South Texas Native Plant Restoration Project
Final Report

Technical Report 0-4570-1

Cooperative Research Program

CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
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in cooperation with the
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SOUTH TEXAS NATIVE PLANT RESTORATION PROJECT FINAL REPORT

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EXECUTIVE SUMMARY

The South Texas Native Plant Restoration Project was a resounding success in that the primary goal of developing commercial sources of native seed has been substantially met. By the conclusion of the project on August 31, 2011, 20 native seed sources had been developed or aided in being commercialized because of this project. Ecotypic native seeds are today commercially available for use by the Texas Department of Transportation, and the methods to plant, establish, and manage these native species along roads in Texas have been tested, reported on, and are available for vegetation managers reference and implementation. We graciously thank the Texas Department of Transportation and its Commissioners, employees, and contractors for their tremendous collaborative nature and unyielding support that made such successes possible.

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CHAPTER 1: INTRODUCTION

Figure 1.1. Seeding a Recently Completed Right of Way along US HWY 77 in South Texas.

Restoring vegetative cover on disturbed or engineered soils following roadway construction is a minor part of the overall workload of the Texas Department of Transportation (TxDOT). But the resultant plant communities that exist along Texas' 80,000 miles of roadways may well be the most visible and cared about portion of a roadway to many members of the public, natural resource managers, and especially adjacent landowners. Historic (TxDOT 1995) and recent (TxDOT 2004) use of exotic grasses for erosion control is a major complaint against the agency. While little empirical evidence has been gathered to support it, the near-consensus conclusion among the general public and natural resource managers is that TxDOT use of exotic grasses such King Ranch bluestem (*Bothriochloa ischaemum* L. Keng) and Bermudagrass (*Cynodon dactylon* (L.) Pers.) along roadways is the primary reason for their current prevalence in the state of Texas. Other common exotic grasses on Texas roadsides, such as Kleberg bluestem (*Dichanthium annulatum* (Forssk.) Stapf.), Johnsongrass (*Sorghum halepense* (L.) Pers.), Wilman lovegrass (*Eragrostis superba* Peyr.), and guineagrass (*Urochloa maxima* (Jacq.) R. Webster) have not been specified for use, or planted by the agency, yet do exist on and spread from TxDOT rights of way.

In south Texas (Laredo, San Antonio, Corpus Christi, and Pharr TxDOT Districts), TxDOT (2004) (Figure 1.1) seed mixture specifications include both native and exotic grass seed in order to establish permanent vegetation for erosion control on highway rights of way. Exotic species include Bermudagrass, buffelgrass (*Pennisetum ciliare* (L.) Link), and Lehmann lovegrass (*Eragrostis lehmanniana* Nees). Ecotypic seeds of native plant species specified for south Texas districts were not available commercially before this project. Substantial evidence suggests native seeds used for restoration and reclamation should originate from populations from the same ecosystem as the planting site in order for best performance (Johnson et al. 2010). TxDOT districts in south Texas fall primarily within the Gulf Prairies and Marshes and South Texas Plains ecoregions of Texas (Gould 1969) (Figure 1.2).

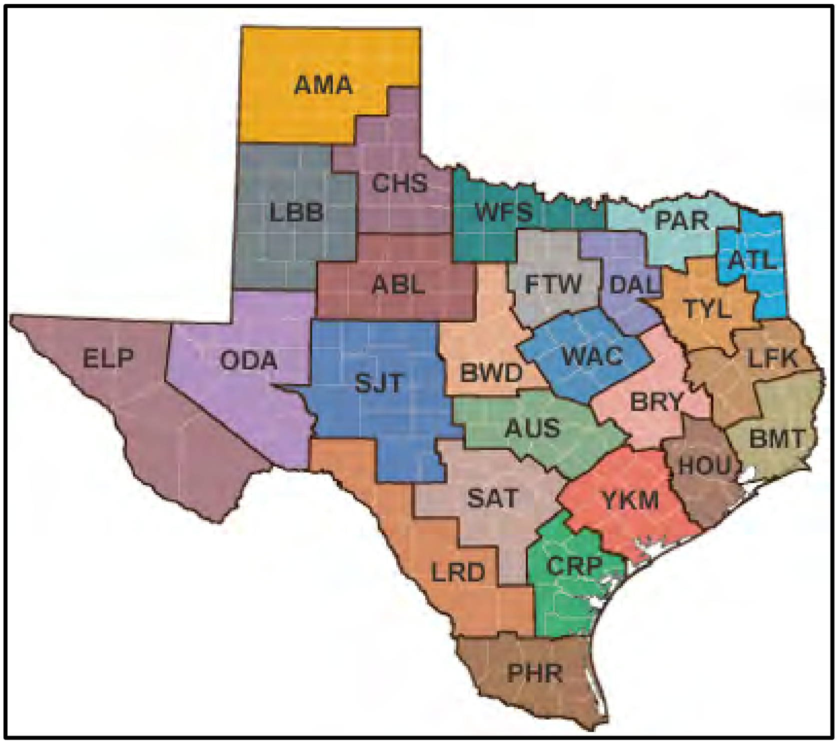

Figure 1.2. Map of Texas Department of Transportation Districts, Courtesy Texas Department of Transportation.

Native species included in current TxDOT specifications for south Texas include the grasses green sprangletop (*Leptochloa dubia* (Kunth) Nees), sideoats grama (*Bouteloua curtipendula* (Michx.) Torr.), plains bristlegrass (*Setaria vulpiseta* (Lam.) Roem. & Schult.), buffalograss (*Bouteloua dactyloides* (Nutt.) J.T. Columbus), sand dropseed (*Sporobolus cryptandrus* (Torr.) A. Gray), little bluestem (*Schizachyrium scoparium* (Michx.) Nash), sand lovegrass (*Eragrostis trichodes* (Nutt.) Alph. Wood); and forbs Illinois bundleflower

(*Desmanthus illinoensis* (Michx.) MacMill. Ex B.L. Rob. & Fernald), purple prairie clover (*Dalea purpurea* Vent.), and partridge pea (*Chamaecrista fasciculata* (Michx.) Greene).

Of the currently available commercial varieties of these native species that meet TxDOT (2004) and Texas Seed Law (TDA 1988) specifications allowing use in roadside plantings, only one species (Sabine Illinois bundleflower-Gulf Prairies and Marshes) originates from a south Texas ecoregion (Table 1.1). One additional species, Mason sand lovegrass, narrowly falls within the accepted ecotypic range of the far northern portion of the San Antonio District only.

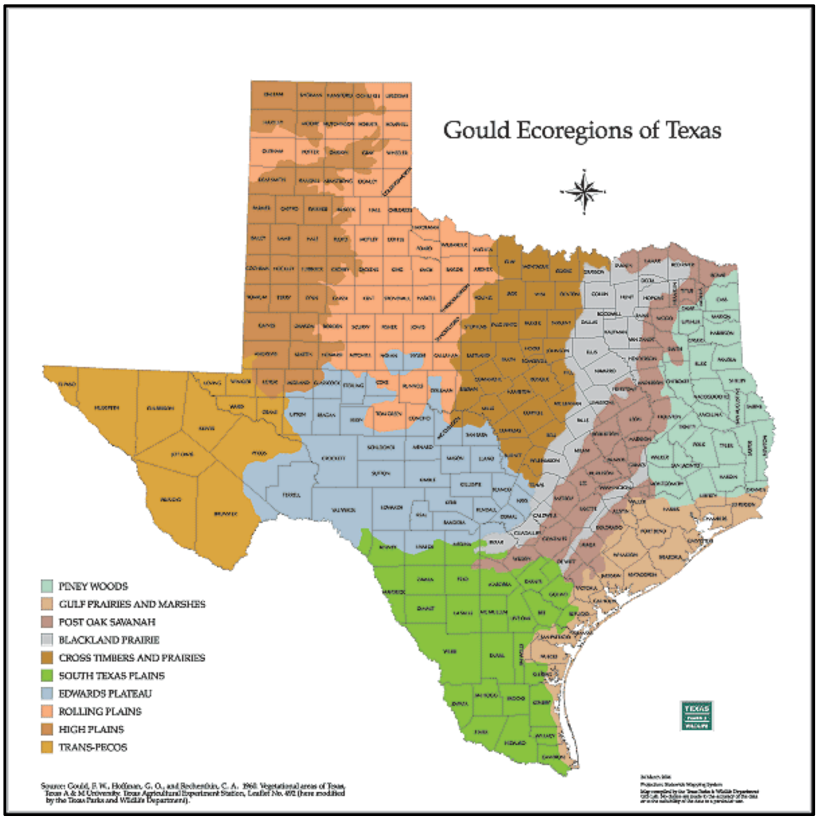

Figure 1.3. Map of Gould's (1969) Ecoregions of Texas, Courtesy Texas Parks and Wildlife Department.

Because of the poor performance of seed of these maladapted or non-ecotypic native seed mixture components, TxDOT continues to include exotic grass seed (i.e., buffelgrass, Lehman lovegrass, and Bermudagrass) in seeding mixes and specification to meet Federal vegetation cover mandates of the Clean Water Act (USEPA 2010). However, compliance with these Clean Water Act Provisions is in direct violation of the more recent Executive Order 13112 on Invasive Species (Clinton 1999), which directs government agencies to provide for the restoration of native species along roadsides, and not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species.

In order to make ecotypic sources of native seeds available for south Texas and meet both coverage and native species use requirements, Project 0-4570 South Texas Native Plant Restoration Project, was initiated in 2001. Goals of the project included collection of local seed ecotypes of native plants, evaluating and selecting collections of potential use by TxDOT, facilitating their production by local commercial seed growers, and finally ensuring ecotypic native seeds are available to end users such as TxDOT for reseeding projects in south Texas (Markwardt 2005).

Table 1.1. Origin of Native Seed Varieties Currently Specified for Use by TxDOT in Corpus Christi, Laredo, Pharr, and San Antonio Districts.

Common name	Commercial variety	Texas Ecoregion/other state of origin
Buffalograss	Texoka	Rolling Plains/Oklahoma, Kansas
Green sprangletop	Van Horn	Trans-Pecos, Mountains and Basins
Illinois bundleflower	Sabine	Gulf Prairies and Marshes
Little bluestem	OK Select Germplasm	Oklahoma
Partridge pea	Comanche	Rolling Plains
Plains bristlegrass	Stevan	High Plains/Arizona, New Mexico
Purple prairie clover	Cuero	Post Oak Savannah
Sand dropseed	Borden County Germplasm	Rolling Plains
Sand lovegrass	Mason	Edwards Plateau
Sideoats grama	Haskell	Rolling Plains

OBJECTIVES

The objectives of this research were to develop adaptable native seed mixes and effective revegetation strategies and techniques TxDOT can implement for right-of-way plantings in south Texas.

The specific tasks carried out during the course of the project were as follows:

- Selection of native species of interest to be developed for TxDOT use.
- Collection of native seeds from throughout the south Texas region for evaluation.
- Process and store collected seeds at the USDA NRCS E. “Kika” de la Garza Plant Materials Center for use and evaluation.

- Establish greenhouse and nursery plantings of collected seeds for evaluation and selection.
- Harvest seeds from nursery plantings for evaluation of seed quality characteristics.
- Test seed produced to screen for minimum levels of seed purity and germination in order to ascertain if evaluated materials are economically viable to produce.
- Increase seed of native species selected for release in order to provide commercial growers adequate seed for establishment of production fields, and to provide seed for experimental planting experiments.
- Conduct pilot experiments to develop planting methods for native seeds along highway rights-of-way using developed native seeds.
- Provide a comprehensive report of project activities, findings, and recommendations to TxDOT.

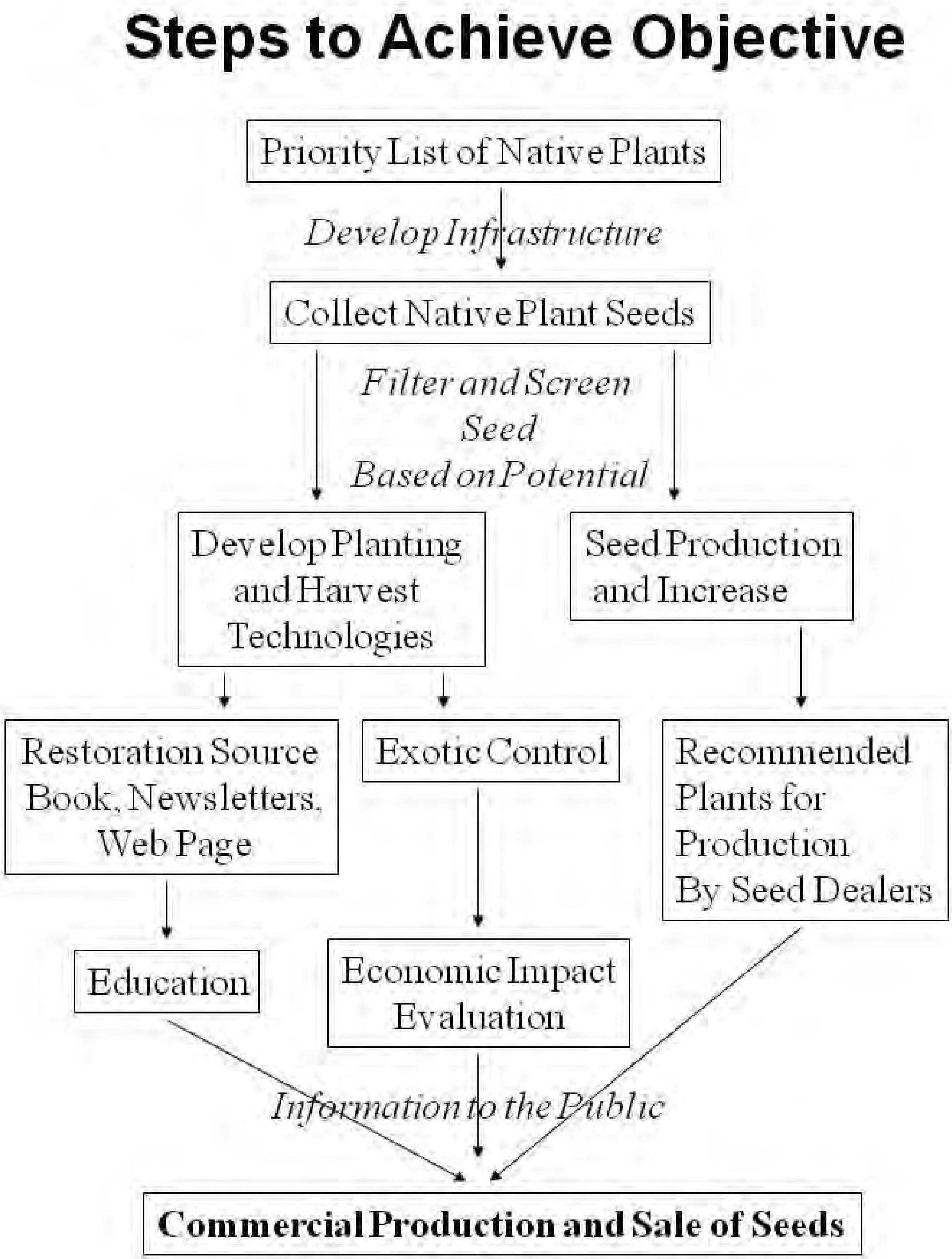

Figure 1.4. Original Schematic of Project to Provide Native Seed Sources for South Texas.

APPROACH

The project was conducted in three overlapping phases over a period of 10 years. Each phase of the project was carried out for each plant species considered; however Phases 2 and 3 began in later years of the project for some species, if environmental conditions (such as drought) prohibited the completion of Phase 1 in earlier years of the project.

1. Phase 1 consisted of efforts to collect, evaluate, and select promising germplasm of a variety of native species selected by the project technical committee as potentially useful for restoration and reclamation of south Texas rights-of-way by TxDOT.
2. Phase 2 involved the initial seed increase, advanced evaluation, and field testing of selected germplasm of each native plant species.
3. Phase 3 established larger seed increase plantings of species identified as acceptable for commercial release. After production-scale quantities of seed were produced, extensive release documentation was prepared, submitted for review and approval by the collaborating agencies, and formal release of seed was made to commercial producers.

CHAPTER 2: SELECTION OF SPECIES

Figure 2.1. Native Plants Growing along IH 37 near George West Texas.

Not all native plant species possess characteristics that make them desirable for use in roadside restoration. Furthermore, many species lack the genetic or environmental propensities to produce economical amounts of seed to make commercialization a viable option. Additionally, while some species may be useful for TxDOT, this potential market alone is not large enough to convince seed producers to provide products useable for just one demand sector (Williams pers. comm. 2010). So, while ecosystem restoration may be very successful when broadly diverse seed mixes representing all past plant community members of the site (Tinsley et al. 2005) are used, the implementation of such mixes, or the commercial production of the components (e.g., species) at the scale of seeding needed by TxDOT in south Texas districts (est. 3,000 acres/yr [Markwardt pers. comm. 2009]), is impractical.

In order to effectively develop seed sources of native plants for restoration within the framework of this project, a group of technical advisors was assembled to prioritize native plant species for collection, evaluation, and consideration of release in this project. This technical committee included a diverse group of natural resource managers, native plant experts, and seed producers (Table 2.1). From meetings of this group, a finite collection list of species was developed, and species of greatest priority for the project were then sought by collectors (Table 2.2).

Figure 2.2. Native Grasses Such as Texas Grama Possess Characteristics that Are Desirable for Roadside Restoration, including: 1) Small Stature, 2) High Seedling Vigor, 3) Good Drought Tolerance, and 4) Ability to Grow in Shallow, Rocky, and Dry Soils.

Plant species selected for development in this project represent a variety of low growing (<5 ft mature height) grasses and forbs, including annuals and perennials, cool and warm season plants, and plants characteristic of a variety of habitat seral stages from early to late successional species. Species chosen have widespread distributions in south Texas and are found on a variety of soil series. Selections also took into account that species developed should have multiple demand sectors other than those specifically of TxDOT, including uses in rangeland, wildlife, conservation, and reclamation plantings. The potential to be able to economically produce seed of each species was carefully evaluated to ensure species collected, evaluated, and developed had a high likelihood of commercialization.

Once priority species lists were determined, information was sent to collaborating seed collectors, technical committee members, and student seed collectors were hired to begin collection of wild populations (germplasm) of the plant species from the south Texas region. A goal of two collections from each county in the project area (Figure 2.1) was set for collection. This was thought to provide representative genetic, climatic, and edaphic representation of each plant species. The natural ranges of many species did not include the entire project area, so achievement of this objective was not possible in all cases.

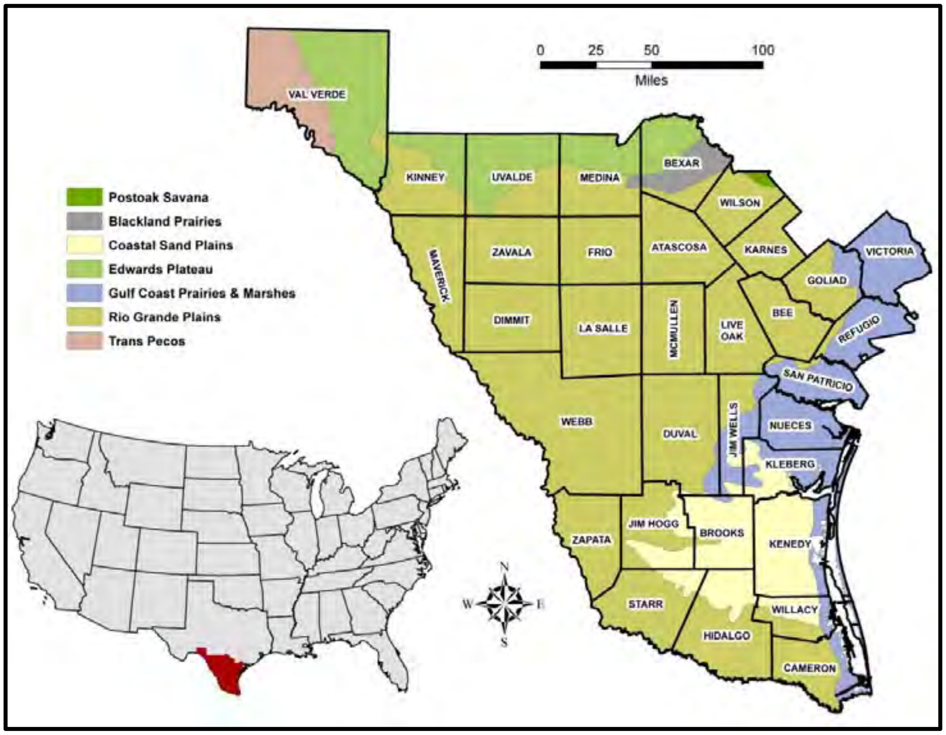

Figure 2.3. South Texas Native Plant Restoration Project Counties for Seed Collection.

