | 2.43 | 1.75 | 1.86 | 2.57 | 2.71 | 2.00 | 2.43 | x | 2.29 | x | 2.43 | 2.50 | 2.14 | x | 2.14 | 2.25 | x | 1.57 | x | 2.57 | 2.71 | 2.57 | x | 2.29 |
| 2006 Uniformity | x | 1.67 | 1.33 | 2.00 | 4.00 | 1.50 | 1.83 | 2.00 | 2.00 | 1.67 | x | 2.60 | x | 2.00 | 2.00 | 2.83 | x | 2.00 | 2.00 | x | 1.83 | x | 2.00 | 2.17 | 2.00 | 1.40 | 2.04 |
| 2005 Developement sta | x | x | x | 1.29 | 1.25 | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 | x | 1.29 | x | 1.17 | 1.25 | 1.29 | x | 1.29 | 1.25 | x | 1.29 | x | 1.29 | 1.29 | 1.29 | x | 1.27 |
| 2006 Developement sta | x | 1.33 | 1.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | x | 1.00 | x | 1.00 | 1.00 | 1.00 | x | 1.00 | 1.00 | x | 1.00 | x | 1.00 | 1.00 | 1.00 | 1.20 | 1.04 |
| 05 Seed production | x | x | x | 2.71 | 2.75 | 3.00 | 3.00 | 2.00 | 3.00 | 2.14 | x | 2.43 | x | 3.14 | 3.25 | 1.86 | x | 2.00 | 2.50 | x | 1.14 | x | 3.14 | 2.71 | 3.43 | x | 2.60 |
| 06 Seed production | x | 2.00 | 2.17 | 3.40 | 5.00 | 3.83 | 5.17 | 1.83 | 3.33 | 2.33 | x | 3.80 | x | 3.67 | 2.67 | 4.33 | x | 2.83 | 6.50 | x | 2.00 | x | 3.67 | 4.17 | 4.33 | 4.20 | 3.56 |
| 05 Forage production | x | x | x | 2.29 | 3.00 | 2.29 | 2.86 | 2.29 | 2.43 | 1.86 | x | 3.14 | x | 3.14 | 3.50 | 2.29 | x | 2.14 | 2.75 | x | 1.43 | x | 3.57 | 3.14 | 3.14 | x | 2.66 |
| 06 Forage production | x | 1.67 | 2.17 | 3.00 | 4.67 | 3.67 | 4.50 | 2.50 | 3.67 | 2.33 | x | 3.60 | x | 4.00 | 2.33 | 5.17 | x | 3.00 | 6.00 | x | 2.00 | x | 4.33 | 3.67 | 4.50 | 4.80 | 3.58 |
| 2005 Plant height | x | x | x | 2.43 | 2.25 | 1.43 | 2.57 | 2.14 | 2.29 | 2.14 | x | 2.57 | x | 3.14 | 3.25 | 1.86 | x | 1.71 | 2.00 | x | 1.14 | x | 3.14 | 2.71 | 3.00 | x | 2.34 |
| 2006 Plant height | x | 1.67 | 2.00 | 2.00 | 4.00 | 2.80 | 3.00 | 2.20 | 2.60 | 2.00 | x | 2.80 | x | 3.40 | 2.00 | 4.00 | x | 2.40 | 4.50 | x | 1.60 | x | 3.67 | 3.40 | 4.00 | 4.20 | 2.91 |
| 05 Mean evaluation sco | x | x | x | 2.27 | 2.36 | 1.98 | 2.53 | 2.12 | 2.24 | 2.00 | x | 2.51 | x | 2.57 | 2.79 | 2.00 | x | 2.00 | 2.25 | x | 1.41 | x | 2.82 | 2.57 | 2.69 | x | 2.30 |
| 06 Mean evaluation sco | x | 1.73 | 1.79 | 3.43 | 3.92 | 2.70 | 3.92 | 1.94 | 2.91 | 1.85 | x | 3.48 | x | 3.63 | 2.67 | 3.88 | x | 2.84 | 4.94 | x | 2.16 | x | 3.54 | 3.59 | 4.00 | 3.18 | 3.10 |