Table 2.1. Original Project Technical Committee Responsible for Selection of Species for Project Focus.

Name	Affiliation	Category
Marc Bartoskewitz	King Ranch, Inc.	Private land manager
Paul Cox	San Antonio Botanical Gardens	Native plant expert
David Douget	Bladerunner Farms, Inc.	Turf/seed producer
Lynn Drawe, Ph.D.	Rob and Bessie Welder Wildlife Foundation	Native plant expert
Lavoyger Durham	El Tule Ranch	Private land manager
Jim Everitt, Ph.D.	USDA Agricultural Research Service	Native plant expert
Timothy E. Fulbright, Ph.D.	Caesar Kleberg Wildlife Research Institute	Academic researcher in restoration and wildlife
Vivian Garcia	USDA Natural Resources Conservation Service	Rangeland management specialist
Andres Garza, Jr.	Texas Soil and Water Conservation Board	Conservation program specialist
David Grall	Laborcitas Creek Ranch	Private land manager
C. Wayne Hanselka, Ph.D.	Texas AgriLife Extension-Corpus Christi	Rangeland management specialist
Patrick D. Larkin, Ph.D.	Texas A&M University-Corpus Christi	Academic researcher in plant genetics
John Lloyd-Reilley	USDA NRCS E. “Kika” de la Garza Plant Materials Center	Native plant expert
David Mahler	Environmental Survey, Inc.	Restoration specialist
Bill Nieman	Native American Seed	Seed producer
William R. Ocumpaugh, Ph.D.	Texas AgriLife Research-Beeville	Academic researcher in agronomy and forages
Gary Pogue	Pogue Agri Partners	Seed producer
Stan Reinke	USDA Natural Resource Conservation Service	Rangeland management specialist
David Riskind	Texas Parks and Wildlife Department	State land manager
Jimmy Rutledge	Texas Parks and Wildlife Department	Wildlife habitat management specialist
Lisa Williams	The Nature Conservancy	NGO land manager
Steve Windhager, Ph.D.	Lady Bird Johnson Wildflower Center	Restoration specialist
Larry Zibilske	USDA Agricultural Research Service	Academic researcher in agronomy
Rick Wood	Pape-Dawson Engineers, Inc.	Reclamation specialist

Table 2.2. Priority Species List for South Texas Native Plant Restoration Project.

Common name	Plant type/seral stage (early, mid, or late)	Rank 1-5 (1=highest priority for collection)
Arizona cottontop	Grass/mid	1
Plains/streambed bristlegrass	Grass/mid	1
Hooded windmillgrass	Grass/early	1
Shortspike windmillgrass*	Grass/early	1
Pink/whiplash pappusgrass	Grass/late	1
Halls panicum	Grass/early	1
Brownseed paspalum	Grass/late	1
Sideoats grama	Grass/late	1
Green sprangletop	Grass/early	2
Slim/rough tridens	Grass/mid	2
Little bluestem	Grass/late	2
Silver bluestem	Grass/mid	2
Rio Grande bristlegrass	Grass/mid	2
Red grama	Grass/early	2
Wrights threeawn	Grass/early	2
Purple threeawn	Grass/early	2
Texas panicum	Grass early	3
Hairy grama	Grass early	3
Texas grama	Grass/mid	3
Slender grama	Grass/early	3
Common curly mesquite	Grass/late	3
Multiflowered false rhodesgrass	Grass/late	3
Plains lovegrass	Grass/early	3
Orange zexmenia	Forb/late	1
Awnless bush sunflower	Forb/mid	1
Engelmann daisy	Forb/late	1
Redseed/Hookers plantains	Forb/early	2
Rio Grande clammyweed	Forb/early	3

*shortspike windmillgrass was not collected since adequate collections were already present in the Plant Materials Center inventory.

CHAPTER 3: SEED COLLECTION

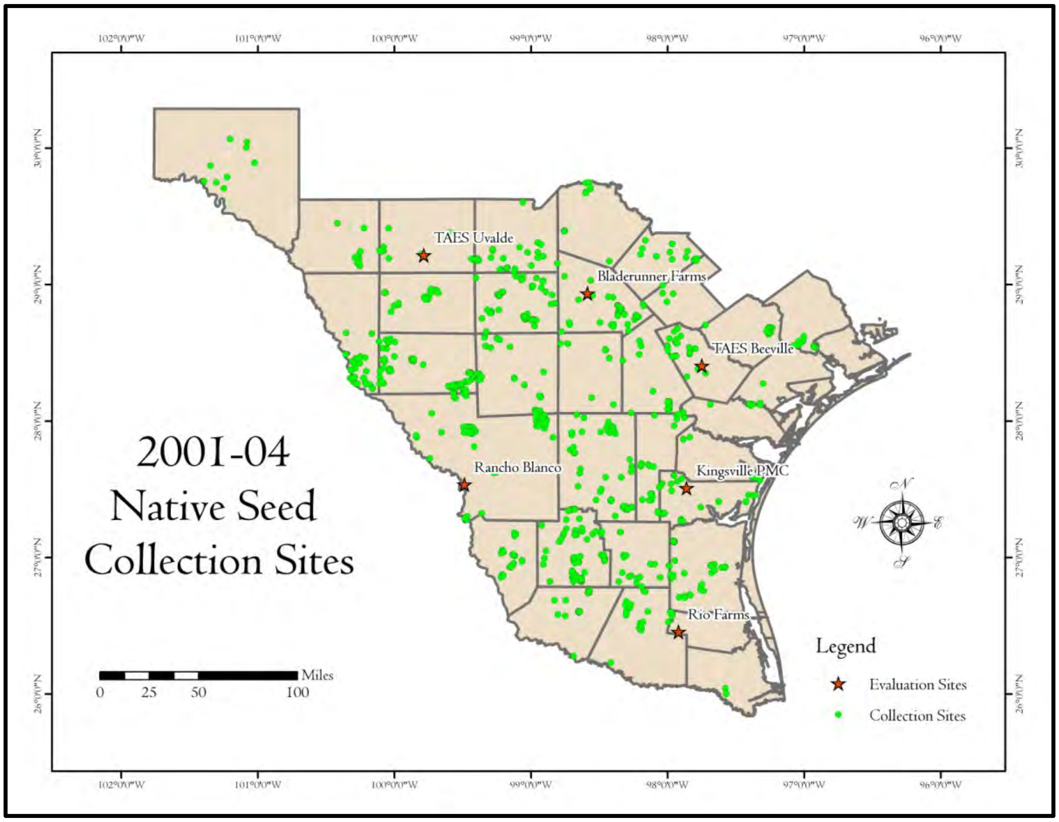

Figure 3.1. Native Seed Collection Sites for the South Texas Native Plant Restoration Project.

Beginning October 2001, project personnel obtained wild seed collections of target plant species. From 2001–2004, 1,032 collections of the target species were obtained. Some species were collected more frequently because of common occurrence or distribution across the region and others may have been collected in higher numbers simply by random occurrence during collection efforts. Populations of some species were wholly absent from large areas of the project region of focus, likely due to past management practices including brush management, overgrazing, or a history of farming. The Lower Rio Grande Valley was one such region where relict stands of native plant species of interest are essentially gone from the landscape.

At each collection site, collectors randomly traveled across the accessible landscape by foot or vehicle to locate population of each plant species of interest. Typically, no more than two collections of the same species were made at a general collection site, such as a ranch, or highway right of way within a single county. When collecting on extremely large ranches (>10,000 acres), more collections were often obtained, especially if distinguishing characteristics between possible collection sites were apparent. An example would be widely divergent soil series or textures, or different land use histories of separate collection sites. Often a seed collection from a species was bulked from throughout a ranch or land management unit and identified as a single collection.

Figure 3.2. Project Seed Collector Obtaining Seeds of Pink Pappusgrass in Webb County, Texas.

For each species of interest encountered with ripe seeds, collectors obtained seed from as many plants as possible to maximize genetic diversity of the seed collection. Seed was hand stripped from the plants and placed in paper lunch bags (bag size #s 5, 6, or 7). Collection bags were immediately labeled with the collection date, common name of the species, name of the collection site, soil series name (if available), soil texture of the site, specific locality of the collection (ranch or place name, highway number, etc.), and finally Global Position System (GPS) coordinates of the collection site were recorded. Additional information was also recorded such as exceptional plant or population characters, competitive ability with exotic vegetation in the area, or observations of regeneration characteristics. Following the field collection, all collection information was transferred into an Excel database for cataloguing and organization, and a separate collection form was filled out with the collection information and stapled or otherwise attached to the original bag of seed. Once field-processed in this manner, seeds were delivered or shipped to the USDA NRCS E. "Kika" de la Garza Plant Materials Center in Kingsville for further processing (Chapter 4).

SUMMARY OF SEED COLLECTION

Grasses made up 90 percent of the 1,032 seed collections obtained for the project. Grass seeds are typically easier to collect; the seeds remain attached to the plants longer; and grass seeds are less likely to be depredated by wildlife and livestock. Collection totals were highest in 2002 and 2003, in part because of greater seed collection effort during those periods. However, 2002 was a high precipitation year in south Texas, which facilitated good native seed production of a number of native species. Seed collection totals by year and plant type are given in Table 3.1. Please note that because of the high priority placed on grasses by the project technical committee, the collection list was comprised of 21 species of grasses and five species of forbs.

Table 3.1. Summary of Seed Collections by Plant Type and Year.

Year	Grasses		Forbs		Annual total
	# of collections	% annual total	# of collections	% annual total	
2001	50	96	2	4	52
2002	567	92	52	8	619
2003	246	90	28	10	274
2004	65	75	22	25	87
Total	928	90	104	10	1032

Seed collections were sought throughout the year, to maximize genetic diversity of the collections obtained. Since a mixture of warm and cool-season plants were present on the list, some species obviously matured at divergent times of the year. However, we present data on month of collection for the project, as a good reference to best periods of the year for collection efforts for future projects, or for use by others interested in similar work in south Texas (Table 3.2). The cyclical nature of the south Texas climate and sporadic annual distribution of rainfall requires multiple years of seed collection in order to obtain representative collections of even a small group of native species from an area the size of south Texas. In general, over the four years of collection, the months of May, June, July, August, October, November, and December were productive seed collection months.

Table 3.2. Percent of Annual Total of Seed Collections Obtained by Month 2001–2004.

Month	% Seed collections obtained by month			
	2001	2002	2003	2004
January	-	0	3	0
February	-	0	0	0
March	-	0	0	1
April	-	2	0	7
May	-	22	18	8
June	-	8	27	15
July	-	5	10	33
August	-	29	9	1
September	-	5	0	0
October	30	7	6	0
November	34	9	19	32
December	36	13	8	0

Table 3.3. Summary of Seed Collection Sites by Type, 2001–2004.

Site type	Number of collections	% of total
County road rights of way	64	6
Farm-to-market road rights of way	49	5
Federal lands	24	2
Non-government organization lands	24	24
Private land	777	75
State lands	44	4
Total	1,032	100

The most productive seed collection locations were private lands, namely large private ranches. Seventy-five percent of collections were obtained from private lands. County road rights-of-way were a distant second, with 64 collections obtained from these areas. A number of other types of seed collection sites (e.g., federal and state owned lands) were visited during the project; however most yielded few collections for the project.

Figure 3.3. Silver Bluestem Was the Species Most Frequently Collected in the Project.

Silver bluestem was the species collected most frequently during the project. Other common grasses readily collected included hooded windmillgrass, little bluestem, and pink/whiplash pappusgrass. Orange zexmenia and awnless bush sunflower were the forb species most commonly collected.

Table 3.4. Summary of Collections by Species, 2001–2004.

Species common name	Number of collections
GRASSES	
Silver bluestem	102
Hooded windmillgrass	82
Little bluestem	81
Pink/whiplash pappusgrass	76
Slim/rough tridens	60
Multiflowered false rhodesgrass	59
Plains/streambed bristlegrass	54
Red grama	50
Arizona cottontop	49
Sideoats grama	48
Halls panicum	46
Curly mesquite	39
Rio Grande/Reverchons bristlegrass, Knotgrass	35
Hairy grama	35
Purple threeawn	27
Texas grama	25
Wrights threeawn	24
Brownseed paspalum	15
Green sprangletop	11
Slender grama	9
Texas panicum	1
Total grasses	928
FORBS	
Orange zexmenia	34
Awnless bush sunflower	28
Redseed/Hookers plantain	25
Engelmann daisy	11
Rio Grande clammyweed	5
Total forbs	104
ALL SPECIES	
Total forbs and grasses	1032

CHAPTER 4: SEED PROCESSING AND STORAGE

Figure 4.1. Cleaning Native Seed Collections at the USDA NRCS Plant Materials Center in Kingsville.

Once collections were obtained from the field they were air dried under ambient conditions. Collections were then sent to USDA NRCS E. “Kika” de la Garza Plant Materials Center (PMC). Upon receipt of collections by the PMC, their staff assigned each collection with a unique nine-digit accession number. This accession number was used from this point forward to identify the collection. The collection information was then entered into the nationwide PMC accession database.

After accession numbers were assigned, staff of STN and the PMC began cleaning collections so that actual seeds were separated from the original material collected. Chaff, stems, leaves, and other non-seed materials were then discarded. Methods used to clean seed from litter or inert materials in collections included hand separation, separation using various screens, seed blowers, fire, and hand stripping. Selections of each species were evaluated through this process for general seed fill, and if no viable seeds could be found, the collection was discarded. Approximately 1–2 percent of collections were determined to be non-viable during the cleaning process.

Seeds of some species could not reliably be cleaned from stems and trash. Plants whose seed could not be cleaned to an acceptable level of purity (e.g., seed making up 10–20 percent by weight of material) were noted. These species were identified as potentially problematic for production by commercial producers, as 100 lb of pure seed would require as much as 1,000 lb of inert material harvested, transported, dried, stored, and bagged. This would result in extremely high seed costs to consumers. Some species, such as purple and Wrights threeawn for example, were specifically not worked with in detail in this project because of purity considerations.

Figure 4.2. Many Native Grass Species such as Arizona cottontop (above) Have Seeds Covered in Dense Pubescence (e.g., "fluffy seeds") that Can Be Difficult to Clean and Process.

Other species, such as Arizona cottontop, presented difficulties in cleaning. For these species, various cleaning techniques were conducted to determine if it was possible to clean or process the seed sample to a degree in which seed would be "mechanically plant-able." If no method for cleaning was determined that would facilitate mechanical planting of the species, then further selection or evaluation work with collections of that species was limited. Examples again included purple and Wrights threeawn. For Arizona cottontop, seed coatings were determined to be an economically and practical method of processing seeds so that they could be mechanically planted; thus work with this species was continued.

Once cleaned and processed seeds were weighed and placed into PMC Program storage envelopes that included both the accession number and all collection information. These envelopes were stored in climate (temperature and humidity) controlled seed vaults at the PMC to preserve the seed and provide cold stratification necessary for germination of many species. Viability of the collections for use throughout the project was assured by these storage conditions.

For collections of species where no information regarding seed quality, germability, or germination, dormancy ratios were available and initial laboratory or greenhouse trials were conducted. These trials were not a true evaluation of quality characteristics of the species but did give an indication of the variation among the accessions for seed quality characteristics. Some species, notably common curly mesquite and a complex of bristlegrasses (Reverchons, Rio Grande bristlegrasses and knotgrass) showed almost no propensity for viable seed. Therefore these species were not evaluated beyond these tests. Conversely, evaluation of slim/rough tridens, redseed, and Hookers plantains showed a high amount of variation in seed quality characteristics among accessions. These species were then targeted for selection of the high seed quality accessions or ecotypes, which were then evaluated for other desirable traits.

Figure 4.3. Extensive Research and Lab Trials Were Necessary to Determine Appropriate Seed Cleaning Techniques for Grasses like Hairy Grama (above). Many Species Considered in This Project Had Not previously Been Worked with by Scientist.

CHAPTER 5: NURSERY AND GREENHOUSE PLANTING

Figure 5.1. Preparing Native Plant Transplants for Planting in an Evaluation Plot at Rancho Blanco near Laredo, Texas.

Once suitable numbers of local collections of a species were obtained, we proceeded to grow seedlings from each accession in the greenhouse for transplanting into filed nurseries for initial evaluation of the respective species. For each species we evaluated, commercially available materials of the species, or previous releases of the species were included in each evaluation for comparison. Field plant nurseries (hereafter referred to as “evaluation plots”) were utilized throughout the project area (Figure 5.1). Greenhouse facilities at Kingsville (TAMUK Campus and the USDA NRCS Plant Materials Center) (Figure 5.2), as well as at the Texas AgriLife Research Station in Beeville were utilized in this portion of the research. Methodology for each phase of the project is given below.

GREENHOUSE PLANTINGS

Plantings of warm season plants for evaluations were started in multi-cell flats in the greenhouse in late November of the year preceding installation of the evaluation experiment. For initial evaluations of most species 50–100 plants/accession were produced. Planting trays were filled with a commercial potting mix and planted with ~10 seeds per cell of the desired accession. Trays were labeled with the 9-digit USDA NRCS accession number for identification. All trays were hand watered to promote emergence and growth of the seedlings. Once seedlings were mature enough to withstand ambient conditions outside the greenhouse, flats were placed in a shade house to harden-off the plants for field planting.

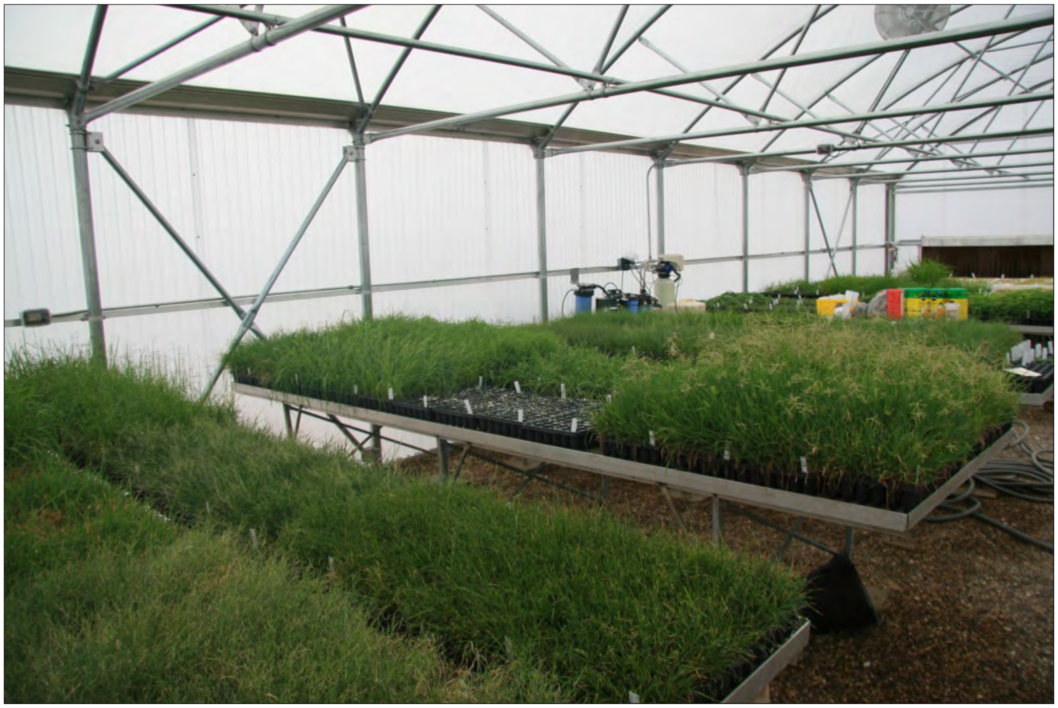

Figure 5.2. Native Plant Transplants for Evaluation Plots Being Produced in the Project Greenhouse.

EVALUATION PLOT DESIGN

Evaluation plot plantings at multiple growing locations were desired for all plant selection experiments. This was done in order to avoid selection bias by site. A minimum of two evaluation locations were used for each species, but in most cases 3–5 sites were utilized (Figure 5.3). Evaluation locations were selected to be representative of sites throughout the natural distribution range of the species being evaluated, as well as representative of potential use regions of the plant material. Typical plantings were arranged in a randomized block design for each evaluation location.

Figure 5.3. Evaluation Plot Planting of Slim Tridens at Texas AgriLife Research Station Uvalde.

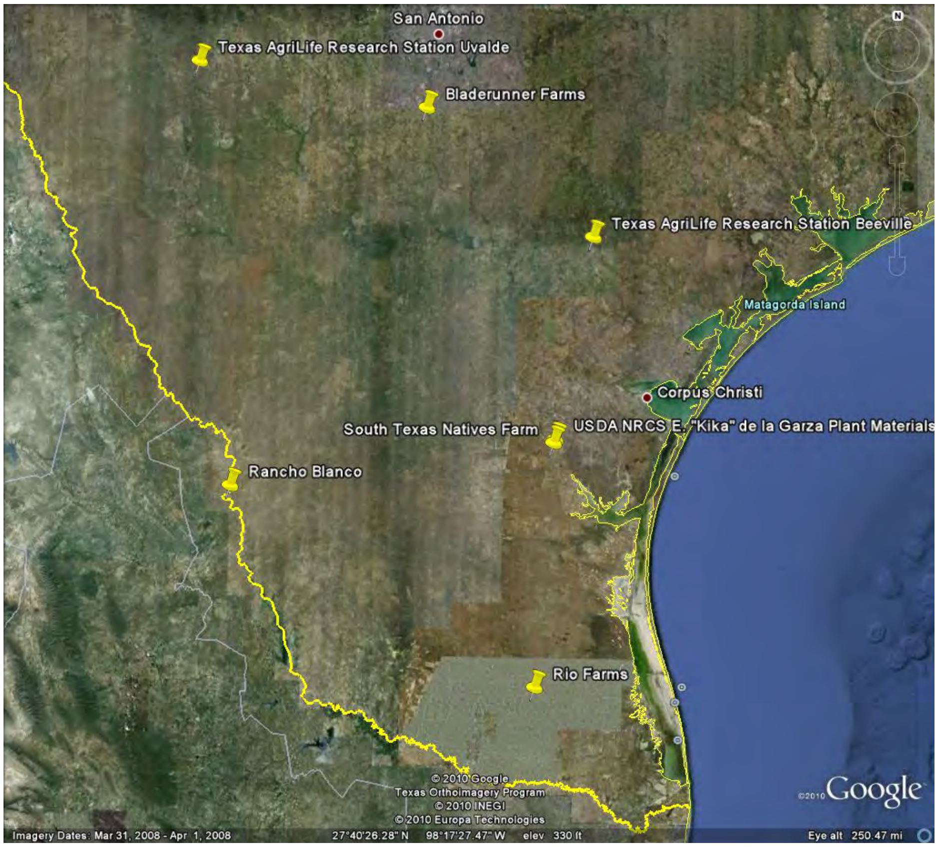

Figure 5.4. Map of Plant Evaluation Locations Utilized in the South Texas Native Plant Restoration Project. Courtesy Google Earth.

Each evaluation location utilized a split-plot design so that there were two replications (blocked) of each accession planted at each location. Typically this included two completely randomized sets of plots, each containing 10 transplants of each accession. Transplants were planted in 30–36 inch rows depending on equipment available at each location, with 1–2 ft spacing among individual transplants in a row depending on mature plant size of the species being evaluated. Larger grasses were planted at the 2 ft interval whereas small stature plants were planted at 1 ft intervals. Plots of each accession were separated by 5 ft space between the tenth plant of one accession and the first plant of the neighbor accessions. Plots within a replication were located on uniform sites to minimize variability within replications at each evaluation site. Soil series and surface textures of the evaluation sites are given in Table 5.1.

Table 5.1. Soil Series and Texture of Evaluation Plots Utilized in the Project.

Evaluation site name	Soil series and texture
South Texas Natives Farm	Cranell sandy clay loam
USDA NRCS E. "Kika" de la Garza PMC	Victoria clay
Rancho Blanco	La Gloria silt loam
Texas AgriLife Research Station-Beeville	Parrita sandy clay loam
Texas AgriLife Research Station-Uvalde	Uvalde silty clay loam
Rio Farms	Delfina fine sandy loam
Bladerunner Farms	Miguel fine sandy loam

Plots were prepared for planting by multiple disking treatments. Planting beds were used where necessary depending on soil series, and to facilitate irrigation and maintenance. Bedded rows were utilized at Rio Farms, Rancho Blanco, STN Farm, the PMC, and Texas AgriLife Research Station-Uvalde (TARS-U) (Figure 5.1). Transplants were installed by hand or by use of mechanical transplanters pulled by small tractors. Accessions were identified by the 9-digit accession number or a sequential number corresponding to the accession number. Plot maps were made by hand in the field and subsequently copied into Microsoft Excel (Figure 5.2). Immediately following planting, pendamethelin herbicide (trade name Prowl) was applied to prevent weed seed germination. Following herbicide application, supplemental irrigation was applied to ensure transplant establishment. Plots at Rancho Blanco, TAR-U, and Rio Farms were flood irrigated, and those at Bladerunner Farms and Texas AgriLife Research Station-Beeville (TARS-B) were sprinkler irrigated. Following initial irrigation, weedmat was installed on most sites to prevent weed growth between rows of plants. Weeds that emerged within planted rows were controlled by hand hoeing or selective use of herbicides. Herbicides used most frequently included glyphosate (for blank spaces between transplants), 2-4, D (for broadleaf weeds in grass plantings), and Fusillade (for grass weeds in forb plantings). At the completion of the growing season all plots at each evaluation location were mowed, and the thatch raked and removed to facilitate new growth in the following evaluation year. Pendamethelin herbicide was reapplied to help control weeds after raking in each year. Supplemental irrigation was provided at all plots throughout year 1 to promote maximum plant growth for evaluation. Irrigation was discontinued thereafter.

	9088987	9090589		9088992	9090318
	9088608	9090548		9088925	9088989
	9089182	9088951		9088609	9090548
9088831	9090318	9090553	9088987	9090380	9088825
9088992	9090290	9088968	9090360	9090290	9088927
9091865	9088925	9088989	9088780	9088608	9089182
9089060	9090707	9088927	9088903	9088548	9089060
9088779	9088809	9088609	9088778	9088968	9088779
9088903	9090380	9088562	9090707	9090589	9088831
9088778	9088780	9088825	9088809	9088951	9088804
9090360	9088548	9088804	9088562	9090553	9091865
35	**34 33**	**32**	**31**	**30**	
		4-flower trichloris			

Figure 5.5. Example Plot Map of 4-Flower Trichloris Accessions Evaluated at Rancho Blanco.

EVALUATION PLOT DATA COLLECTION

Data were collected monthly for each evaluation plot in year 1 and bi-monthly thereafter. Evaluations consisted of visual rankings of plant performance. These evaluations were conducted utilizing multiple trained evaluators for each evaluation. Characteristics evaluated included survival, plant vigor, foliage density, uniformity, development stage, seed production, forage production, plant height, and comments. A numerical ranking system was used to record observations for most characteristics, where a value or score of 1 was given to the superior performing accession for each characteristic at the site, and a value of 9 given to the poorest performing accession at the site. For survival, values were expressed as a percent of surviving plants at the evaluation date, based on a plant count obtained between 30–60 days post-planting. An explanation of each evaluation category is given below.

Figure 5.6. Project Employees Observing and Recording Seedhead Characteristics of an Arizona Cottontop Accession at the Rio Farms Evaluation Plot.

Survival

Survival was expressed as the percent of transplants surviving at each evaluation date, based on a count of seedlings that survived for a minimum of 30 days after transplanting. Survival was based on the post-planting count because early transplant mortality can be caused by factors unrelated to plant adaptability or performance at the evaluation site (i.e., low-quality transplants, poor planting techniques, or insufficient irrigation). By basing survival counts on 30-day post planting counts, we hoped to avoid biased estimates of mortality caused by planting and transplant factors. Individual plants were carefully identified as those transplanted and not volunteer plants. Volunteer plants were controlled for by use of pre-emergence herbicides that limited volunteer plants from seed. To help further distinguish which plants were transplanted from those that may have volunteered, transplants were carefully spaced in each evaluation plot in a linear row at a specific interval from one another.

Plant Vigor

Plant vigor was a cumulative expression of the performance of each accession. Factors such as foliage color, degree of chlorosis, incidence of disease, overall rate of growth, and vegetative spread were consider in vigor rankings.

Foliage Density

Foliage density rankings related to the closure or lack of closure of canopy of the plants. Criteria such as ability to fill spaces between plants, width of leaf canopy, and density, width, and length of leaf blades were considered.

Uniformity

Uniformity of the accession was an important consideration for later selection, production, and commercialization of any accession. Uniformity was an indication of the heterogeneity or homogenous nature of the plants of the accession. Accessions that were highly uniform (all plants had near-identical characteristics) were given a ranking of 1, since this is a desirable characteristic from a seed production standpoint, and accessions with highly variable plants were given higher numerical rankings.

Development Stage

Development stage was an important evaluation character for the selection of accessions for multiple-accession blend releases. Accessions could only reasonably be grown together in mixed accession releases in later seed increases or commercial seed production settings if they grew and produced ripe seed at the same time on a common site. Development stage rankings were different than other rankings in that scores of 1–9 corresponded to various growth stages of the respective plant species. For grasses, rankings were as follows: 1=ripe seed present on plants, 2=immature seed present on plants, 3=flowering stage, 4=boot stage (reproductive stages not emergent from foliage), 5=stem elongation phase, but prior to seedhead formation, 6=vegetative stage, no reproductive stems emerging from crown, 7=immature vegetative stage, 8=post transplant stage with new growth, and 9=seedling or transplant stage. Cumulative analysis of development stage data over an evaluation year indicating a low-mean score in this category could be interpreted as representative of accessions capable of producing seed throughout the year and potentially having high seed yields, a desirable characteristic.

Seed Production

Seed production rankings were based heavily on three criteria: 1) density and number of seedheads present on the accession, 2) size (typically length) of individual seedheads, and 3) density of spikelets present on the seedheads. Actual measures of seed produced (weighed in grams) were occasionally taken for seed production rankings, especially in later stages of evaluation of a species.

Forage Production

Forage rankings were an estimate of the biomass produced by each accession. Occasional rankings were based on actual estimates obtained by clipping and weighing biomass samples from the accessions. High biomass production was typically a secondary consideration for selection.

Plant Height

Plant height was evaluated in order to find accessions that could be combined in multiple accession blend releases and to find accessions that could be mechanically harvested together in multiple accession blend seed fields. Actual measurements in centimeters were occasionally taken in order to quantify plant height, especially in later stages of an evaluation.

Comments

A comments section was included on evaluation sheets for inclusion of evaluators remarks about accessions. Cumulative analysis of the accessions, such as noteworthy performance in an evaluation category could be recorded; comments commonly included observations regarding diseases, fungi, and pests impacting the accession. Notes regarding external influences on plots were also made in order to provide information that might explain temporary sources of variation or damage to a plot.

ANALYSIS OF EVALUATION PLOT DATA

Evaluation data were analyzed by a number of methods. For actual measurements, analysis of variance (ANOVA) statistical procedures were used. For visual rankings and other nonparametric data, simple means by site and year were calculated and used to separate superior accessions from poor performing accessions. Means were calculated for all accessions at each site, and accessions with better than mean performance in the greatest number of categories at each evaluation site were those considered for selection. All data were considered by year and by site in the selection process.

CHAPTER 6: SEED HARVEST

Figure 6.1. Collecting Seed from an Evaluation Plot.

EVALUATION PLOT SEED COLLECTION

Throughout each evaluation year, seeds from all accessions were collected for testing and quality analysis. In the first year of evaluation, seeds were collect when ripe from all accessions at each evaluation location by accession. Seed from both replications of each individual accession were combined for testing. Efforts to collect seed from each of the 20 plants present at the evaluation sites were made. Collections were made by hand stripping the ripe seeds from the seedheads and placing seeds into paper bags with the date of the collection, respective accession number, and site name. Seeds were stored in ambient conditions and allowed to air dry following collection. Germination tests were conducted a minimum of 3 months after field collection to allow a period of after-ripening needed by many seeds in order to germinate.

CHAPTER 7: SEED TESTING

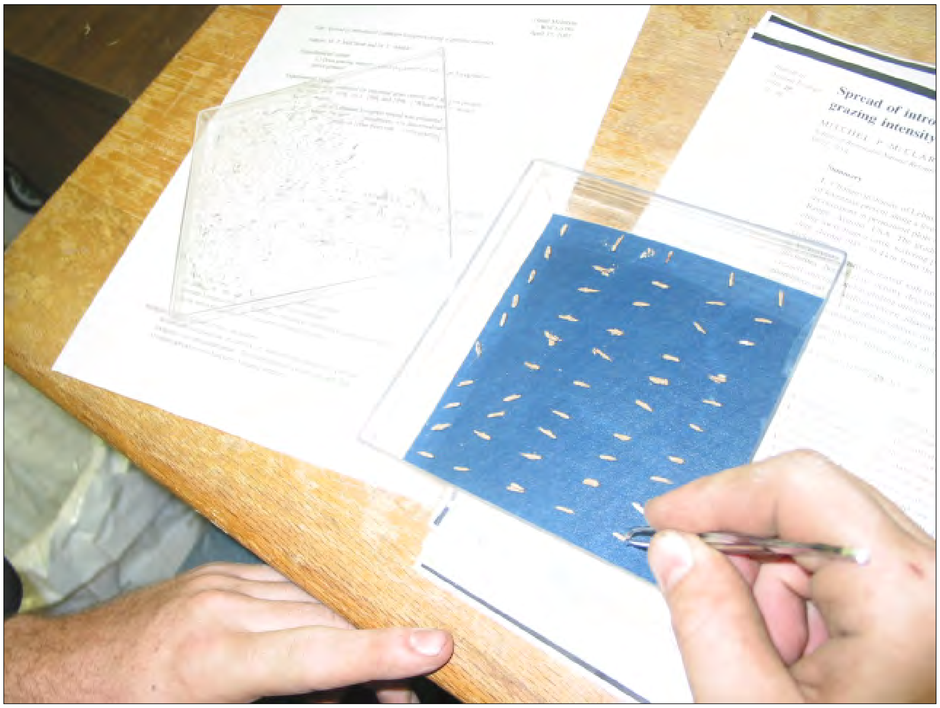

Figure 7.1. Counting Seeds and Placing Them into a Container for a Germination Trial.

Following collection and after-ripening, seeds of each site-accession were thoroughly mixed, and samples were drawn and hand counted for use in germination trials. These experiments were conducted using a diurnal growth chamber with 12 hrs light at 85°F to simulate daytime conditions, and 12 hrs dark at 68°F to simulate nighttime conditions. For most tests, 4–100 seed replications from each accession were included. Occasionally because of low seed production of some species, 50 seed replications were required. After placing seeds in labeled Petri dishes wetted with deionized water, counts of seeds germinated were made every other day for 30 days, beginning on day 3 after installation of the experiment. Tetrazolium tests were conducted by outside laboratories when needed to assess species with high seed dormancy. In year 2 and beyond, specific germination tests by harvest date were conducted. These tests provided an indication of best seed harvest dates for later seed increase and commercial production. The same germination test methodology was used for these tests. From these tests, rankings of percent active germination could be made by accession for consideration in the selection process. Consistency of germination from test to test was considered a desirable character of an accession. Other information obtained from these tests included measures of time of initiation of germination and time to total germination.

Figure 7.2. Germination Trays in the Growth Chamber for an Experiment.

ANALYSIS OF EVALUATION PLOT SEED GERMINATION DATA

Mean germination of seed from each accession was calculated by site following germination tests. Also calculated was mean germination of all accessions by site. Accessions with greater than the mean germination for the species were noted and considered for release. Time of germination was calculated as number of days to 10 percent of total germination, and time to total germination was calculated as number of days to 50 percent of total germination.

CHAPTER 8: SEED INCREASE

Figure 8.1. Seed Increase Fields of Native Grass Selection at Rio Farms in the Lower Rio Grande Valley, Texas.

Following analysis of seed tests and evaluation plot data, selections of the best performing accessions were made. These accessions were then grown for seed increase for further testing, release, and distribution to commercial seed growers for production.

In all cases, seed increases were initiated with seed or vegetative material from the original plant population of each chosen accession to ensure the genetic integrity of the future release. In most cases, seed from the original field collection was used to begin increase of the accessions. In cases where the original seed collection was used in its entirety in the evaluation phase, mother plants from the evaluation plots were dug, transplanted to isolated plots, and used to produce seed for use in seed increases.

Seed increase plots were isolated from other plots of the same species. Often multiple species were being increased at one time, so several seed increase plots were planted in an area, so long as only one accession of a given species was located in one area (Figure 8.1). A distance of 900 ft was considered adequate isolation for all species.

Figure 8.2. Phase I Seed Increase of a Selection of Pink Pappusgrass.

Increases of most accessions required a two-phase process conducted over 2 years. In phase 1, a small plot of 50–100 plants of the accession was established by transplants. Throughout year 1, this plot was harvested intensively, and then this seed was used in year 2 to produce additional transplants for establishment of a larger field of typically 5,000 plants, which would produce enough seed of the accession for release to a commercial grower. Species-specific yields dictated these seed increase plot sizes.

Seed increase plots and fields were utilized at a number of locations throughout the project. But the majority of increases were installed at Rio Farms in the Rio Grande Valley of South Texas.

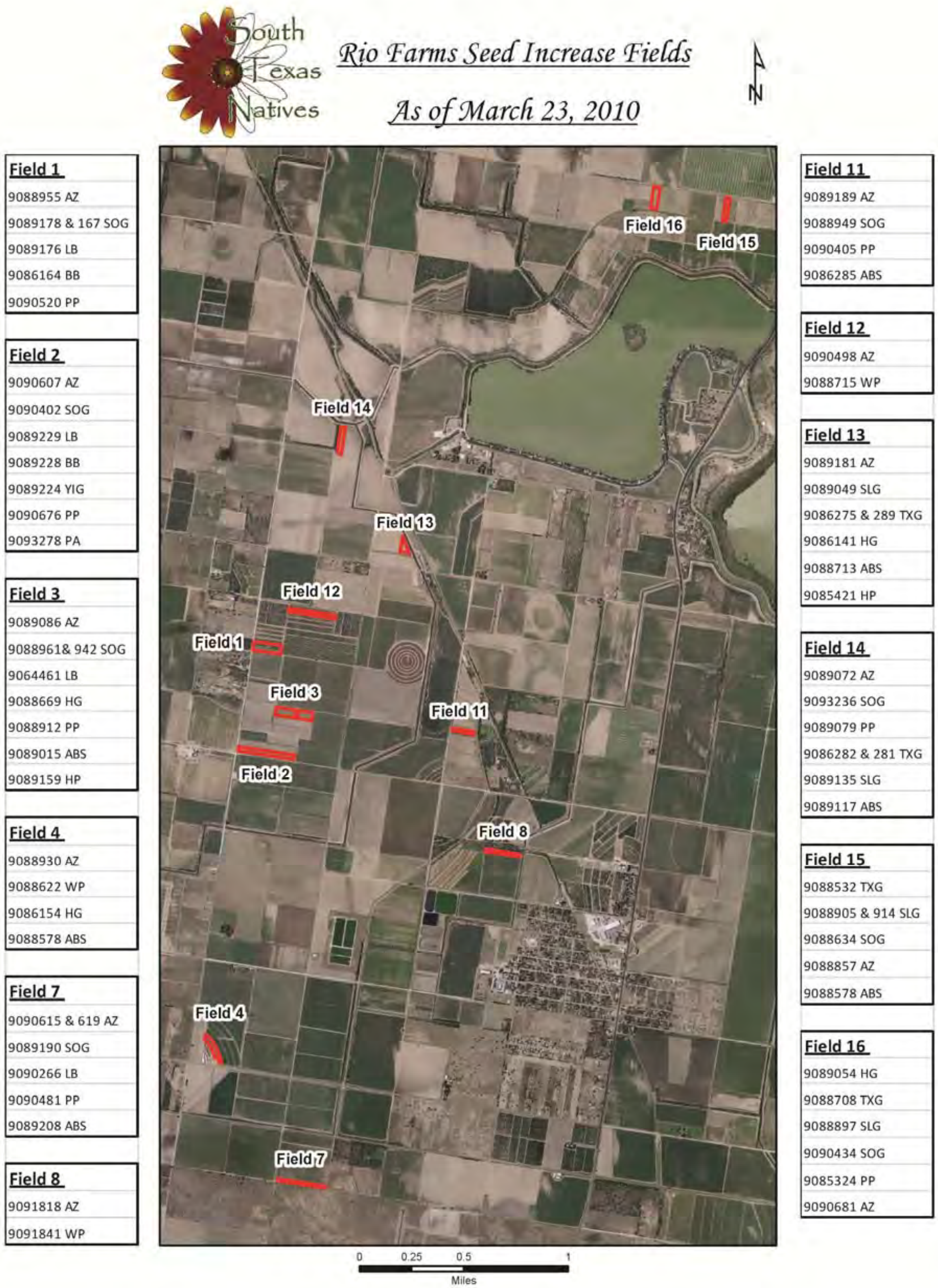

Figure 8.3. Seed Increase Field Map of Rio Farms, 2010.