Indicates > mean performance at Rio Farms

Selected accessions

1 good - 9 poor

## Table 5. Orange zexmenia evaluation data from South Texas Natives at AgriLife Research Uvalde for 2005-2006.

| Accession | 9061276 | 9064430 | 9064456 | 9086293 | 9088580 | 9088799 | 9088936 | 9088939 | 9088944 | 9089020 | 9090526 | 9090531 | 9090626 | 9090640 | 9090711 | 9090718 | 9091886 | 9091906 | 9091913 | 9091922 | 9091935 | 9091943 | 9093178 | 9091956 | 9091929 | NAS | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County | Val Verde | Starr | Goliad | Starr | Live Oak | Webb | Frio | Atascosa | Atascosa | Duval | Duval | Duval | Kinney | Kinney | Frio | Bexar | Starr | Jim Hogg | Webb | Dimmit | Jim Hogg | Webb | Bexar | Bexar | Zavala | Kimble | |
| Soil type | silty clay loam | clay | sandy clay loam | sandy loam | clay | clay loam | sandy loam | clay loam | caliche loam | sandy loam | (gravelly hill) | loamy sand | loam | gravel | gravel | loam | loam | sand | loam | gravel | sand | sandy loam | loam | loam | sand | ? | |
| 2005-2006 Survival | 100 | 100 | x | 100 | 85 | 100 | 88 | 90 | 83 | 100 | 100 | 94 | 85 | 100 | 100 | 100 | 66 | 89 | 87 | 100 | 83 | 100 | 94 | 94 | 84 | x | 92.58 |
| 2005 Vigor | 2.40 | x | x | 2.80 | 2.20 | 2.70 | 2.90 | 3.10 | 2.90 | 2.70 | 2.00 | 2.50 | 2.60 | 2.70 | 3.30 | 2.90 | 4.00 | 2.70 | 2.30 | 3.40 | 2.50 | 2.20 | 2.60 | 2.40 | 2.90 | x | 2.67 |
| 2006 Vigor | 2.40 | 2.00 | x | 3.00 | 1.80 | 2.40 | 2.50 | 3.40 | 2.89 | 2.90 | 3.40 | 1.80 | 2.40 | 2.20 | 2.60 | 3.00 | 4.57 | 2.50 | 2.10 | 3.60 | 1.90 | 2.00 | 3.20 | 2.60 | 2.10 | x | 2.64 |
| 2005 Foliage density | 3.00 | x | x | 2.80 | 2.10 | 2.60 | 3.10 | 2.70 | 2.70 | 2.30 | 2.40 | 2.40 | 2.60 | 2.60 | 2.90 | 2.90 | 4.29 | 2.40 | 2.30 | 2.80 | 2.40 | 2.60 | 2.60 | 2.50 | 2.40 | x | 2.55 |
| 2006 Foliage density | 2.50 | 3.00 | x | 2.88 | 2.13 | 2.63 | 2.75 | 2.63 | 2.29 | 2.25 | 3.75 | 2.13 | 2.38 | 2.00 | 2.63 | 3.00 | 4.86 | 2.25 | 2.38 | 3.00 | 1.88 | 3.00 | 3.13 | 3.13 | 2.38 | x | 2.70 |
| 2005 Uniformity | 3.20 | x | x | 2.70 | 2.50 | 2.20 | 2.70 | 2.90 | 3.30 | 2.80 | 2.80 | 2.50 | 2.80 | 2.80 | 3.10 | 3.00 | 3.29 | 2.30 | 2.20 | 3.00 | 2.50 | 2.40 | 2.40 | 2.60 | 2.50 | x | 2.57 |
| 2006 Uniformity | 2.20 | 1.00 | x | 3.10 | 2.50 | 2.70 | 2.50 | 2.70 | 3.11 | 2.10 | 2.20 | 2.60 | 2.60 | 2.00 | 3.20 | 2.80 | 2.29 | 3.10 | 1.90 | 3.40 | 2.40 | 2.20 | 3.40 | 3.00 | 2.30 | x | 2.55 |