CHAPTER 9: ESTABLISHMENT METHODS

Figure 9.1. Installing a Native Seed Establishment Method Experiment in South Texas.

A variety of experimental plantings were made throughout the course of the project to determine best establishment methods for each species and mixtures of species. Planting locations included highway rights of way, experimental field settings, and private ranchlands. Establishment methods were studied using a rigorous experimental protocol for all plantings, so that data from the various experiments could be evaluated and compared accordingly. Our establishment methods and experimental design are outlined below.

Site Inventory

Each planting site was evaluated prior to disturbance or site preparation. Detailed data sheets were completed with information including GPS coordinates, site history and present state, and soil series and texture. Whenever possible, presampling of the existing vegetation was conducted to include 3–100 point step-point transects, and semi-permanent photo-point markers were installed and initial photographs were taken.

Site Preparation

Site preparation by site varied according to the establishment method being studied. For all experiments detailed inventories of site preparation methods and chronology were recorded.

Seed Mixture Preparation

All seeds used in establishment method experiments were tested for germination, purity, dormancy (TZ tests), and noxious/invasive weed seed by third-party laboratories. Based on result of tests, seed mixtures were composed according to percent pure live seed (PLS). Each replication of each planting in an experiment was weighed and mixed separately.

Figure 9.2. Small-Plot Establishment Method Study after Installation.

Planting Equipment Calibration

Using the seed mixture specified, seed drills or broadcast planting equipment was calibrated using standard shop calibration techniques. Calibration was conducted using three replicated measures following each adjustment, followed by an additional replicate of three measures once the target rate was achieved as a check. Variances of ±10 percent of the desired rate were accepted because of limitations to planting equipment metering.

Planting Methods

All replications of each planting were installed on the same day if possible. Drill or broadcaster travel was consistent among replications. Between planting replications the drill or broadcaster was cleaned with a vacuum to prevent seed from one replication being accidentally planted in the following plot.

Evaluation and Data Collection

Data on plant performance were collected at 30 days post-planting and biannually in late spring and late fall each year of the experiment. Data collection methods included a minimum of 3–100 point step-point transects, and 25 to 100 0.25 m^2 frames used to estimate percent cover and or seedling/plant density of the seeded species. Data were evaluated using standard statistical procedures.

Figure 9.3. August 2008 (L) and June 2010 (R) Photographs of an Establishment Methods Experiment in Duval County Texas, Showing Excellent Performance of Native Seed Sources.

Figure 9.4. Native Grasses Growing along US HWY 77, 4 Years after an Establishment Methods Experiment.

Figure 9.5. Slender Grama (Front), Plains Lovegrass (Center), and Shortspike Windmillgrass(rear) in the US HWY 77 Median, 4 Years after an Establishment Methods Experiment.

CHAPTER 10: WORK SUMMARY BY SPECIES

Figure 10.1. Multiple Species Evaluation Study at Rio Farms in the Lower Rio Grande Valley of South Texas.

Chapter 10 gives a bulleted summary of the work performed from collection, through evaluation, to release as applicable for each plant species. For more information for released varieties, please see Appendixes A, B, and C. Unless different from methods described in Chapter 9, evaluation, experimental design, procedures, and analysis are not described in detail. Number of collections evaluated includes project collections and collections of the USDA Plant Materials Program that were available for evaluation.

Hooded Windmillgrass (*Chloris cucullata*)

- 142 collections were evaluated.
- Evaluation locations were the Plant Materials Center in Kingsville (PMC), Texas AgriLife Research Station Beeville (TARS-B), Rio Farms (RF), and Texas AgriLife Research Station-Uvalde (TARS-U).
- A single accession was chosen for release because of unique plant characteristics (e.g., a stoloniferous growth habitat beneficial for roadside plantings) and superior seed quality.
- Seed quality and production attributes were evaluated in PhD projects.

- Work resulted in release of Mariah Germplasm hooded windmillgrass
- Commercial seed is produced by Douglass W. King Seed Company.
- Performance in field plantings suggests variety is a rapid establishing grass cover on coarse textured soils.

Shortspike Windmillgrass (*Chloris x subdolistachya*)

- 42 collections were evaluated.
- Evaluation locations were the PMC, TARS-B, RF, and TAR-U.
- A single accession was chosen for release because superior seed quality and dense cover and foliage characteristics.
- Seed quality and production attributes were evaluated in PhD projects.
- Work resulted in release of Welder Germplasm shortspike windmillgrass.
- Commercial seed is produced by Turner Seed Company and Pogue Agri Partners.
- Performance in field plantings suggests variety is a rapid establishing grass cover on fine textured soils.
- Welder Germplasm has shown excellent competitive ability with various exotic grasses found in south Texas.

Figure 10.2. Shortspike Windmillgrass.

Sideoats Grama (Bouteloua curtipendula)

- 48 collections were evaluated.
- Evaluation locations were the PMC, TARS-B, RF, TARS-U, and Rancho Blanco (RB).
- Standards for comparison were the commercial varieties “Haskell,” “Niner,” “Vaughn,” “Premier,” and a selection from Mexico by Pogue Agri Partners.
- 8 accessions were chosen for initial seed increase and advanced evaluation.
- 5 accessions were selected for release as a blend of selected germplasms.
- Emergence and persistence in south Texas field plantings, and seed yields of the selected germplasms are superior to current commercial varieties of sideoats grama.
- A commercial release will be made in 2011–2012.
- Field plantings show rapid establishment characteristics and excellent competitive ability with buffelgrass and Kleberg bluestem.

Red Grama (Bouteloua trifida)

- 50 accessions were evaluated.
- Evaluation location was Bladerunner Farms (BF).
- Seed fill and germination averaged <2 percent.
- Plant survival more than 1 year was poor for most all accessions.
- Because of poor seed quality and stand life, work with the species was discontinued.

Texas Grama (Bouteloua rigidiseta)

- 25 accessions were evaluated.
- Initial evaluation location was BF, subsequent evaluations were performed at TARS-B, RF, STN Farm (STN), and RB.
- 6 accessions were selected for advanced evaluation based on seed germination experiments.
- 4 accessions were chosen for release based on advanced evaluation experiments.
- Work resulted in the release of Atascosa Germplasm Texas grama.
- Commercial seed is produced by Douglass W. King Seed Company.

- In highway plantings, Atascosa Germplasm readily establishes in very shallow, rocky microsites, caliche based soils, and along asphalt.
- Should be used as a minor component of most seed mixes.

Hairy Grama (Bouteloua hirsuta)

- 35 accessions were evaluated.
- Initial evaluation location was BF, subsequent evaluations were performed at TARS-B, RF, STN Farm (STN), and RB.
- 4 accessions were selected based on strong perennial habits, seed quality, and origin so as to provide a broadly adapted commercial source of this widespread species.
- Work resulted in release of Chaparral Germplasm hairy grama.
- Commercial seed is produced by Douglass W. King Seed Company.
- Release shows broad adaptability to different soil textures.
- Typical establishment requires more than 6 months after seeding because of seed dormancy.

Slender Grama (*Bouteloua repens*)

- 9 accessions were evaluated.
- Initial evaluation location was BF, subsequent evaluations were performed at TARS-B, RF, STN Farm (STN), and RB.
- 6 accessions were chosen for advanced evaluation because of superior seed quality and perennial habits.
- 4 accessions were chosen for release based on seed quality and plant characteristics.
- Work resulted in release of Dilley Germplasm slender grama.
- Commercial seed is produced by Douglass W. King Seed Company.
- Dilley Germplasm is the most consistent performer across all field plantings.
- Shows broad adaptation to south Texas soils and is the most competitive species evaluated with exotic grasses.
- Establishment is less than 60 days in most all plantings.

Figure 10.3. Slender Grama.

Arizona Cottontop (Digitaria californica)

- 49 accessions were evaluated.
- Evaluation locations were the PMC, RF, RB, TAR-U, and STN.
- Standards for comparison were the releases PMT-389 and "Loetta" Arizona cottontops.
- 12 accessions were chosen based on vegetative characteristics and seed germination.
- Work resulted in release of LaSalle Germplasm Arizona cottontop.
- Commercial seed is produced by Pogue Agri Partners.
- LaSalle Germplasm is a rapid establishing grass species for disturbed soils, and it is often one of the first native grasses to emerge from seed after planting.
- Best performance in field plantings has been documented on fine textured soils.

Plains Bristlegrass (*Setaria leucopila*) and Streambed Bristlegrass (*Setaria vulpiseta*)

- 150 collections were evaluated.
- Evaluation locations were PMC, TARS-B, TAR-U, and STN.
- 4 accessions were chosen for release based on seed quality.

- Each accession was released separately, under the names KIKA677, KIKA648, KIKA819, and KIKA820.
- Commercial seed is marketed as a blend of the releases under the name Catarina Blend Bristlegrass.
- Commercial seed is produced by Turner Seed Company, Douglass King Seed Company, and Pogue Agri Partners.
- Excellent field plant performance has been documented throughout south Texas.
- Establishment generally occurs 3 to 6 months after seeding.

Little Bluestem (Schizachyrium scoparium)

- 81 collections were evaluated.
- Evaluation locations were the PMC, BF, RF, TARS-B, TAR-U, RB, and STN.
- Standards for comparison were "OK Select," Turner Native, "Cimarron," and "Aldous."
- 4 accessions were chosen for advanced evaluation and seed increase.
- 2 of the 4 were selected for release as selected germplasms.
- 2 releases will be made (1 representative of eastern south Texas material, and 1 representative of western south Texas material) in 2011-2012.
- Commercial seed will be produced by Douglass King Seed Company and Pogue Agri Partners.
- Selections have shown greater long-term survival in south Texas than current commercial varieties of little bluestem.

Pink Pappusgrass (*Pappophorum bicolor*) and Whiplash Pappusgrass (*Pappophorum vaginatum*)

- 76 collections were evaluated.
- Evaluation locations were the PMC, RB, RF, TAR-U, and STN.
- 7 selections of pink pappusgrass and 3 selections of whiplash pappusgrass were made based on seed quality and uniformity.
- Work resulted in the release of Webb Germplasm whiplash pappusgrass and Maverick Germplasm pink pappusgrass.

- Commercial seed of Webb Germplasm is produced by Douglass King Seed Company, and commercial seed of Maverick Germplasm is produced by Pogue Agri Partners.
- Selections show very good competitive ability with common exotic grasses.
- Releases show good establishment and persistence in dry, shallow sites across a variety of planting locations in south Texas.
- Webb and Maverick Germplasm show good adaptation to saline and alkaline soils.

Figure 10.4. Pink Pappusgrass.

Common Curly Mesquite (*Hilaria belangeri*)

- 39 accessions were evaluated.
- Evaluation locations were BF and the PMC.
- Seed fill and germination averaged less than 1 percent.
- Transplant and vegetative methods of increase were unsuccessful.
- Work was discontinued with the species because of poor seed and vegetative production potential.

Halls Panicum (*Panicum hallii*)

- 46 accessions were evaluated.
- Evaluation location was the PMC and RF.
- 2 accessions were selected based on seed fill and seed retention.
- A release will be made in 2011.

Brownseed Paspalum (*Paspalum plicatulum*)

- 15 accessions were evaluated.
- Evaluation locations were the PMC, TARS-B, and RF.
- 4 accessions were chosen for release and increased at RF.
- Seed fill and production were inadequate for commercialization of these selections.
- A King Ranch/PMC selection of brownseed paspalum is currently being increased for possible release.

Silver Bluestem (Bothriochloa laguroides)

- 102 collections were evaluated.
- Evaluation location was the PMC.
- 5 selections were made based on seed quality.
- Selections are currently being increased at the PMC.
- A commercial release will be made 2012–2013.

Multiflowered False Rhodesgrass (*Trichloris pluriflora*)

- 59 accessions were evaluated.
- Evaluation locations were the PMC, RB, TAR-U, and RF.
- 5 accessions were selected based on seed quality characteristics.
- Selections are currently being increased at the PMC and STN.
- A commercial release will be made in 2011.
- Field planting performance has been excellent; however most establishment occurs 9 to 12 months after planting.

Figure 10.5. Multiflowered False Rhodesgrass.

Slim Tridens (*Tridens muticus* var. *muticus*) and Rough Tridens (*Tridens muticus* var. *elongatus*)

- 60 accessions were evaluated.
- Evaluation locations were TAR-U, RB, and STN.
- 2 accessions were selected (1 ea var. *elongatus*, and var. *muticus*) based on seed quality and accession uniformity.
- Accessions are currently being increased at STN.
- Release will be considered if seed production potential and stand life are found to be acceptable for commercialization.

Rio Grande Bristlegrass (Setaria reverchonii var. ramiseta) and Knotgrass (Setaria reverchonii var. firmula)

- 35 accessions were evaluated.
- Seed quality and germination were too poor to produce transplants for evaluation.
- Work with these species was discontinued because of poor seed quality.

Purple Threeawn (*Aristida purpurea*)

- 27 collections were obtained.
- Seed processing studies were conducted to determine if large scale mechanical harvest and processing techniques could be developed.
- Current technology and methods prevent effective commercialization of the species.

Wrights Threeawn (Aristida wrightii)

- 24 collections were obtained.
- Seed processing studies were conducted to determine if large scale mechanical harvest and processing techniques could be developed.
- Current technology and methods prevent effective commercialization of the species.

Plains Lovegrass (Eragrostis intermedia)

- 8 collections were evaluated.
- Evaluation locations were the PMC and STN.
- One accession showed potential for commercialization based on vegetative characteristics and seed quality.
- Increase of the selected accession is currently being conducted at the PMC.
- Additional collections are being obtained for comparison to determine if the selected accession warrants release.

Green Sprangletop (*Leptochloa dubia*)

- 11 collections were evaluated.
- Evaluation location was the PMC.
- Standard for comparison was “Van Horn” green sprangletop.
- Accessions evaluated showed no superior performance characters to Van Horn.
- Evaluation of new collections was discontinued.
- “Van Horn” green sprangletop is recommended for use in south Texas.

Texas Panicum (*Urochloa texana*)

- 1 collection was evaluated.
- Evaluation was discontinued because numerous common varieties of the species are available commercially.
- Source-identified seed of Texas Panicum can be obtained commercially and is recommended for use.
- Seed source used should originate from the ecoregion where it will be planted whenever possible for good performance.
- Evaluation of Texas panicum seed originating from areas beyond south Texas shows consistent planting failures, whereas ecotypic seed results in acceptable planting results.

Engelmann Daisy (Engelmannia pinnatifida)

- 11 collections were evaluated.
- Evaluation location was the PMC.
- Standard for comparison is "Eldorado" Engelmann daisy.
- Populations under evaluation show potential for improvement over "Eldorado."
- Additional collections are being sought for continued study of the species.

Awnless Bush Sunflower (*Simsia calva*)

- 28 accessions were evaluated.
- Evaluation locations were TAR-U, PMC, STN, and RF.
- Standards for comparison were "Plateau" and a commercial source from Native American Seed Company.
- 5 accessions were selected based on flower height and vegetative characters facilitating harvest.
- Selected accessions are currently being increased at STN.
- A release of the species will likely be made in 2012–2013.

Rio Grande Clammyweed (Polanisa dodecandra ssp. riograndensis)

- 5 accessions were evaluated.
- Evaluation locations were the PMC, RF, RB, and STN.

- 2 accessions were chosen for release as Zapata Germplasm Rio Grande clammyweed.
- Commercial seed is produced by Rio Farms, Inc., and Douglass King Seed Company.
- Zapata Germplasm shows excellent performance when used as a warm-season, annual cover crop on disturbed sites.
- Zapata Germplasm readily establishes on a variety of planting sites and competes well with annual and perennial weeds common to south Texas.

Redseed Plantain (*Plantago rhodosperma*) and Hookers Plantain (*Plantago hookeriana*)

- 25 accessions were evaluated.
- Evaluation locations were the TARS-B, STN, and RF.
- 2 selections (1 of each spp.) were made based on seed yields.
- Work resulted in the release of STN-496 Germplasm redseed plantain and STN-562 Germplasm Hookers plantain.
- Commercial seed is marketed at a blend of the 2 releases under the name Divot Tallow Weed Blend.
- Commercial seed is produced by Pogue Agri Partners.
- Divot Tallow Weed Blend shows excellent performance as a cool-season, annual cover crop on disturbed sites.
- Divot Tallow Weed blend readily establishes on a variety of soil types.

Orange Zexmenia (*Wedelia hispida*)

- 76 accessions were evaluated.
- 7 accessions were selected and increased based on seed quality, harvest ability, tolerance to disease, and origin.
- Work resulted in release of Goliad Germplasm orange zexmenia.
- Seed for commercial production will be provided to a grower once adequate quantities are produced.

Figure 10.6. Orange Zexmenia.

Other Species Considered and Evaluated

- **Big bluestem (*Andropogon gerardii*)** - 2 selections have been made and are being tested and increased for possible release.
- **Big sacaton (*Sporobolus wrightii*)** - the PMC has released Falfurrias Germplasm big sacaton. It is an excellent species for riparian areas, and saline soils in south Texas. This species can be used as a native substitute to pampasgrass in ornamental plantings along highway rights of way.
- **Bundleflower (*Desmanthus virgatus*)** - 3 selections have been made and are being tested in comparison to other commercial cultivars ("Beewild," "Sabine," and "Hondo").
- **Canada wildrye (*Elymus canadensis*)** - Lavaca Germplasm Canada wildrye has been released by the PMC. It is an excellent cool-season grass and may be used as a temporary native cover crop. Commercial seed is produced by Turner Seed Company.
- **Crinkleawn (*Trachypogon secundus*)** - Evaluations showed limited ability to harvest and process seed; limited natural range of plant results in limited commercial interest.
- **Dalea spp**. **(*Dalea emarginata, Dalea nana, Dalea aurea,* and *Dalea pogonothera*)** - evaluations show poor seed production potential of most species evaluated, and very specific adaptation to soil types.

- **Deer pea vetch (*Vicia ludoviciana*)** - germplasm developed by TARS-B shows high potential for release and beneficial use as a cool-season annual cover crop. Release is being considered for 2012, and commercial seed is being produced by Pogue Agri Partners.

Figure 10.7. Deer Pea Vetch.

- **Partridge pea (*Chamaecrista fasciculata*)** - collections evaluated showed wide variability based on origin. Seed production potential was low for most south Texas populations. “Comanche” partridge pea showed similar performance as ecotypic sources in our evaluations. However, “Comanche” is ectopically dissimilar to south Texas populations, and field performance in most south Texas plantings is poor.
- **Prairie acacia (*Acacia angustissima*)** - evaluations showed excellent potential of this herbaceous legume. Three selections have been made and a release will be made in 2011.
- **Texasgrass (*Vaseyochloa multinervosa*)** - evaluations indicated high seed yields and seed quality of all accessions. However, similar to crinkleawn, this species has a limited natural range and therefore little demand.

- **False rhodesgrass (*Trichloris crinita*)** - the PMC has release Kinney Germplasm false rhodesgrass. This release is an excellent species for fine textured soils west of IH 37 in south Texas. Commercial seed is produced by Douglass King Seed Company.
- **Wooly croton (*Croton capitatus*)** - south Texas populations evaluated had inferior performance to commercial source available from Turner Seed Company.
- **Yellow Indiangrass (*Sorghastrum nutans*)** - one selection was made that showed superior performance in vegetative characters in comparison to other south Texas populations and the cultivars "Cheyenne" and "Lometa." Seed quality of the south Texas selection has proven erratic, and release and commercial production are unlikely.

Figure 10.8. False Rhodesgrass and Whiplash Pappusgrass.

CHAPTER 11: SEED RELEASES AND COMMERCIALIZATION STATUS

Figure 11.1. Commercial Seed Production Field of Dilley Germplasm Slender Grama.

Through this project, 17 native seed releases were made. Three seed releases previously developed by the USDA NRCS E. "Kika" de la Garza Plant Materials Center were assisted in being made commercially available. Now, 20 varieties of native seed are being grown commercially, already resulting in the availability of native seed for use by TxDOT and other restoration seed consumers. While commercialization of these releases has been a long-term process, we believe that once stable production is established, resulting in consistent demand from agencies like TxDOT, most all of these releases will be commercial successes.

RELEASE PROCESS

Following final selection of best-performing accessions in the evaluation and seed increase stages, a decision to release a species was made by the research team. Release considerations depended on divergent factors for each species, but some commonalities existed that influenced the decision to release a plant species. These factors included:

- **Broad potential consumer demand for seed of the plant species.** Demand for uses such as highway rights-of-way revegetation use, coupled with interest in the plant from rangeland management, wildlife habitat restoration, and ranching interests, coupled with interest in use by the USDA Farm Service Agency Conservation Reserve Program or NRCS Environmental Quality Incentive Program generally indicated a species with adequate demand potential to justify release.

Figure 11.2. Commercial Seed Production Field of Mariah Germplasm Hooded Windmillgrass.

- **Economically feasible seed production from commercial producer and end-user standpoints.** According to most commercial producers worked with in the project, most native grasses must have a ratio of roughly 25 lb PLS yield per acre: 2 lb per acre PLS seeding rate. Grasses with ratios numerically closer than this result in too high of cost seed for most consumers. For example, slender grama (Dilley Germplasm release) is recommended to be planted at 8 lb PLS per acre and commercial seed fields yield about 150 lb PLS per acre. This yield results in slender grama seed priced at around \$20 per PLS lb, or \$160 per acre based on the pure stand seeding rate. For native seeding, this cost falls within the amount economically feasible for a large sector of consumers. Contrast this with crinkleawn, a species with low yields of just 25 lb PLS per acre and a seeding rate near 10 lb PLS per acre. If this species were produced commercially, seed would likely cost \$120 per PLS lb, and at the recommended planting rate for the species, it would cost $1,200 per acre for seed. Obviously, this cost is infeasible for the majority of consumers.

Figure 11.3. Commercial Seed Production Field of Zapata Germplasm Rio Grande Clammyweed.

- **Most forbs have high production and seed cost because of low seed yields.** But, since forbs are typically only minor parts of most native seed mixes, release of these species were still justified by widespread demand whenever a forb species was found that met other criteria for release.
- **Large geographic adaptation.** Species that grow only in specific soil series, or that have geographically small areas of adaptation are not likely to have large enough markets to justify commercial production. An example is Texasgrass, a narrowly distributed, endemic grass to the South Texas Sand Sheet. While an important native species, and one with excellent characteristics for commercial seed production, the potential market is too small to stimulate interest by commercial producers. Texasgrass would likely have a single demand sector (highway right of way plantings), since most areas where the grass is adapted are relatively high-condition native rangeland that are unlikely to require reseeding. Compare Texasgrass to hooded windmillgrass, which grows well in most every soil type and county in south

Texas and adjacent regions. Uses include most all native seed applications, from highway right of way plantings, to range and wildlife plantings, to erosion control plantings. As a result, commercial growers would be more likely to desire to produce hooded windmillgrass than Texasgrass.

Once a decision to release a species was made based on these factors and evaluations of performance, a formal release packet was drafted. The release process requires formal summaries of all data collected, as well as supporting information about the species such as plans for commercialization, and environmental analysis. Release packet deliverables (release document, brochures, and published notice of release articles) are included in Appendixes A, B, and C of this document. Release of a species required the following information:

1. Release proposal including:
    a. Proposed name and variety designation.
    b. Botanical name, family, genus, and species.
    c. Origin and breeding/selection history of the variety.
    d. Objective description of the variety.
    e. Evidence for release (data summaries of initial evaluation, advanced evaluation, seed increase, and seeding trials).
    f. Seed production, harvest, and cleaning information.
    g. Area of known adaptation.
    h. Procedure for maintaining stock classes of seed.
    i. Description of how the variety is to be constituted.
    j. Additional restrictions.
    k. Ecological considerations and evaluation.
    l. Potential conservation uses.
    m. Availability of plant materials.
    n. References.
    o. Tables and figures supporting release.
    p. Map of collection, evaluation, and experimental planting sites.
    q. Photograph of representative specimens of the variety.
    r. Signatures for release.

i. Director of the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville.
ii. Dean of the Dick and Mary Lewis Kleberg College of Agriculture, Natural Resources, and Human Sciences at Texas A&M University-Kingsville.
iii. Director of Texas AgriLife Research.
iv. State Conservationist of USDA NRCS Texas.
v. Director of the Ecological Sciences Division of the United States Department of Agriculture.

2. Letter stating confirmation of botanical identification of submitted specimens (performed by Dr. Stephen Hatch of Texas A&M University S.M. Tracy Herbarium).
3. Submission of plant specimens to the National Plant Materials Center Herbarium and the National Arboretum.

Figure 11.4. Commercial Seed Production Field of Maverick Germplasm Pink Pappusgrass.

4. Submission of seed of the variety to the National Plant Germplasm System repository.

5. Proof of completion of the USDA NRCS Form 540.90-Worksheet for Documenting an Environmental Evaluation of NRCS Plant Releases.
6. Completion of USDA NRCS Conservation Plant Release Review Worksheet.
7. Memorandum or letters showing proof of interest in production of the variety by commercial seed producers.
8. Memorandum presenting current and anticipated breeder and foundation seed stock, and current production capacity of the developer.
9. Letter from USDA NRCS specifying clearance of the name selected for the release following review according to the International Code for Nomenclature for Cultivated Plants, Association of Official Seed Certifying Agencies, and National Plant Materials Program guidelines.
10. Preparation and publication of a release brochure for use by commercial producers and consumers.
11. Preparation and publication of a notice of release journal article in Native Plants Journal.
12. Preparation and publication of a news release announcing the release.
13. Plant variety/germplasm release disclosure form for Texas A&M System Office of Technology and Commercialization.
14. Texas AgriLife Research Plant Review committee cover sheet including:
    a. Crop type.
    b. Proposed name and identification.
    c. Designation or name in development stages.
    d. Primary features or advantages of the release.
    e. Plant Variety Protection intent.
    f. Seed amount and date of availability.
    g. Proposed distribution method.
    h. Royalty collection intent.
    i. Suggested fees.
    j. Supportive documents (release proposal).
    k. Submission signatures (TAR breeder and Station Directors of collaborating TAR/TAMU scientists).

Figure 11.5. Commercial Seed Production Field of Catarina Blend Bristlegrass.

Once each release packet is compiled, all documents are reviewed by each collaborating entity and the supervisors of the personnel involved in the development of the release. Release packets are also reviewed by senior faculty of TAMUK, the Texas A&M Department of Crop and Soil Sciences/Texas Foundation Seed Service Plant Review Committee, and the USDA NRCS Texas Plant Materials Specialist, Southern Region Plant Materials Specialists, and the Texas State Resource Conservationist.

Typically, 1–2 years of review and revisions were required between final decision to release and final approval for release was granted by all collaborating entities. A table listing all release made under these procedures is presented in Appendix D.

Figure 11.6. Commercial Seed Production Field of LaSalle Germplasm Arizona Cottontop.

COMMERCIALIZATION

Following official release, efforts were begun to ensure successful commercialization of each release and eventual availability of seed to consumers. This began by informally polling potential seed producers to gauge interest in producing the release. In early stages of the project, commercial growers were difficult to convince to grow releases. However, as demand for such seed sources increased, seed dealers began to compete heavily for production rights for each release. To equitably determine the best grower, inspections of potential growing sites were made and evaluated against the knowledge of the production requirements and climatic and edaphic adaptation of the release. Furthermore, grower selections were refined with assistance from the Texas Foundation Seed Service based on past production histories available for review. Additionally, producers willing to begin commercial production by vegetatively establishing seed fields using transplants instead of by direct seeding were given preference for seed distribution. We typically choose a single grower to initially produce each new release. If necessary to ensure rapid commercialization, term-limited, exclusive, or non-exclusive production rights were granted to the grower with the help of the Texas A&M System Office of Technology and Commercialization. All releases are eligible for sale by multiple growers, regardless of the producer, licenses, or other restrictions.

Once a grower was selected, available Breeder-level seed of the release was distributed to them. Throughout the establishment phases, assistance was provided in planting and managing the new crop. Estimates of the amount of production needed to meet market projections were developed by project personnel and the grower, and long-term production plans were initiated to achieve the milestones and ensure commercial availability of seed. For most releases, 1–2 years were needed for establishment of initial acreages, and by years 2–5 significant commercial production amounts were produced and available for sale to consumers. Final target production amounts to meet the expected demand of most releases were met within 2–5 years of the release of most varieties. Current commercial production status of each release is given in Appendix E.

CHAPTER 12: RECOMMENDATIONS AND FUTURE WORK

Figure 12.1. Native Grassland Restored Using Project Seed Releases.

Developing commercially viable native seed products is a time-intensive, laborious, and expensive process. But, it is necessary if performance-based and quality controlled native seed sources are desired for restoration of disturbed soils along highway right of ways. Restoration of Texas' highway right of ways is an extremely difficult task, but one worthwhile of TxDOT's investment in this project and future efforts like it in other parts of the state. TxDOT's role in the native seed market is enormous, given that highway rights of way are one of the largest single land uses in the state, and the agency is one of the largest single consumers of native seed in Texas.

Such seed sources as those developed in this project have high potential for long-term benefit and near-indefinite availability for use so long as breeder seed is produced and maintained by the developers. For example, Haskell sideoats grama, a very successful native seed release of the USDA NRCS James E. "Bud" Smith Plant Materials Center was formally released in 1983. This native seed release has been available for use by those desiring native plant restoration seeding almost 30 years. The impact of a native seed releases on conservation and restoration can be profound. Haskell has been used on countless thousands or hundreds of thousands of acres of highway rights of way and Conservation Reserve Program plantings. We look forward to and hope releases made by this project will have similar beneficial impacts over the coming century.

Even though 20 seed releases have now been developed for south Texas, more work is needed to ensure successful commercial availability and use of native plants on Texas' roadsides. Additional areas of Texas have similar native seed sources needs as south Texas did when this project began. The collection, selection, increase, and release of native seeds for these areas is greatly needed. We recommend the successful methods developed in this project be similarly followed elsewhere in the future. Areas of particular need are west Texas, areas of central Texas, the upper Gulf Coast region of Texas, and most all of East Texas.

The range and limits of adaptation of the native seed sources developed in this project, as well as other previous native seed releases made by other agencies in Texas need be more well defined. Currently, the areas of adaptation of most native seed releases are simply hypothesized; they have not been thoroughly tested, nor have the results of tests been made available to TxDOT and other seeding practitioners. Such publications would be of great help to TxDOT and other natural resources managers. Perhaps no other attribute of native seed would be as useful at influencing consumer demand, and in turn commercial seed production, as succinct limits and areas of adaptation for native seed sources would.

Furthermore, commercial seed stocks of most all native seed sources are too low, or availability varies too greatly to allow widespread use and specification of such seed by agencies, landowners, and conservation programs. Without consistent commercial production and availability in needed amounts, TxDOT's inclusion of many native seed sources in their Vegetation Specifications will be difficult. To overcome this problem, greater efforts to provide large amounts of Breeder and Foundation Seed Stocks must be undertaken. Such seed is necessary to maintain, or increase commercial seed supplies over time. In our experience, the presence or existence of adequately-funded, regional native seed initiatives are necessary to solve this problem. Such native seed initiatives, of which the South Texas Natives Project is an example, have the flexibility, expertise, and geographic location necessary to rapidly produce and distribute Breeder and Foundation level seed to commercial growers when needed to maintain or increase commercial acreage to meet demand for seed supplies.

Seed increase and Breeder and Foundation seed maintenance operations will require strong collaboration and open dialogue between seed consumers and seed producers. Regional native seed initiatives, by way of receiving guidance from all parties through Technical Advisory Committees, and maintaining open lines of collaboration, can receive and communicate this information between parties, as well as take action affirmatively in support of the needs or problems identified. Only by coalescing inputs from the various seed demand sectors (e.g., TxDOT, NRCS, oil and gas industry, private landowners), can a true picture of the native seed market be gained. There is great value in having trained staff employed by regional native seed initiatives who can balance and tally each seed use sector's needs, devise production plans to produce the seed necessary, and finally communicate with and assist commercial seed industry on establishing, managing, and marketing native seed crops. Currently, no other agency, academic research group, private entity, or unit of government provides such a service as it pertains to native seed in Texas. While South Texas Natives is a strong regional seed initiative in south Texas, need exists for such units in most every other part of the state.

The end goal of the South Texas Native Plant Restoration Project was the development and implementation of native seed mixes by the Texas Department of Transportation in south Texas. Through work with the Vegetation Management Section, special seeding provisions utilizing native seed developed in this project have been developed for the Pharr and Corpus Christi TxDOT Districts (Tables 12.1 and 12.2). Approval of the specifications, and implementation of these native grass seed mixes, will represent partial achievement of the overall goal of this project. In years to come, as commercial seed quantities reach adequate levels, we hope native-only seed mixes will be able to be specified for all south Texas TxDOT districts.

Table 12.1. Proposed Special Provision Native Seed Mix Specification for Clay Soils in the Pharr and Corpus Christi TxDOT Districts.

Clay Soils		
Species	**Variety**	**Lbs PLS per acre**
Green sprangletop	Van Horn	**0.1**
Sideoats grama	Haskell	**0.35**
Sand dropseed	NS	**0.1**
Slender grama	Dilley Germplasm	**2**
Hairy grama	Chaparral Germplasm	**0.1**
Texas grama	Atascosa Germplasm	**0.75**
Hooded windmillgrass	Mariah Germplasm	**0.1**
Shortspike windmillgrass	Welder Germplasm	**0.05**
Bristlegrass	Catarina Blend	**0.15**
Arizona cottontop	LaSalle Germplasm	**0.15**
Pink pappusgrass	Maverick Germplasm	**0.2**
Whiplash pappusgrass	Webb Germplasm	**0.2**
Canada wildrye	Lavaca Germplasm	**0.1**

Finally, as better adaptation information is provided, and commercial seed stocks of native plants reach necessary levels, TxDOT should consider substantially rewriting their seeding specifications to include only native vegetation. Such action would be well-received throughout the state, set precedence, and perhaps most importantly, dramatically influence seed markets away from the production, sale, or use of exotic, often invasive, restoration and reclamation seeds in the State of Texas. While performance of exotic vegetation often adequately meets engineering standards, the current use of exotic species as bermudagrass, buffelgrass, or Lehman lovegrass directly contradicts Texas' shift away from traditional livestock-production systems, to rural land use systems focused on natural resources management and native landscapes. The opportunity exists for TxDOT to become *the leader* in the use of native seeds for restoration in Texas. Our hope is that this project has helped ensure future generations' drives down south Texas highways will be framed by native plants. The same can be true for the entire state with TxDOT's continued leadership and support.

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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.

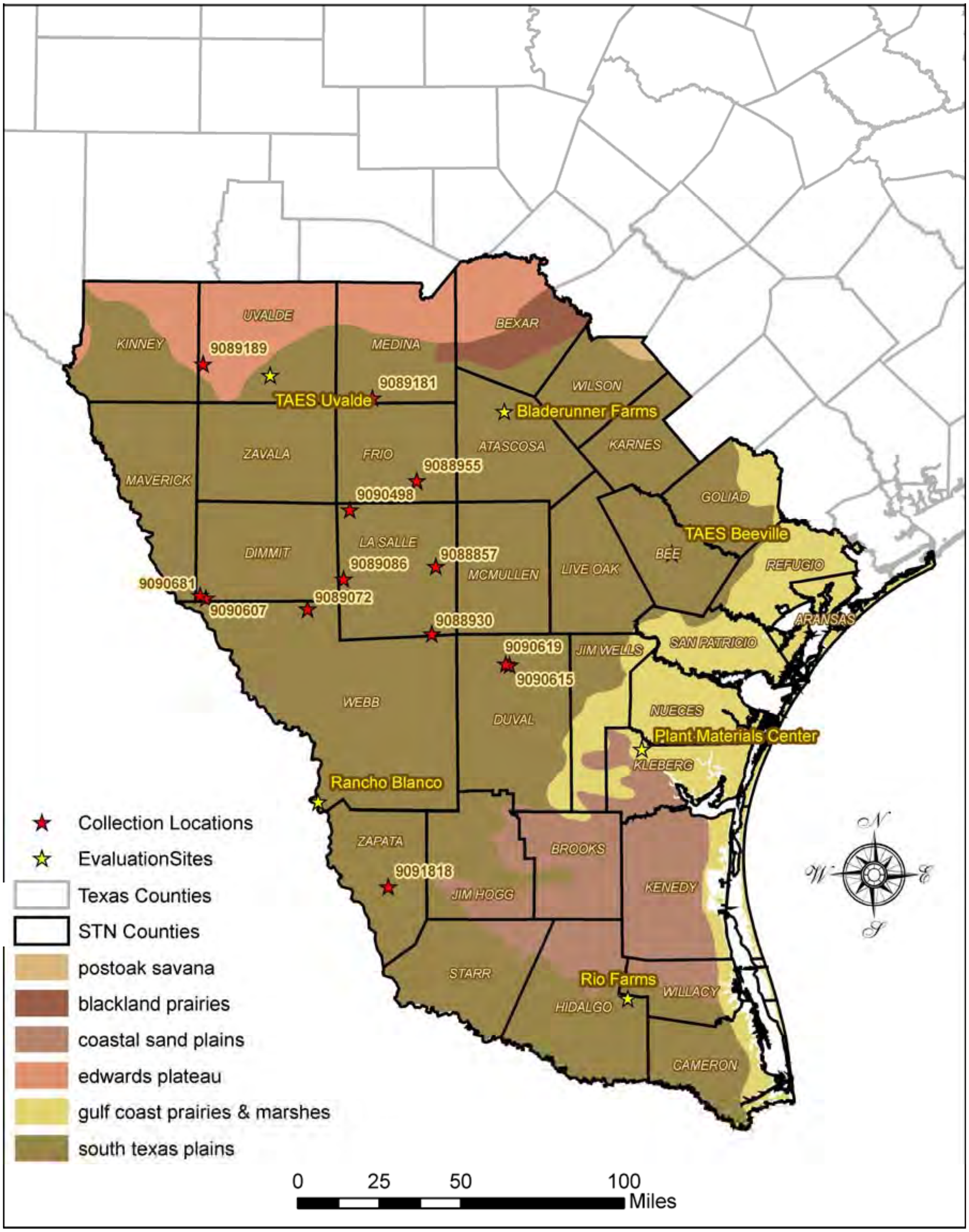

Table 1. Origin and collection information for accessions that make up the Selected Plant Material release of Arizona cottontop.