| 2005 Developement sta | 1.20 | x | x | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.50 | 2.29 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | x | 1.20 |
| 2006 Developement sta | 2.00 | 4.00 | x | 1.88 | 1.88 | 1.63 | 1.75 | 2.50 | 2.29 | 2.38 | 1.75 | 1.75 | 1.88 | 1.75 | 1.75 | 1.88 | 3.71 | 1.88 | 1.88 | 2.75 | 1.75 | 1.75 | 2.00 | 1.75 | 1.75 | x | 2.09 |
| 05 Seed production | 3.20 | x | x | 3.10 | 2.60 | 2.50 | 3.20 | 3.10 | 3.20 | 3.50 | 2.60 | 2.60 | 3.10 | 3.70 | 3.40 | 2.90 | 5.00 | 2.70 | 2.10 | 2.80 | 2.60 | 1.60 | 2.40 | 2.40 | 2.70 | x | 2.42 |
| 06 Seed production | 3.40 | 4.00 | x | 3.10 | 2.00 | 2.50 | 2.80 | 3.67 | 3.67 | 3.50 | 3.80 | 1.90 | 2.78 | 1.70 | 3.00 | 3.20 | 5.75 | 3.22 | 2.00 | 2.67 | 1.90 | 3.00 | 2.67 | 2.40 | 2.20 | x | 2.95 |
| 05 Forage production | 2.80 | x | x | 2.60 | 2.40 | 2.70 | 3.20 | 3.40 | 3.20 | 2.70 | 2.40 | 2.80 | 2.60 | 2.70 | 3.60 | 3.00 | 6.14 | 2.50 | 2.30 | 3.00 | 2.60 | 2.60 | 2.40 | 2.40 | 3.10 | x | 2.68 |
| 06 Forage production | 3.00 | 4.00 | x | 2.90 | 2.00 | 2.60 | 3.00 | 3.80 | 2.89 | 3.30 | 3.80 | 2.00 | 2.60 | 1.90 | 2.80 | 3.10 | 6.57 | 2.50 | 2.20 | 3.80 | 1.90 | 2.80 | 2.70 | 2.50 | 2.20 | x | 2.95 |
| 2005 Plant height | 2.40 | x | x | 2.60 | 2.40 | 2.50 | 3.10 | 3.40 | 3.00 | 2.90 | 2.20 | 2.50 | 2.60 | 2.50 | 3.60 | 2.90 | 5.43 | 2.60 | 2.00 | 3.20 | 2.40 | 2.40 | 2.40 | 2.20 | 3.00 | x | 2.60 |
| 2006 Plant height | 2.25 | 2.00 | x | 2.13 | 1.50 | 1.88 | 2.25 | 3.38 | 2.86 | 3.00 | 2.50 | 1.75 | 2.13 | 1.25 | 2.25 | 2.38 | 6.43 | 2.38 | 2.25 | 3.75 | 1.25 | 1.50 | 2.38 | 2.00 | 1.38 | x | 2.37 |
| 05 Mean evaluation sc | 2.60 | x | x | 2.54 | 2.20 | 2.34 | 2.77 | 2.83 | 2.79 | 2.59 | 2.23 | 2.36 | 2.50 | 2.60 | 3.01 | 2.73 | 4.35 | 2.34 | 2.06 | 2.77 | 2.31 | 2.14 | 2.29 | 2.24 | 2.54 | x | 2.38 |
| 06 Mean evaluation sc | 2.34 | 2.63 | x | 2.50 | 1.98 | 2.17 | 2.44 | 2.88 | 2.75 | 2.55 | 2.78 | 1.87 | 2.34 | 1.73 | 2.40 | 2.54 | 4.77 | 2.48 | 2.09 | 3.00 | 1.87 | 2.16 | 2.56 | 2.30 | 2.04 | x | 2.46 |
| 05 harvest germ. | 45.33 | x | x | 55.3 | 22.0 | 62.0 | 51.3 | 48.7 | 62.7 | 64.7 | 55.3 | 72.0 | 32.7 | 64.0 | 60.0 | 84.7 | x | 71.3 | 60.0 | 73.3 | 74.0 | x | 66.0 | 64.0 | 58.7 | x | 58.36 |