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/ft^2) 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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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	Unit Heads – Date
W R Ocumpaugh 5-26-06	Bobby R. Eddleman 5-30-06

Signatures for release of:

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

Fred C. Bryant

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

3/12/07
Date

Texas Agricultural Experiment Station
College Station, Texas

4-6-2007
Date

Acting

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

4-12-2007
Date

Robert T Escheman

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

4-23-2007
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 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.

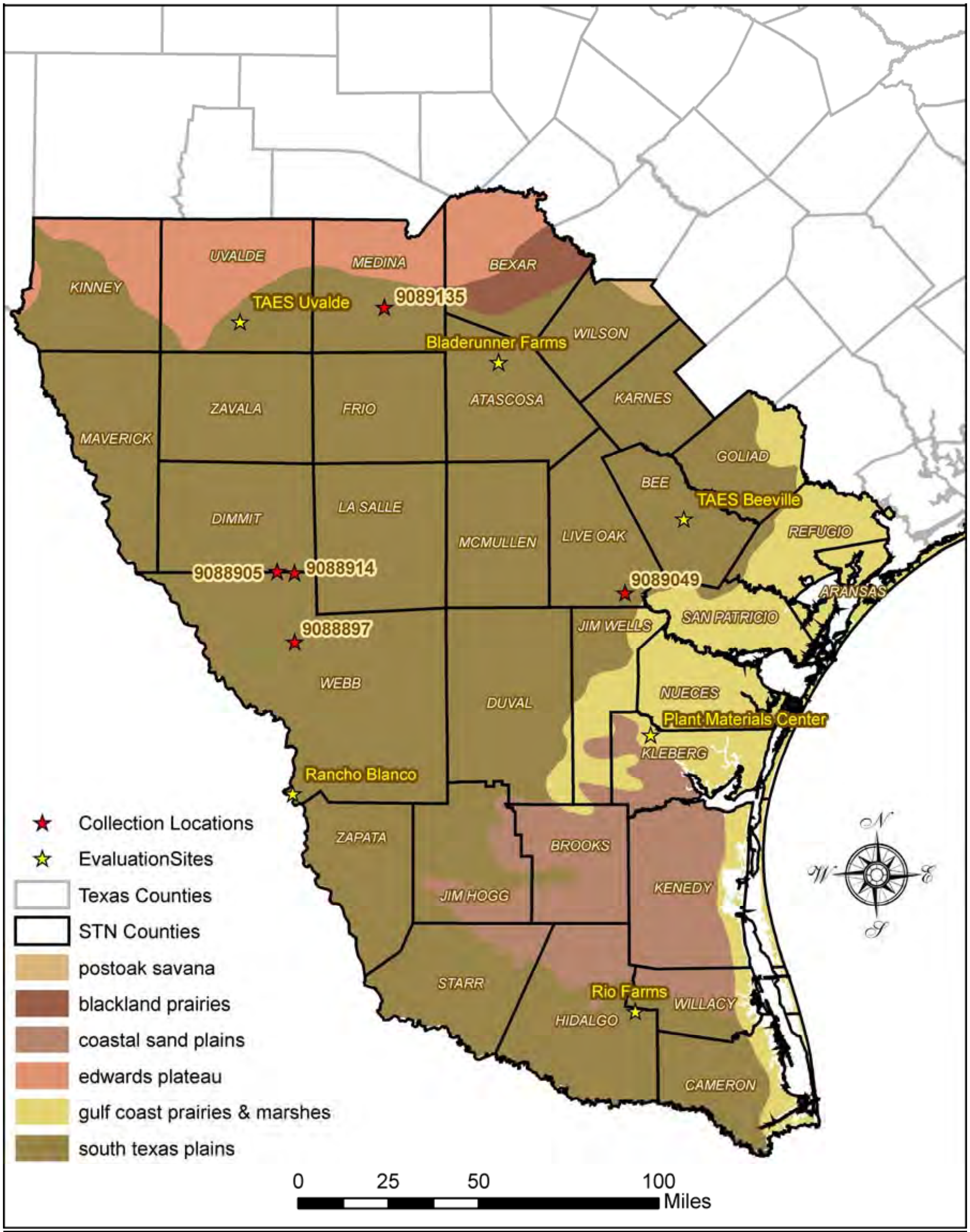

Table 1. Origin and collection information for Selected Plant Material of slender grama.

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 (ft²)	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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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	Unit Heads – Date
W M Ocumpaugh 5-26-06	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

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).

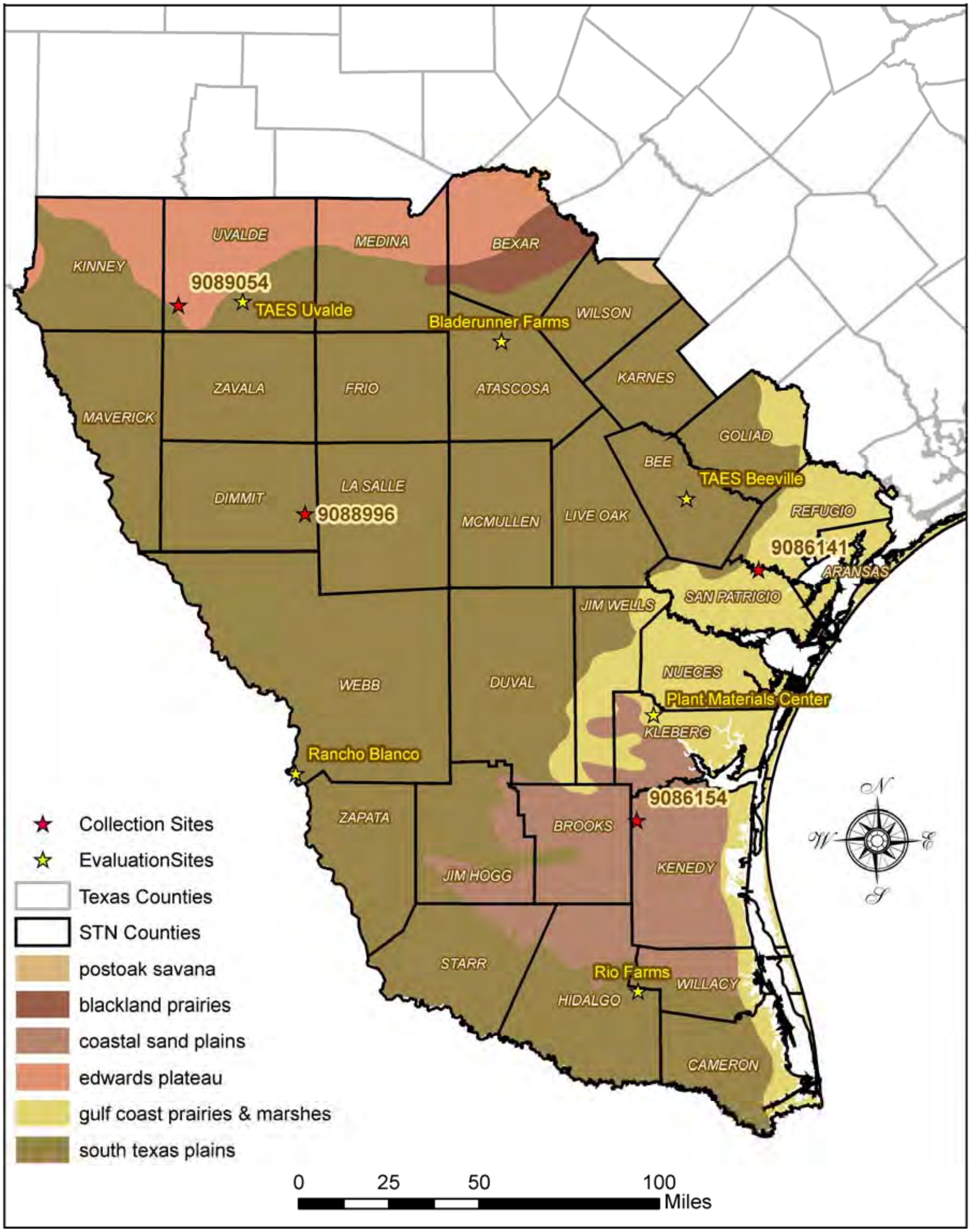
Table 2. Collection information of 24 accessions of hairy grama obtained by *South Texas Natives* from 2001-2003.

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 | Unit Heads – Date

W.R. Ocumpaugh 5-26-06 | 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

4-6-2007

Texas Agricultural Experiment Station
College Station, Texas

Date

Acting 4-12-2007

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

Date

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.

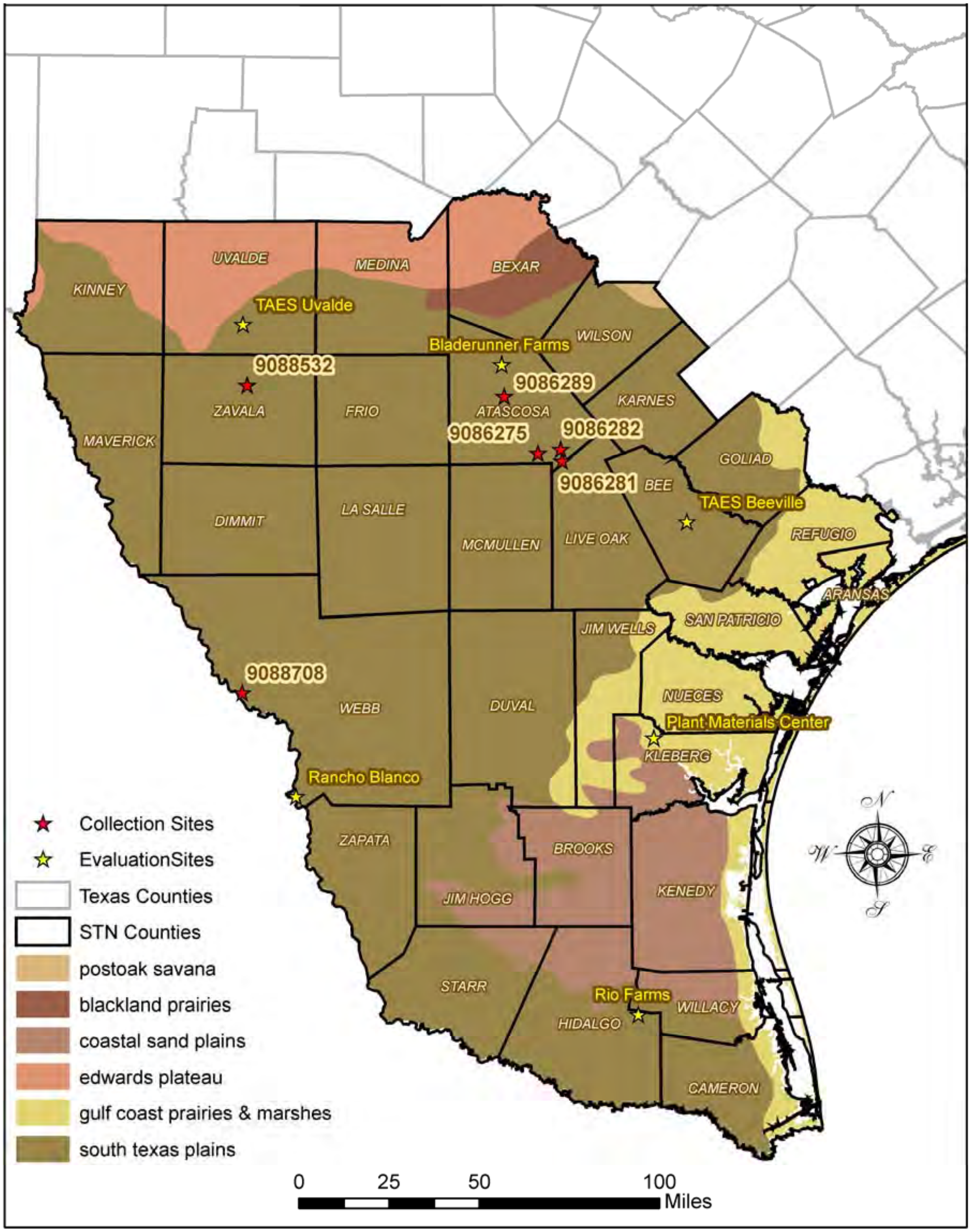

Table 1. Origin and collection information of Selected Plant Material of Texas grama.

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 ft^2 (plot size = 1280 ft^2). Plants were watered and fertilized, and seed was harvested throughout 2005. Table 11 shows the amount of seed produced and seed quality from this increase. Seed production of 37 lbs pure live seed (PLS)/acre was achieved. Seed was harvested by hand and by the use of a Flail-vac seed stripper at 1000 rpm. Seed production was lower than expected; active germination was 40-50% lower than observed in pervious harvests.

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

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

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

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

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

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

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

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

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

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

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

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

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

References:

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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.

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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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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	Bobby R. Eddleman 5-30-06

Signatures for release of:

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

Dr. Fred Bryant, Director Caesar Kleberg Wildlife Research Institute Texas A&M Kingsville, Texas	3/12/07 Date
Texas Agricultural Experiment Station College Station, Texas	4/6/2007 Date
Walter W. Douglas Acting State Conservationist United States Department of Agriculture Natural Resources Conservation Service Temple, TX	Acting 4-12-2007 Date
Robert Escheman National Plant Materials Program Leader United States Department of Agriculture Natural Resources Conservation Service Washington, D.C.	4-23-07 Date

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^{o}C (50^{o}F) / 8 hours 30^{o}C (86^{o}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^{o}C (50^{o}F) / 8 hours 30^{o}C (86^{o}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.

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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 — Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

8-29-2006

Texas Agricultural Experiment Station — Date
College Station, Texas

9/08/06

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

Robert T Escheman — 9-18-06

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

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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

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
[signature] 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^{o}C (50^{o}F) / 8 hours 30^{o}C (86^{o}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^{o}C (50^{o}F) / 8 hours 30^{o}C (86^{o}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 — Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Mark A. Hussey 8-28-2006

Texas Agricultural Experiment Station — Date
College Station, Texas

Fred Bryant 9/8/06

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

Robert T Escheman 9-18-06

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

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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

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
[illegible signature] 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 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.

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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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Signatures for release of:

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

Salvador Salinas

Dr. Larry Butler | Acting | SEP 05 2006 Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

8-28-2006
Date

Texas Agricultural Experiment Station
College Station, Texas

9/8/06
Date

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

9-18-06
Date

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

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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 9/22/2006

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. R. 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 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.

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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.

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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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Afolayan A.J. and S.S. Olugbami. 1993. Seed germination and emergence of *Setaria pallidefusca* and *Pennisetum pedicellatum* (Cyperales: Poaceae) in Nigeria. Revista de Biologia Tropical 41(1): 23-26.

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Signatures for release of:

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

John W. Mueller Acting SEP 0 1 2006

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

8-23-2006

Texas Agricultural Experiment Station — Date
College Station, Texas

9/8/06

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

9-15-06

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

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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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
[signature] 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:

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Signatures for release of:

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

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
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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: **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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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
[signature] 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^{o}C (68^{o}F) / 12 hours light 30^{o}C (86^{o}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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Signatures for release of:

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

John W. Mueller Acting SEP 01 2006
Dr. Larry Butler Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Mark A. Hussey 8-23-2006
Texas Agricultural Experiment Station Date
College Station, Texas

Fred. Bryant 9/8/06
Dr. Fred Bryant, Director Date
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Robert T Escheman 7-18-06
Robert Escheman Date
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

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

Changes in Release: none

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

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
[signature] 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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Reeder J.R. and L.J. Toolin. 1989. Notes on *Pappophorum* (Gramineae: Pappophoreae). Systematic Botany 14:3, 349-358.

USDA NRCS. 2009. Web soil survey. http://websoilsurvey.nrcs.usda.gov.

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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.

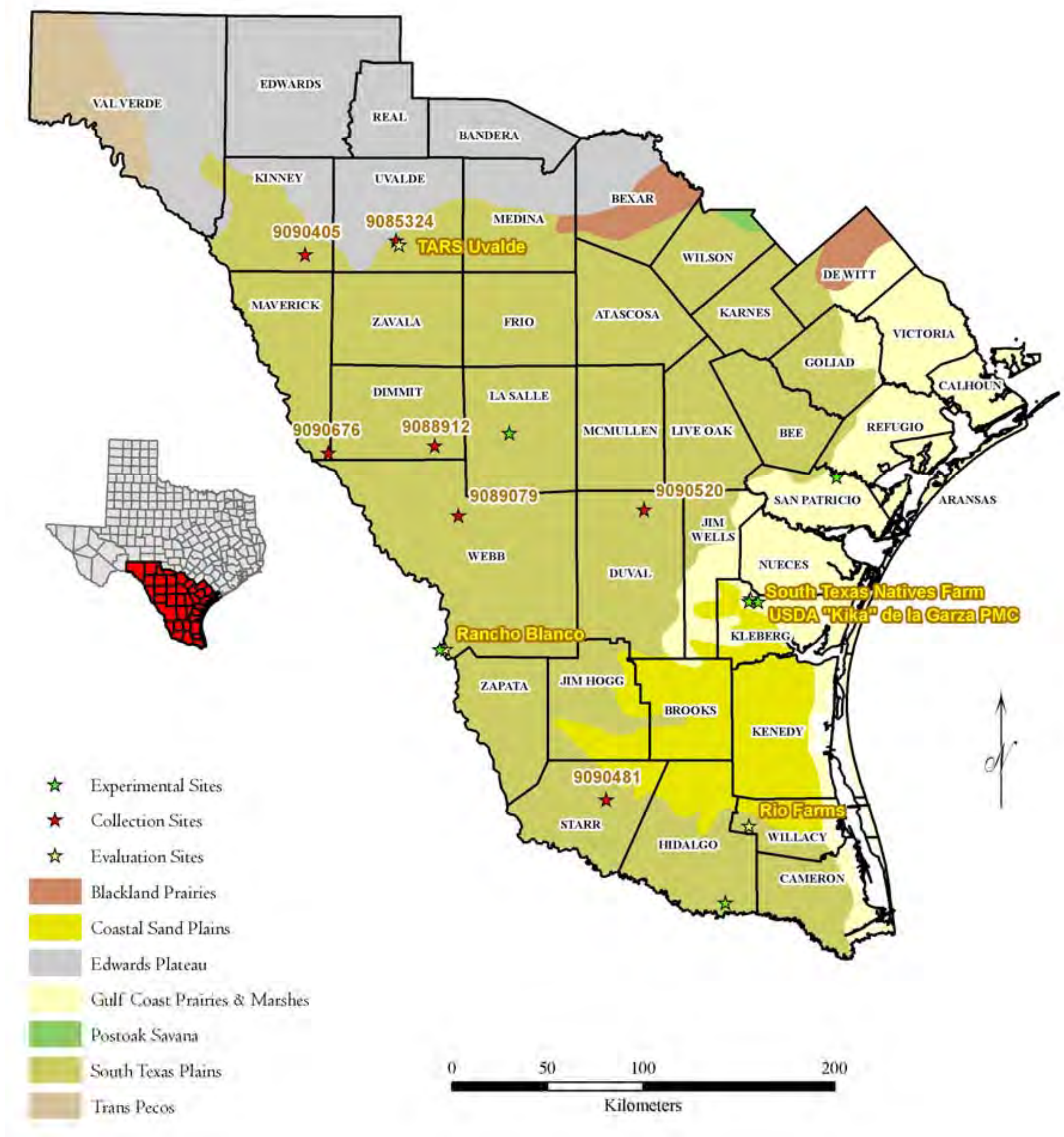

Figure 2. Seed increase field of accession 9090481 pink pappusgrass, a component of Maverick Germplasm, 2008 at Rio Farms.

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.**

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

8/17/10
Date

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

8/17/10
Date

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

8/18/10
Date

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

8/27/10
Date

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

9-21-2010
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/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. 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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USDA NRCS. 2009. Web soil survey. http://websoilsurvey.nrcs.usda.gov.

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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.