Indicates>mean performance at TAES Uvalde

Selected accessions

1 good - 9 poor

## Table 6. South Texas Natives evaluation of selected accessions 2005-2006.

| Accession | 9061276 | 9064430 | 9064456 | 9088799 | 9089020 | 9091935 | 9091956 | Mean |
|---|---|---|---|---|---|---|---|---|
| County | Val Verde | Starr | Goliad | Webb | Duval | Jim Hogg | Bexar | |
| Soil type | silty clay loam | clay | sandy clay loam | clay loam | sandy loam | sand | loam | |
| | | | | | | | | |
| 2005-2006 AgriLife Research Uvalde Survival | 100 | 100 | x | 100 | 100 | 83 | 94 | 92.58 |
| 2005-2006 Rio Farms Survival | x | 100 | 100 | 83 | 93 | 66 | 43 | 55.75 |
| | | | | | | | | |
| 2005 Rio Farms Vigor | x | x | x | 1.86 | 2.00 | 1.43 | 2.29 | 2.24 |
| 2006 Rio Farms Vigor | x | 2.33 | 2.17 | 3.50 | 2.17 | 2.00 | 4.00 | 3.41 |
| 2005 AgriLife Research Uvalde Vigor | 2.40 | x | x | 2.70 | 2.70 | 2.50 | 2.40 | 2.67 |
| 2006 AgriLife Research Uvalde Vigor | 2.40 | 2.00 | x | 2.40 | 2.90 | 1.90 | 2.60 | 2.64 |
| | | | | | | | | |
| 2005 Rio Farms Foliage density | x | x | x | 2.14 | 2.14 | 1.86 | 3.14 | 2.70 |
| 2006 Rio Farms Foliage density | x | 2.17 | 2.17 | 3.33 | 2.33 | 2.83 | 4.33 | 3.49 |
| 2005 AgriLife Research Uvalde Foliage density | 3.00 | x | x | 2.60 | 2.30 | 2.40 | 2.50 | 2.55 |
| 2006 AgriLife Research Uvalde Foliage density | 2.50 | 3.00 | x | 2.63 | 2.25 | 1.88 | 3.13 | 2.70 |
| | | | | | | | | |
| 2005 Rio Farms Uniformity | x | x | x | 1.86 | 2.43 | 1.57 | 2.71 | 2.29 |
| 2006 Rio Farms Uniformity | x | 1.67 | 1.33 | 1.50 | 1.67 | 1.83 | 2.17 | 2.04 |
| 2005 AgriLife Research Uvalde Uniformity | 3.20 | x | x | 2.20 | 2.80 | 2.50 | 2.60 | 2.57 |
| 2006 AgriLife Research Uvalde Uniformity | 2.20 | 1.00 | x | 2.70 | 2.10 | 2.40 | 3.00 | 2.55 |
| | | | | | | | | |
| 2005 Rio Farms Developement stage | x | x | x | 1.29 | 1.29 | 1.29 | 1.29 | 1.27 |
| 2006 Rio Farms Developement stage | x | 1.33 | 1.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.04 |
| 2005 AgriLife Research Uvalde Developement stage | 1.20 | x | x | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| 2006 AgriLife Research Uvalde Developement stage | 2.00 | 4.00 | x | 1.63 | 2.38 | 1.75 | 1.75 | 2.09 |
| | | | | | | | | |
| 2005 Rio Farms Seed production | x | x | x | 3.00 | 2.14 | 1.14 | 2.71 | 2.60 |
| 2006 Rio Farms Seed production | x | 2.00 | 2.17 | 3.83 | 2.33 | 2.00 | 4.17 | 3.56 |
| 2005 AgriLife Research Uvalde Seed production | 3.20 | x | x | 2.50 | 3.50 | 2.60 | 2.40 | 2.42 |
| 2006 AgriLife Research Uvalde Seed production | 3.40 | 4.00 | x | 2.50 | 3.50 | 1.90 | 2.40 | 2.95 |
| | | | | | | | | |
| 2005 Rio Farms Forage production | x | x | x | 2.29 | 1.86 | 1.43 | 3.14 | 2.66 |
| 2006 Rio Farms Forage production | x | 1.67 | 2.17 | 3.67 | 2.33 | 2.00 | 3.67 | 3.58 |
| 2005 AgriLife Research Uvalde Forage production | 2.80 | x | x | 2.70 | 2.70 | 2.60 | 2.40 | 2.68 |
| 2006 AgriLife Research Uvalde Forage production | 3.00 | 4.00 | x | 2.60 | 3.30 | 1.90 | 2.50 | 2.95 |
| | | | | | | | | |
| 2005 Rio Farms Plant height | x | x | x | 1.43 | 2.14 | 1.14 | 2.71 | 2.34 |
| 2006 Rio Farms Plant height | x | 1.67 | 2.00 | 2.80 | 2.00 | 1.60 | 3.40 | 2.91 |
| 2005 AgriLife Research Uvalde Plant height | 2.40 | x | x | 2.50 | 2.90 | 2.40 | 2.20 | 2.60 |
| 2006 AgriLife Research Uvalde Plant height | 2.25 | 2.00 | x | 1.88 | 3.00 | 1.25 | 2.00 | 2.37 |
| | | | | | | | | |
| 2005 Rio Farms Mean evaluation score | x | x | x | 1.98 | 2.00 | 1.41 | 2.57 | 2.30 |
| 2006 Rio Farms Mean evaluation score | x | 1.73 | 1.79 | 2.70 | 1.85 | 2.16 | 3.59 | 3.10 |
| 2005 AgriLife Research Uvalde Mean evaluation score | 2.60 | x | x | 2.34 | 2.59 | 2.31 | 2.24 | 2.38 |
| 2006 AgriLife Research Uvalde Mean evaluation score | 2.34 | 2.63 | x | 2.17 | 2.55 | 1.87 | 2.30 | 2.46 |
| | | | | | | | | |
| 2005 AgriLife Research Uvalde harvest (active germ.) | 45.33 | x | x | 62.00 | 64.67 | 74.00 | 64.00 | 58.36 |

| | |
|---|---|
| | Indicates >mean performance at Rio Farms |
| | Indicates>mean performance at AgriLife Research Uvalde |

For selection, data was sorted by evaluation site, year and evaluation type, and averaged by accession. Accessions that showed above average performance in the greatest number of categories at each location, and above average performance at each location were selected. Accession 9088799-Webb and 9091935-Jim Hogg were selected because they showed excellent performance in most categories at both evaluation sites (Tables 4-6). Accession 9089020-Duval was selected because of its excellent performance at Rio Farms (Table 4 and 6) and accession 9091956-Bexar was selected for excellent performance at AgriLife Research Uvalde (Table 5 and 6).

***Seed production:*** Orange zexmenia can be harvested with a combine. When harvesting orange zexmenia, run the combine's cylinder speed at 900 RPM, the convave at 6 mm, the sieve open at ¼", and the fan off. Orange zexmenia can also be harvested using a weed eater with a stripper attachment. Evaluation plots at the PMC have been harvested for several years with a combine. Seed yield of these plots has averaged 60 pounds of seed/ acre. There are approximately 140,520 seeds in a pound of orange zexmenia.

Orange zexmenia seed is cleaned initially using a "Westrup" brush machine to dislodge the seeds from the seedheads. Once the seed is dislodged, it is processed through a clipper style seed cleaner. The seed of orange zexmenia is an achene and appears similar to a sunflower seed but smaller. The seed comes in two basic shapes, depending on if it was formed by a ray or a disk flower. One shape is triangular and the other is triangular with wings along the sides of the seed coat. The seeds with wings are more difficult to separate out, as the wings cause the seeds to blow away with the chaff during separation with air. A germination test was performed in August 2002 to determine if the seeds with wings had good enough germination to warrant the added effort to keep them during cleaning. Two accessions that had previously exhibited good germination (accessions 9064403 and 9064423) were selected for observation. One hundred seeds (50 regular and 50 winged) were tested for each accession (Table 7). It was determined that seeds of both types should be kept during cleaning, since the germination results were so close. It is recommended that after cleaning, the seed should be stored at 45$^{o}$F and less than 50% humidity.