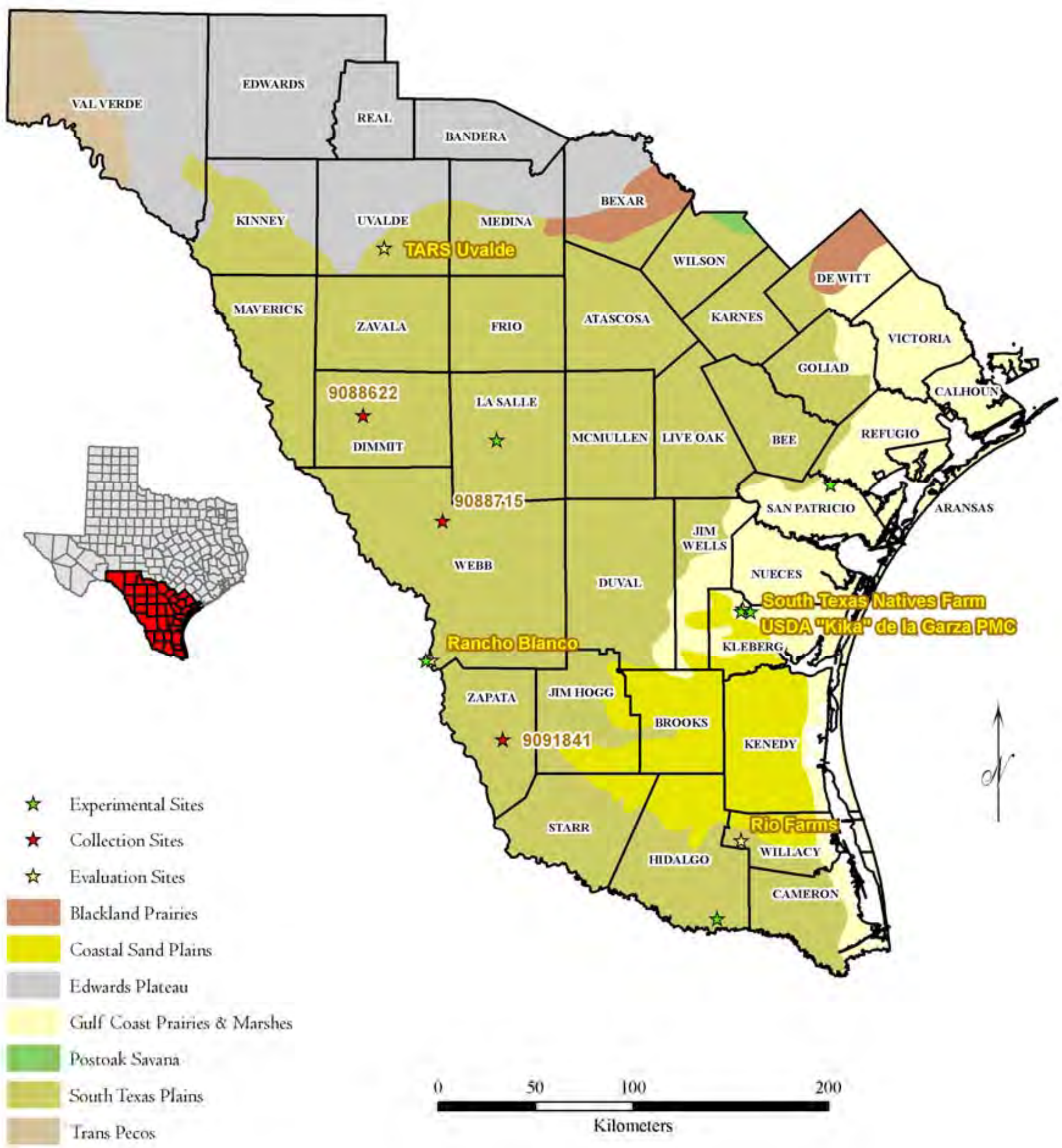

Figure 2. Seed increase field of accession 9091841 whiplash pappusgrass, a component of Webb Germplasm, 2009 at Rio Farms.

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 — Date
Leroy Denman, Jr. Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

George Allen Rasmussen ______________________________ 8/17/10

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

Bill F McCutchen ______________________________ 8/18/10

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

Donald W Gohmert ______________________________ 8/27/10

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

______________________________ 9-21-2010

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

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.

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Signatures for release of:

STN-561 Germplasm Hookers plantain
(*Plantago hookeriana* Fisch. & Mey.)

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

10/24/08
Date

Dr. G. Allen Rasmussen
Dick and Mary Lewis Kleberg College of Agriculture,
Natural Resources and Human Sciences
Texas A&M University-Kingsville,
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10-24-08
Date

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

Date

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

11/13/08
Date

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

9-3-09
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.

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 Linnaean Society 111-2:129-138.

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Signatures for release of:

STN-496 Germplasm redseed plantain
(*Plantago rhodosperma* Dcne.)

Fred C. Bryant — 10/24/08

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10-24-08

Dr. G. Allen Rasmussen — Date
Dean
Dick and Mary Lewis Kleberg College of Agriculture,
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Dr. Bill McCutchen — Date
Associate Director
Texas Agrilife Research
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Don Gohmert — 11/13/08

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

9/3/09

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

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

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/ft^2.

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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Signatures for release of:

Zapata Germplasm Rio Grande clammyweed
(*Polanisia dodecandra* (L.) DC. ssp. *riograndensis*)

Fred C. Bryant

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

10/24/08
Date

10-24-08
Date

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

Don Gohmert

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

11/13/08
Date

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

9/3/09
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).

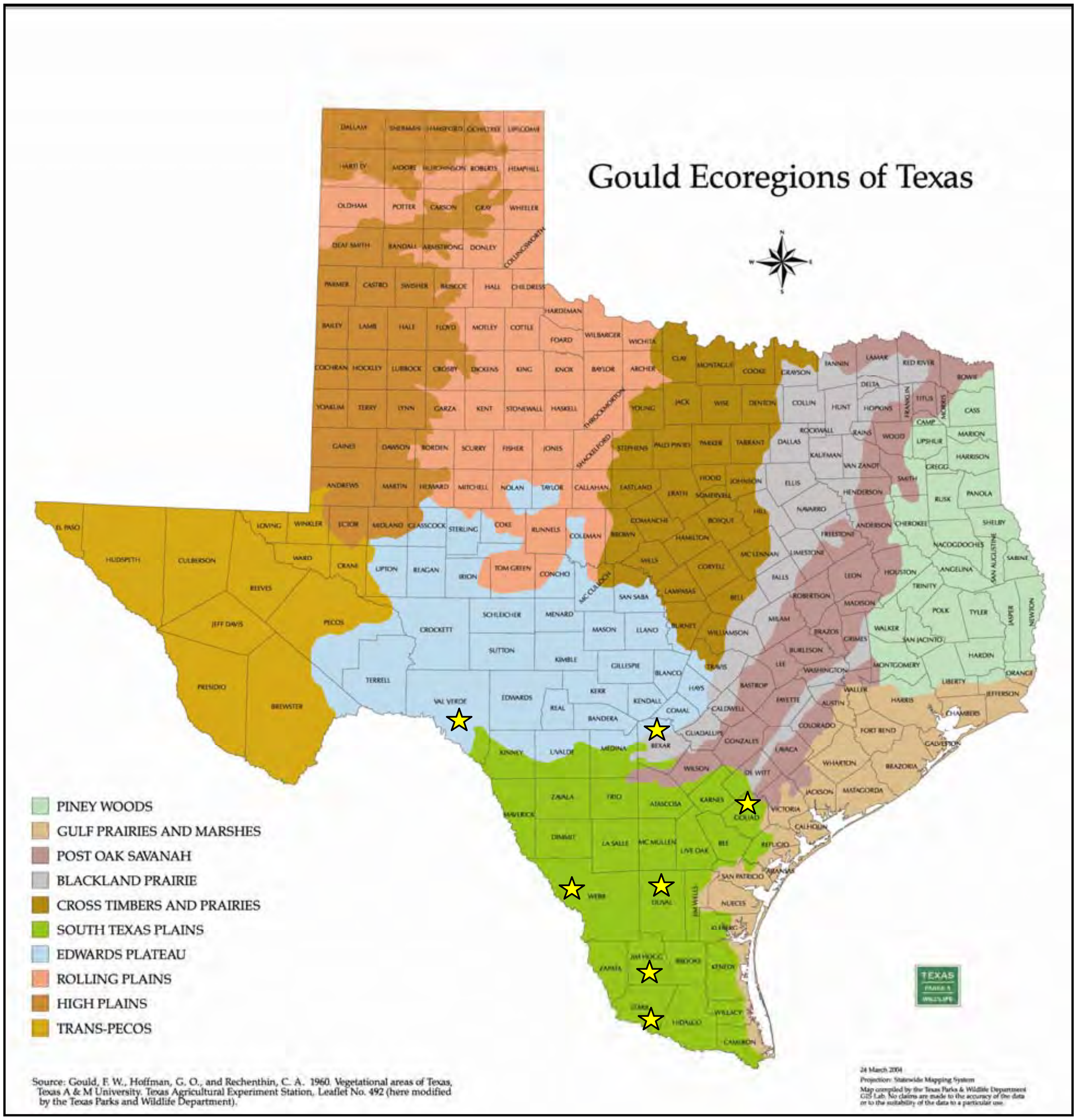
This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted orange zexmenia. The potential for immediate use is high especially in range seeding mixes for restoration, diversification, and wildlife habitat.

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 (yellow)

Selected accessions (green)

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 sco	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 sco	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

(yellow)	Indicates >mean performance at Rio Farms
(orange)	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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Signatures for release of:

Goliad Germplasm orange zexmenia
[*Wedelia texana* (A. Gray) B.L. Turner]

Fred C Bryant — 7/15/08

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

George Allen Rasmussen — 7-16-08

Dr. G. Allen Rasmussen, Dean — Date
Kleberg College of Agriculture, Natural Resources and Human Sciences
Texas A&M University-Kingsville
Kingsville, Texas

Donald W. Gohmert — AUG 15 2008

Don Gohmert — Date
State Conservationist
United States Department of Agriculture
Nat''''l Resources Conservation Service
Te e, TX

James C. Briggs, Acting for — 8-26-08

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

APPENDIX B

PUBLISHED NOTICE OF RELEASE ARTICLES FOR SPECIES FORMALLY RELEASED

Figure 1. Breeder seed field at maturity at Rio Farms near Monte Alto, Texas, which is one of the 12 accessions that make up La Salle Germplasm Arizona cottontop. Photo by Forrest S Smith

NOTICE OF RELEASE OF LA SALLE GERMPLASM

ARIZONA COTTONTOP

SELECTED CLASS OF NATURAL GERMPLASM

| **Forrest S Smith, William R Ocumpaugh, Paula D Maywald, John Lloyd-Reilley, Shelly D Maher, Keith A Pawelek, Andrew W Scott Jr, and Juan Garza**

ABSTRACT

A selected germplasm of Arizona cottontop (*Digitaria californica* (Benth.) Henr. [Poaceae]) has been released for rangeland reseeding and wildlife habitat enhancement plantings in the Rio Grande Plain of Texas. La Salle Germplasm Arizona cottontop is a blend of 12 selected accessions from an extensive evaluation at multiple sites in southern Texas. The release comprises accessions that are increased from the original seed collections of native populations to maintain the genetic integrity of each accession. This germplasm represents the first commercially available release of Arizona cottontop that originates from the intended area of use.

Smith FS, Ocumpaugh WR, Maywald PD, Lloyd-Reilley J, Maher SD, Pawelek KA, Scott AW Jr, Garza J. 2009. Notice of release of La Salle Germplasm Arizona cottontop: selected class of natural germplasm. Native Plants Journal 10(1):43–47.

KEY WORDS

Digitaria californica, Rio Grande Plain

NOMENCLATURE

USDA NRCS (2008)

COLLABORATORS

South Texas Natives CKWRI-TAMUK, Kingsville, Texas; USDA NRCS E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas Agrilife Research-Beeville, Beeville, Texas; and Rio Farms Inc, Monte Alto, Texas.

Species | *Digitaria californica* (Benth.) Henr.
Common Name | Arizona cottontop
Accession number | 9093398

La Salle Germplasm Arizona cottontop (*Digitaria californica* (Benth.) Henr. [Poaceae]), a Texas Selected Native Plant Germplasm eligible for seed certification under the Texas Department of Agriculture (TDA) and Texas Administrative Code guidelines (TAC 2007), is available for use in the Rio Grande Plain of Texas. As a selected class release, this selection will be referred to as La Salle Germplasm Arizona cottontop, USDA Natural Resources Conservation Services (NRCS) accession number 9093398, and Agricultural Resources Service (ARS)–Germplasm Resources Information Network (GRIN)–National Plant Germplasm System (NPGS) PI number 652936.

JUSTIFICATION

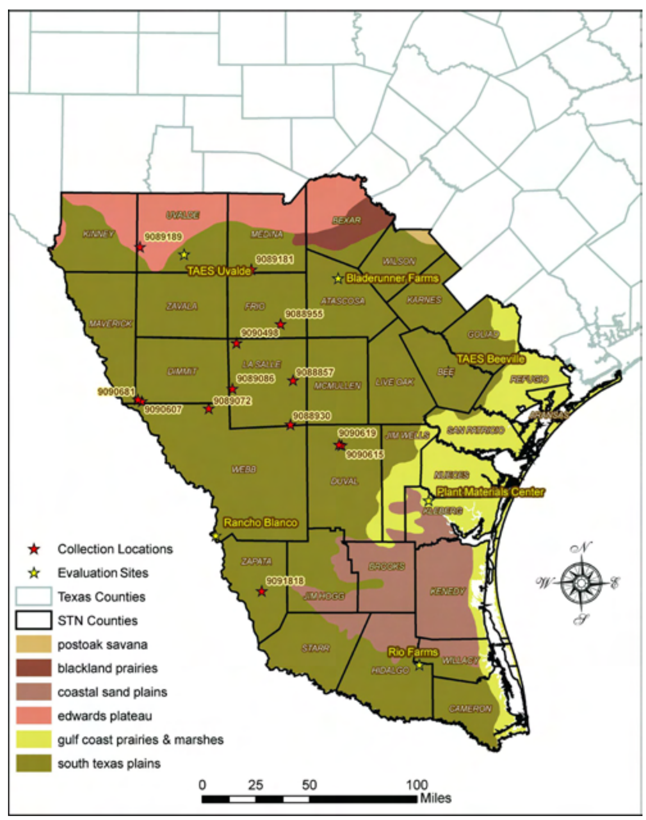
This germplasm is the first release of an Arizona cottontop germplasm that originates from the Rio Grande Plain of southern Texas. Other releases of Arizona cottontop are PMT-389 (Culberson County, Texas, informal) and 'Loetta' (Arizona, cultivar) (USDA NRCS 2007). Neither of these releases meets current standards for use of native seeds in the Rio Grande Plain as outlined by the USDA NRCS Range Planting Code 550 (USDA NRCS 2007). La Salle Germplasm does meet these standards, and is further justified for release because no other commercial sources of Arizona cottontop are currently available in the intended area of use. The name La Salle Germplasm was chosen because 3 of the 13 accessions constituting the germplasm originated from native populations in La Salle County, Texas.

COLLECTION SITE INFORMATION

Accessions contributing to La Salle Germplasm Arizona cottontop were collected from native plants at 12 locations throughout the Rio Grande Plain ecoregion. Original collections were hand harvested from stands observed in seed collection efforts across the region. Seeds were hand stripped from as many plants as possible at each collection site. Collections were cleaned, assigned individual accession numbers, and stored for evaluation. Accessions selected for release as La Salle Germplasm originate from 9 counties and from a variety of range sites and soil types.

DESCRIPTION

La Salle Germplasm Arizona cottontop is a warm-season perennial bunchgrass that grows 61 to 122 cm (2 to 4 ft) in height. Plants of Arizona cottontop are long-lived and will produce seeds during all months of the year under favorable conditions. Accessions that make up La Salle show some genetic variation in plant size, leaf blade width, seedhead length, pubescence, and coloration. The release comprises accessions that are increased from the original collection of a native population, and in spatially discrete increase fields to maintain the genetic integrity of each accession. Seeds harvested from each increased accession are blended by equal percentages of pure live seed (PLS) following harvest. Accessions included in the release have shown superior performance in several ecological and agronomic performance categories as well as in the higher mean percentage of active



Collection sites for germplasm used in developing Arizona Cottontop.

seed germination of accessions sampled from the target ecoregion of the release.

METHOD OF SELECTION

Criteria for selection of accessions for initial evaluation included viability of original seeds, geographic origin, and soil type of collection location. Geographic origin, soil type, and amount of original seeds were evaluated by analysis of the collection information provided for each of 52 accessions of Arizona cottontop collected by the South Texas Natives program from 2001 to 2003. (South Texas Natives is a native plant development project whose primary goal is the development of native plant materials for revegetation and restoration practices in south Texas.) Information included specific locale of the collection (ranch, county road, and so forth), county of the collection site, and major soil type where plants were found. A minimum of one accession from each county and soil type where Arizona cottontop was collected was included in the initial evaluation.

Viability of original seeds was determined by sowing 10 bulk seeds per cell in 72-cell seedling flats filled with commercially available potting medium. Trays were placed in greenhouses with growing conditions of 12 h with daytime temperature maintained near 30 °C (86 °F) and 12 h with night temperature near 18 °C (64 °F) and were watered daily to maintain adequate soil moisture for optimum germination. This greenhouse evaluation of original seeds resulted in the selection of 34 accessions for field evaluation. Those selected had a minimum of one live plant per cell after 60 d in greenhouse conditions.

Initial field evaluation plots of these 34 accessions were established at 4 locations in the Rio Grande Plain of south Texas. Commercially available releases PMT-389 and Loetta were also planted for evaluation at each location for comparison. Evaluation locations were Rancho Blanco near Laredo, Rio Farms near Monte Alto, the E "Kika" de la Garza Plant Materials Center near Kingsville, and Texas AgriLife Research Station-Uvalde near Uvalde. The sites represent broad geographic distribution (125 to 355 km [77 to 220 mi] between sites), differing climatic conditions, and 4 common soil types in which native populations of Arizona cottontop commonly occur (silt loam, sandy loam, clay, and clay loam). At each location 2 replications of 10 transplants of each accession were established in randomized, spaced plantings (30 cm [12 in] between plants), complete block design, on 90-cm (36-in) rows. Plants were irrigated to ensure establishment during the initial growing season. Plantings were not irrigated after September 2004. In 2004, visual rankings (1 to 9; 1 = best, 9 = worst) were given monthly (from May through November) to each replication of each accession for plant vigor, foliage den-

Figure 2. Certified seed field of La Salle Germplasm Arizona cottontop at Bladerunner Farms near Poteet, Texas; field was planted from 12-accession breeder seed blend. Photo by Forrest S Smith
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sity, uniformity, development stage, seed production, biomass production, and plant height. In 2005, visual rankings were recorded bi-monthly (from March through November) for each replication. Seeds were collected when ripe from each accession throughout the growing season in 2004 and 2005, and were tested for active seed germination in germination chambers (3 replications × 50 seeds per accession, 12 hr light at 30 °C [86 °F], and 12 hr dark at 18 °C [64 °F]). Active seed germination was recorded for each accession at 3-d intervals for 30 d.

Accessions were selected for release and seed increase by analysis of visual rankings and germination tests in 2004 through 2005. Accessions were ranked by performance in field evaluation (categories given equal consideration and combined by location) and percentage of active germination (2-y mean), for a total of 8 evaluation categories (evaluations at 4 sites, germination at 4 sites). Accessions selected were those with greater than mean performance in the greatest number of evaluation categories. The releases PMT-389 and Loetta had acceptable performance in terms of survival and seed production; however, distinct differences in initiation of growth, seed set, and plant dormancy were noted. A severe degree of lodging was noted in plantings of Loetta at 3 evaluation locations. Mean plant vigor ratings of PMT-389 were lower than most south Texas–collected accessions at 2 of the evaluation locations, and limited seeding trial data from studies performed at the E "Kika" de la Garza Plant Materials Center showed greater emergence and higher seedling density of a composite of south Texas–collected accessions in comparison with PMT-389, 6 mo after planting.