**Table 7. Orange zexmenia winged seed study from 2001 harvest**.

| Accession | Wings on Seed | 8 days (%) | 20 days (%) | 28 days (%) |
|---|---|---|---|---|
| 9064403 | not present | 12 | 50 | 60 |
| | present | 22 | 60 | 68 |
| 9064423 | not present | 8 | 32 | 36 |
| | present | 16 | 32 | 36 |

***Comparative forb trial:*** An evaluation of four forbs for inclusion in range seeding mixes and wildlife food plots was performed at the PMC in 1998. The four forbs evaluated were: Illinois bundleflower (*Desmanthus illinoensis*), awnless bushsunflower (*Simsa calva*), orange zexmenia, and perennial lazy daisy (*Aphanostephus riddellii*). Native, perennial forbs are commonly used in Texas range plantings. Illinois bundleflower is one of the most important native, perennial

legumes currently used in Texas range planting mixes. It is high in protein, readily eaten by both livestock and wildlife, and is often used as an indicator of range condition (Ajilvsgi, 1984). Awnless bushsunflower is another forb native to Texas. In addition, awnless bushsunflower has been found to be a good source of protein for deer (Schweitzer, Bryant, & Wester, 1993). Other native, warm-season forbs have also been shown to provide a palatable food source for livestock and wildlife in Texas (Nelle, 1994). Perennial lazy daisy is also a native, warm-season forb.

Each species was evaluated for survival, plant hardiness, vegetative production, seed production, and other desirable characteristics. The purpose of this study was to evaluate each forb for potential inclusion in range seeding mixes and wildlife food plots for South Texas.

The Four Forb Plot consisted of four replications of four 15-foot sections of bedded rows, each containing 15 plants of a different forb species. Locations of each species within a replication were randomly selected. There was a five-foot wide alley between each replication, and a border row of orange zexmenia transplants on either side of the plot to control for an edge effect. Plants for this plot were grown individually in the greenhouse in seeded cones. They were transplanted by hand into their randomly assigned locations at one-foot intervals in April of 1998. They were irrigated immediately following planting, and as needed throughout the growing season. Plants were observed several times a month, and survival, hardiness, vegetative production, and seed production were all recorded. On December 1, 1998, all rows were evaluated for plant survival.

**Table 8. Four forb plant survival by species and replication**.

| Species | Replication | # Surviving | % Surviving |
|---|---|---|---|
| Awnless Bushsunflower | 1 | 0 | 0 |
| | 2 | 0 | 0 |
| | 3 | 0 | 0 |
| | 4 | 2 | 13 |
| | **Total Plot** | **2** | **3** |
| Illinois Bundleflower | 1 | 0 | 0 |
| | 2 | 0 | 0 |
| | 3 | 0 | 0 |
| | 4 | 0 | 0 |
| | **Total Plot** | **0** | **0** |
| Orange Zexmenia | 1 | 15 | 100 |
| | 2 | 15 | 100 |
| | 3 | 15 | 100 |
| | 4 | 15 | 100 |
| | **Total Plot** | **60** | **100** |
| Perennial Lazy Daisy | 1 | 15 | 100 |
| | 2 | 13 | 86 |
| | 3 | 14 | 93 |
| | 4 | 15 | 100 |
| | **Total Plot** | **57** | **94** |

In addition, height and width measurements were taken from five randomly selected sample plants from each row. The condition of the plants was also recorded at that time.

Orange zexmenia had the highest survival rate of the four forbs included in the plot, with 100 percent survival for all four replications. Perennial lazy daisy had the second best survival rate at 94% (Table 8). Much of the death loss in the awnless bushsunflower occurred in August of 1998. Most of the plants died suddenly, and upon examination it was noted that roots were spongy-textured. Kleberg County Agricultural Extension Agent, John Ford, confirmed the cause of death of the bush sunflower to be cotton root rot, a soil borne virus. By the beginning of September, 1998, only two awnless bushsunflower survived. The other forbs in the plot appeared to be fairly resistant to the disease. Of the four forbs, orange zexmenia appeared to be the hardiest of the species and also produced the most vegetation. It had 100% survival rate, appeared highly drought and wet tolerant and produced multiple new seedlings near the existing plants.

***Seeding Trials:*** A seeding trial that included orange zexmenia was initiated in 1998. The objective of this field trial was to evaluate a warm-season, native seed mix, which would allow for a diverse combination of grass and forbs in rangeland plantings. Four mixes consisting of a grass and forb mix were compared in 20' by 10' plots. Each mix had four replications planted together in a block in order to guarantee some non-contaminated plots as time progresses. In addition, a fifth repetition of each mix was planted in random order in a four-plot combination block. All four mixes used the same forb combination, which consisted of 0.18 pounds of pure live seed per acre of perennial lazy daisy, 0.93 pounds of pure live seed per acre of Illinois bundleflower (var.'Sabine'), 1 pound of pure live seed per acre of awnless bushsunflower (var. 'Plateau'), and 2 pounds of pure live seed per acre of orange zexmenia. In addition, Mix #1 used 2 pounds of pure live seed per acre of buffelgrass (*Pennisetum ciliare*); Mix #2 consisted of 1 pound of pure live seed per acre each of plains bristlegrass (*Setaria machrostáchya*), two-flower trichloris (*Trichloris crinita*), and four-flower trichloris (*Trichloris pluriflora*); Mix #3 contained 1.5 pounds of pure live seed per acre of the two trichlorises; and Mix #4 had 1.7 pounds of pure live seed per acre of Kleingrass (*Panicum coloratum*, var. 'Verde').

The plantings were made on March 5, 1998, at the PMC in Kingsville, Texas. All plots were on a Victoria Clay soil, and were cultivated prior to planting. Seeds were hand-broadcast, and then pressed into the soil, using a 5-foot cultipacker. Emergence was observed on a daily basis for 60 days after planting. Then observations were made weekly.

At three months, the plots were evaluated for the percent of cover provided by each of the planted species, and the percent of weed cover and bare ground. Data was collected by evaluating ten random 1 foot x 1 foot square locations within each plot. A metal frame was used to mark each location. Ocular estimation was used to evaluate percent of cover provided.

At nine months, the plots were re-evaluated for the percent of cover of each of the planted species and the percent of weed cover and bare ground. The plots were also evaluated for the number of each planted species and weeds per square foot. Data was again collected by evaluating ten random 1 foot by 1 foot square locations within each plot. Ocular estimation was used to evaluate percent of cover. The number of plants of each species was counted.

No grass emerged in any of the plots with the exception of minimal kleingrass in plots containing Mix #4. The kleingrass was found to provide mean cover of only 0.5 percent. The failure of the grasses to emerge may be due to droughty conditions in Kingsville throughout the entire evaluation period. The six month period from March 1998 through August 1998 received only 7.34 inches of rainfall. In addition, the Victoria clay soil tends to form a heavy cap under dry conditions, further inhibiting emergence. With that in mind, the four forbs showed impressive establishment. All four forbs planted emerged and thrived despite droughty conditions and soil capping. All showed some reproductive growth in the spring of 1998. The bushsunflower provided 13.8% of total plot cover, and seemed especially drought tolerant. The lazy daisy provided 3.4% of actual cover and the Illinois bundleflower provided 2.82%. Orange zexmenia, the fourth forb species provided 2.03% of total plot cover, while weeds provided 8.06 percent. The remaining 69.65% was bare ground (Table 9).

By the fall of 1998, bushsunflower had 25% cover, with an average of 2.14 plants per square foot. This was followed by orange zexmenia, with 11.47% of plot cover and an average of 1.1 plants per square foot. Lazy daisy made up 4.5% of total cover and averaged 0.57 plants per square foot. Illinois bundleflower averaged only 0.1150 plants per square foot and made up only 0.8% of the cover. Weeds made up 17.625% of total cover, and 35% of cover was bare ground (Table 9).

There were several notable changes in plot composition from spring of 1998 to fall of 1998. First, only one of the planted species showed a decrease in percent of cover in the fall evaluation. Illinois bundleflower went from having 2.82% of total plot cover in the spring to a mere 0.8% of plot cover in the fall. This seems to indicate a poor survival rate for the Illinois bundleflower in South Texas. The only other decline in cover from spring to fall was that of bare ground, which

**Table 9. Relationship of pure live seed to percent cover**.

| Species | #/Acre of Pure Live Seed | % Cover Spring 1998 | % Cover Fall 1998 | Change in % of Cover 6/98 – 12/98 | Avg. # of Plants / $Ft^2$ Fall 1998 |
|---|---|---|---|---|---|
| Awnless Bushsunflower | 1 | 13.80 | 25.000 | + 11.200 | 2.140 |
| Perennial Lazy Daisy | 0.18 | 3.40 | 4.500 | + 1.100 | 0.570 |
| Orange Zexmenia | 2 | 2.03 | 11.475 | + 9.445 | 1.100 |
| Prairie Bundleflower | 0.93 | 2.82 | 0.800 | - 2.020 | 0.115 |
| Buffelgrass (mix1) | 2 | 0.00 | 0.005 | + 0.005 | 0.001 |
| Kleingrass (mix 4) | 1.7 | 0.50 | 5.600 | + 5.100 | 0.180 |
| Plains Bristlegrass (mix 2) | 1 | 0.00 | 0.000 | 0.000 | 0.000 |
| Four-Flower Trichloris (mix 2) | 1 | 0.00 | 0.005 | + 0.005 | 0.001 |
| Two-Flower Trichloris (mix 2) | 1 | 0.00 | 0.000 | 0.000 | 0.000 |
| Four-Flower Trichloris (mix 3) | 1.5 | 0.00 | 0.000 | 0.000 | 0.000 |
| Two-Flower Trichloris (mix 3) | 1.5 | 0.00 | 0.000 | 0.000 | 0.000 |
| Weeds | - | 8.06 | 17.625 | + 9.565 | 7.540 |
| Bare Ground | - | 69.65 | 35.000 | - 34.650 | - |

decreased from 69.6% to 35.0%. The other planted forbs all showed a fall increase in the percent of total plot cover. Awnless bushsunflower had an 11.2% increase in percent of plot cover. Orange zexmenia had a 9.445% increase in plot cover, while lazy daisy showed a 1.1% increase in plot cover.

**Ecological Consideration 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 Goliad Germplasm orange zexmenia was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that orange zexmenia 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, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

**Conservation Use:** Goliad Germplasm orange zexmenia will provide a native species for rangeland planting, wildlife habitat, and landscaping. It is an attractive plant for landscaping use because of its all around hardiness, small shrub growth form, and brightly colored flowers. Orange zexmenia is also a good plant for inclusion in native seed mixes for range use. It is eaten by sheep, goats, and cattle. Additionally, orange zexmenia is useful for native site restoration. It is often browsed by white-tailed deer and bobwhite quail have been observed eating the seeds. Orange zexmenia is also an adult nectar source for butterflies.

**Area of Adaptation:** Orange zexmenia is hardy in both dry and moist conditions. It grows on varied soil types, brushy sites, and in open spaces. It is found in parts of Texas and Mexico. Goliad Germplasm orange zexmenia is well adapted for use in MLRA 81 (Edwards Plateau), MLRA 83 (Rio Grande Plains), and in MLRA 42 (Trans Pecos). Current testing has not completely substantiated the northern and western limits of its range of adaptation.

**Availability of Plant Materials:** Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

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**Goliad Germplasm orange zexmenia**
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