Following selection, accessions were increased using the original seeds. Transplants (5000) of each accession were grown and outplanted in 0.05 ha (0.12 ac) isolated breeder blocks. Seeds from these breeder blocks of each accession were harvested and bulked by an equal percentage of PLS of each accession, so that the genetic integrity of each accession is maintained, and the potential for genetic shift or adaptation to the breeder field site is minimized. The bulked breeder blend is released to commercial growers as foundation seeds through the Texas Foundation Seed Service for establishment of certified seed fields of La Salle Germplasm Arizona cottontop.

ECOLOGICAL CONSIDERATIONS

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 nonexistent. Also, release of this species will make available an additional native species for rangeland planting.

ANTICIPATED CONSERVATION USE

La Salle Germplasm Arizona cottontop will provide a native grass species for rangeland revegetation and wildlife habitat plantings in the Rio Grande Plain of south Texas.

ANTICIPATED AREA OF ADAPTATION

La Salle Germplasm is known to be adapted to the region south of lat 29°27'N and west of long 97°47'W. The southern and western boundary of known adaptation is the Rio Grande River; the area of adaptation encompasses the Rio Grande Plain Ecoregion, or Major Land Resource Area 83.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and distributed through the Texas Foundation Seed Service. Certified seeds may be grown within the State of Texas. Limited quantities of seeds for research or evaluation purposes will be available on request from Forrest Smith (forrest.smith@tamuk.edu).

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Figure 1. Breeder seed field of one component of Dilley Germplasm slender grama. Photo by Forrest S Smith

NOTICE OF RELEASE OF

DILLEY GERMPLASM SLENDER GRAMA

Forrest S Smith, William R Ocumpaugh, Paula D Maywald, John Lloyd-Reilley, Shelly D Maher and Keith A Pawelek,

ABSTRACT

A selected germplasm of slender grama (*Bouteloua repens* (Kunth) Scribn. & Merr. [Poaceae]) was released for rangeland reseeding, highway rights-of-way plantings, and wildlife habitat enhancement plantings in southern Texas. Dilley Germplasm slender grama is a blend of 5 accessions selected from evaluation at multiple sites in southern Texas. Accessions comprising the release are increased from the original collection of a native population to maintain the genetic integrity of each accession. Dilley Germplasm slender grama has shown consistent early emergence and establishment in rangeland plantings and is highly competitive with several problematic exotic grass species.

Smith FS, Ocumpaugh WR, Maywald PD, Lloyd-Reilley J, Maher SD, Pawelek KA. 2009. Notice of release of Dilley Germplasm slender grama. Native Plants Journal 10(3): 295–298.

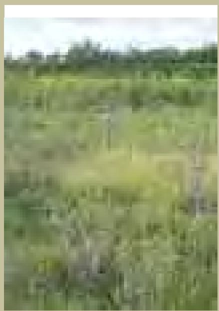
KEY WORDS
Bouteloua repens, Poaceae, southern Texas

NOMENCLATURE

Plants: USDA NRCS (2008)
Insects: ITIS (2009)

COLLABORATORS

South Texas Natives CKWRI-TAMUK, Kingsville, Texas; USDA NRCS E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research-Beeville, Beeville, Texas; Bladerunner Farms Inc, Poteet, Texas; Rancho Blanco, Laredo, Texas; and Rio Farms Inc, Monte Alto, Texas.

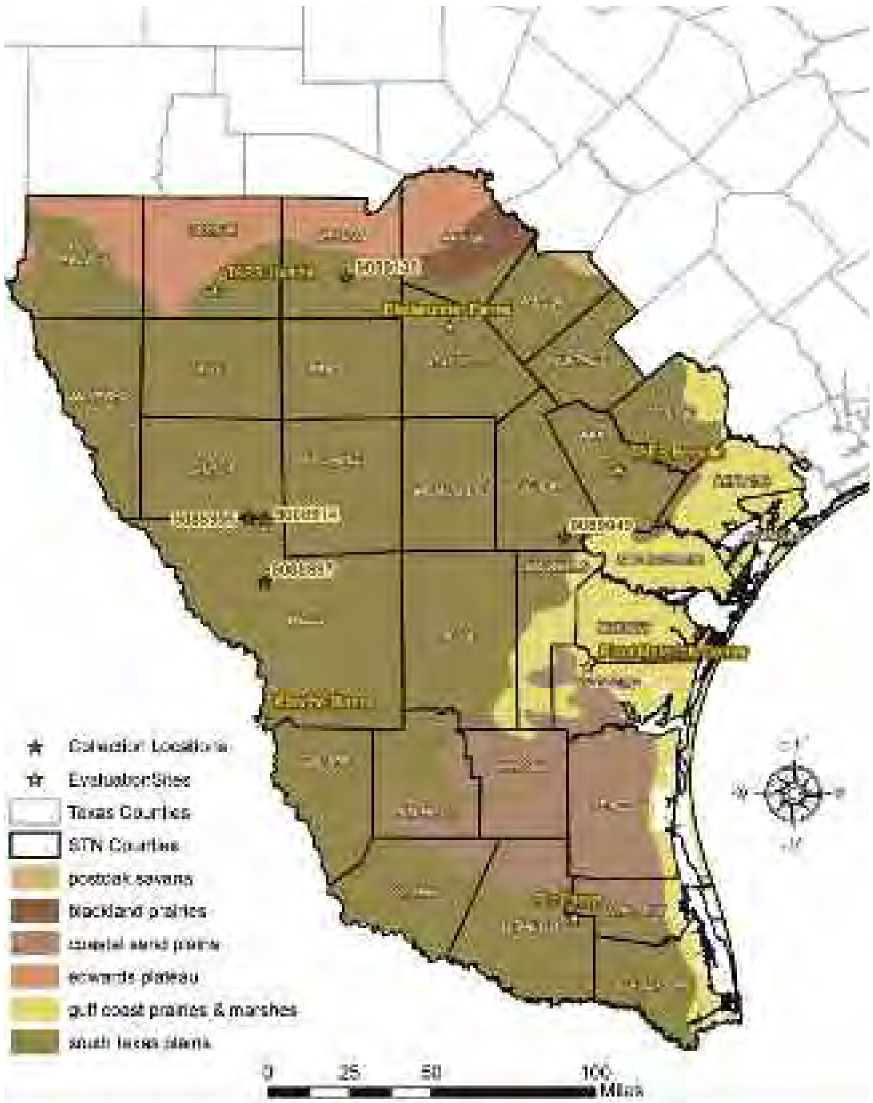


Species | *Bouteloua repens* (Kunth) Scribn. & Merr.
Common Name | Dilley Germplasm slender grama
Accession number | 9093399

Dilley Germplasm slender grama (*Bouteloua repens* (Kunth) Scribn. & Merr. [Poaceae]) was released by *South Texas Natives*-Caesar Kleberg Wildlife Research Institute-Texas A&M University-Kingsville, the USDA-NRCS E "Kika" de la Garza Plant Materials Center, and Texas AgriLife Research-Beeville in 2007. This plant is eligible for seed certification under the Texas Department of Agriculture (TDA) and Texas Administrative Code guidelines (TAC 2007). As a selected class release, this selection will be referred to as Dilley Germplasm slender grama, USDA NRCS accession number 9093399, and Agricultural Resources Service (ARS)-Germplasm Resources Information Network (GRIN)-National Plant Germplasm System (NPGS) PI number GRIF 16602.

JUSTIFICATION

This germplasm represents the first public release of slender grama; previously, there were no commercial sources of this plant available. The name Dilley Germplasm was chosen because 2 accessions comprising the germplasm originated from native populations collected from Dilley fine sandy loam soil types.



COLLECTION SITE INFORMATION

Accessions comprising Dilley Germplasm slender grama were collected from native populations at 5 locations throughout the Rio Grande Plain ecoregion. Accessions selected for release as Dilley Germplasm originate from 4 Texas counties: Webb, Dimmitt, Live Oak, and Medina, and from loam and sandy loam soil types.

DESCRIPTION

Dilley Germplasm slender grama is a warm-season perennial tufted (or bunch grass on some soils) that grows 30 to 61 cm (1 to 2 ft) in height. All accessions commonly exhibit a stoloniferous growth habit on coarse-textured soils. Slender grama will produce seeds in all months of the year under favorable conditions. Slender grama has a low palatability rating, and forage value is also relatively poor. Dilley Germplasm's parent accessions are uniform in growth habit, phenology, and morphology. Accessions that make up the release were increased from the original collection of a native population and were spatially isolated from other populations of slender grama to maintain the genetic integrity of each accession. Seeds harvested from each increased accession are blended following harvest for distribution to interested producers. Selected accessions have shown a strong perennial habit, good seed production potential, and higher mean percentage active seed germination of populations sampled from the target ecoregion of the release.

METHOD OF SELECTION

Slender grama was selected for evaluation of potential use as a low-growing native species in highway rights-of-way plantings and as an aggressive, early successional native plant species for restoration plantings and exotic grass diversification efforts. Nine slender grama seed collections were obtained for evaluation in 2002. Transplants of each accession were grown in greenhouses and planted for evaluation in a split plot design with 2 replications of each accession. Each replication consisted of a 3 x 6-m (10 x 20-ft) plot with 25 evenly spaced transplants. Each plot was irrigated at planting to ensure transplant establishment. Four of the 9 accessions experienced 100% transplant mortality by one year after planting. Seeds were collected from the 5 surviving accessions and tested for active seed germination in 2003. All accessions had a high percentage of active seed germination in the evaluation setting (mean active seed germination in growth chamber of > 20%, mean active seed germination in greenhouse tests of > 30%); good set (94% mean seed viability determined by tetrazolium tests); and seed production potential (> 200 bulk lb of seeds produced per ac). In 2004 plots were subjected to a severe drought; however, survival and tolerance to extremely adverse environmental conditions were observed to be excellent. Slender grama showed greater drought tolerance than did several other low-growing native species planted nearby. In 2005, 2- to 10-plant transplant plots of each of the 5 surviving accessions were planted for advanced evaluation at 3 locations in southern Texas (Laredo, Beeville, and Kingsville). Again in this evaluation, all 5 accessions had good performance. Mean active seed germination of the 5 accessions was 30%, 36%, and 25%, respectively, at each evaluation site. In 2005, these slender grama accessions were also planted to assess commercial seed production potential of the species. Seed yield was found to be acceptable for commercial production, with bulk seed production of 100 lb per ac (45 kg/0.4 ha) at Kingsville, and 360 bulk lb per ac (163 kg/0.4 ha) at Beeville. Harvest averaged 50% pure live seed. At this time, harvest, cleaning, and processing criteria were developed. Harvest is best achieved using a Flail-Vac or similar brush-type harvester. Rice stink bugs (*Oebalus pugnax* (Fabricius, 1775) [Pentatomidae]) and thrips (*Thrips* spp. Linnaeus, 1758 [Thripidae]) were identified as harmful seed pests in irrigated fields, and control regimes were devised. Following the advanced evaluation, all 5 accessions were chosen for release. Seeds of each accession were planted in isolated increase fields near Poteet, Texas. Mean seed yield for the 5 accessions was 296 lb bulk seeds per ac (134 kg/0.4 ha). In 2006, harvests from May to August had mean pure live seed of 35%, while September to November harvests had a mean of 53% pure live seed. Harvests of each accession were blended by equal percentage pure live seed for distribution to commercial producers.

A series of seeding trials were conducted using the Dilley Germplasm slender grama blend throughout 2005 to 2009. Plantings were made in a variety of soil types in San Patricio, Kleberg, Webb, Hidalgo, Jim Hogg, Duval, and La Salle counties of southern Texas. Dilley Germplasm slender grama was noted in each planting as one of the first native grasses to emerge, establish, and produce seeds. Plantings in Webb County were conducted to determine the competitive ability of 10 native grass species with the nonnative buffelgrass (*Pennisetum ciliare* (L.) Link) (all Poaceae). Results showed that Dilley Germplasm slender grama was one of 2 native grasses that were able to reliably establish and persist in these areas. Plantings in San Patricio County also identified Dilley Germplasm slender grama as a competitive native species in areas dominated by nonnative Old World bluestems (*Dichanthium* spp.). Demonstration plantings in Kleberg County along a major highway showed Dilley Germplasm's ability to also establish in a highly disturbed area, with competition from a variety of nonnative species, including bermudagrass (*Cynodon dactylon* (L.) Pers.). A wildlife habitat improvement planting in Hidalgo County showed that among 27 native species that were planted, Dilley Germplasm slender grama had the greatest plant density 6 mo after seeding, despite comprising only 4% of the overall seed mixture. When included in rangeland native seed mixes in southern Texas, Dilley Germplasm slender grama is often the first planted native grass species to establish and produce seeds. Our evaluations show that Dilley Germplasm slender grama is a reliable, easy-to-establish native grass species that should aid in restoration attempts by quickly stabilizing soil and increasing native plant competition with exotic grasses. Dilley Germplasm slender grama shows broad adaptability to a variety of soil types in the region, ranging from coarse sands to fine-textured clays. Dilley Germplasm slender grama can be planted in most standard seed drills, but seeds may be coated to ensure flowability. The recommended seeding rate for solid stands is 8 lb pure live seed per ac (3.6 kg/0.4 ha).

ECOLOGICAL CONSIDERATIONS

Slender grama is a naturally occurring species in Texas, and planting it would not constitute an introduction of an exotic species into local ecosystems. Any negative impacts on other native plant species would likely be minimal to nonexistent. Also, release of this species will make available an additional native species for rangeland and highway rights-of-way plantings.

ANTICIPATED CONSERVATION USE

Dilley Germplasm slender grama will provide a native grass species for highway rights-of-way, rangeland revegetation, and wildlife habitat plantings in southern Texas.

ANTICIPATED AREA OF ADAPTATION

Dilley Germplasm slender grama is known to be adapted to the region south of latitude 29°27'N and west of longitude 97°47'W. The southern and western boundary of known adaptation is the Rio Grande River; the area of adaptation encompasses the Rio Grande Plain Ecoregion and Gulf Coast Prairies, or Major Land Resource Areas 83 and 150. Experimen-tal plantings in southern Oklahoma, central Texas, and north central Texas have had poor winter survival.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by *South Texas Natives* and the Texas Foundation Seed Service. Certified seeds may be grown within the State of Texas from seeds obtained from the breeder. Limited quantities of seeds for research or evaluation purposes will be available on request from Forrest Smith (forrest.smith@tamuk.edu) for 5 y after registration through Native Plants Journal. Afterward, seeds will be available from the National Plant Germ-plasm System (NPGS). Recipients of seeds are asked to make appropriate recognition of the source of germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

ACKNOWLEDGMENTS

Special thanks are extended to Jim Muir, PhD, of Texas AgriLife Research-Stephenville, and Twain J Butler, PhD, of the Samuel Roberts Nobel Foundation-Ardmore, Oklahoma, for evaluating plant material.

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Breeder seed fields at Rio Farms Inc near Monte Alto, Texas

NOTICE OF RELEASE OF

CHAPARRAL GERMPLASM HAIRY GRAMA

SELECTED CLASS OF NATURAL GERMPLASM

Forrest S Smith, Paula D Maywald, William R Ocumpaugh, John Lloyd-Reilley, Shelly D Maher, and Keith A Pawelek

ABSTRACT

Chaparral Germplasm hairy grama (*Bouteloua hirsuta* Lag. var. *hirsuta* [Poaceae]) was released as a Texas Selected Native Plant Germplasm in 2007. This germplasm is a blend of 4 selections of hairy grama originating from native populations in the Edwards Plateau, Rio Grande Plain, Sandsheet Prairie, and Gulf Coast Prairies ecoregions of Texas. Chaparral Germplasm comprises plants representative of the considerable ecotypic variation of *B. hirsuta* found across the intended area of use and contains ecotypes originating from a variety of soils where the species occurs. This germplasm has high potential for use in rangeland seed mixtures and in highway rights-of-way plantings. Chaparral Germplasm represents the first release of selected plant material of this widespread native grass.

Smith FS, Maywald PD, Ocumpaugh WR, Lloyd-Reilley J, Maher SD, Pawelek KA. 2010. Notice of release of Chaparral Germplasm hairy grama: selected class of natural germplasm. Native Plants Journal 11(3):295–298.

KEY WORDS

Bouteloua hirsuta, Texas, restoration, Poaceae

NOMENCLATURE

Plants: USDA NRCS (2009a)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research, Beeville, Texas; Bladerunner Farms, Poteet, Texas; and Rio Farms Inc, Monte Alto, Texas.

Photos by Forrest S Smith

Species | *Bouteloua hirsuta* Lag. var. *hirsuta*
Common name | hairy grama
Accession number | 9093400

Chaparral Germplasm hairy grama, the first release of selected plant material of this widespread native grass, comprises 4 selections representing ecotypes originating from a variety of soils where this species occurs.

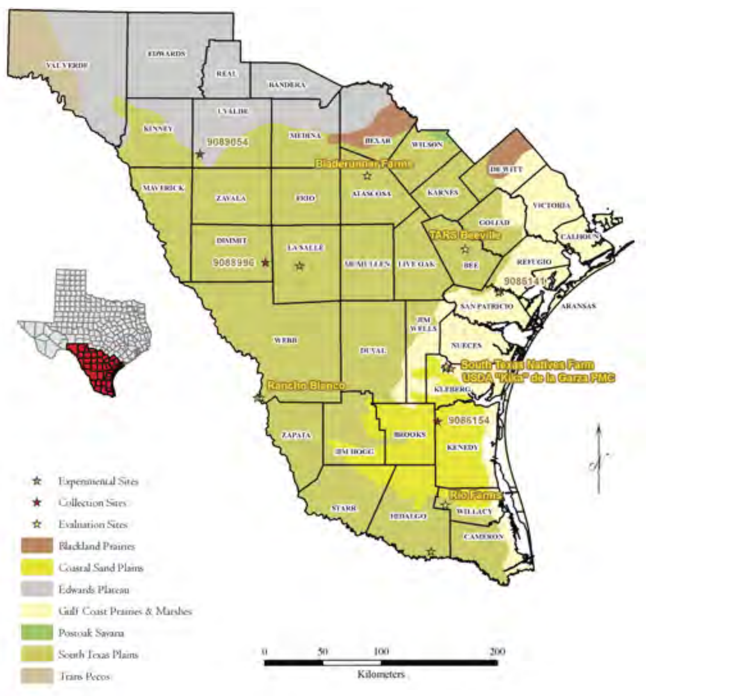
Hairy grama (*Bouteloua hirsuta* Lag. var. *hirsuta* [Poaceae]) is a widespread subdominant plant of grassland communities throughout the US. In south Texas, hairy grama is found on well-drained sand or sandy loam soils in the Gulf Prairies and Marshes and Sand Plains (Hatch and others 1999), and in the Edwards Plateau on shallow, dry, or rocky sites, as well as in well-drained sandy clays, limestone, and caliche-like soils (Loflin and Loflin 2006). Native populations of *B. hirsuta* show considerable morphological variation (Roy and Gould 1971). Evidence of this variation includes stoloniferous and caespitose ecotypes (Morrow and others 1954), vegetative apomixis in the form of vivipary in some populations (Hill 1982), and hybridization with similar *Bouteloua* species (Roy and Gould 1971). Because of this inherent variation, and the assumption of a cross-pollinated mode of reproduction (Roy 1968), Chaparral was developed to be a freely crossing germplasm, comprising a designated blend of seed from populations originating from the diverse areas of intended use.

JUSTIFICATION

Commercially available seed of hairy grama would provide considerable utility to range seed mixes in south Texas, especially for use on sand and sandy loam soils. It provides good forage for livestock and is an important component of grassland and prairie vegetation in south Texas. It may also be useful as a soil stabilizing species on highway rights-of-way because it is a low-growing native species that could help reduce mowing costs.

COLLECTION SITE INFORMATION

Chaparral Germplasm comprises 4 selected accessions of hairy grama collected during extensive seed collection efforts across south Texas from 2001–2005. Accession 9086154 was collected in Kenedy County from a private ranch on a Sarita fine sand soil. Accession 9086141 was collected in San Patricio County from the Welder Wildlife Refuge on an Odem fine sandy loam soil. Accession 9089054 was collected in Uvalde County from the Farm to Market Road 1022 right-of-way on Olmos and Ector very gravelly loam soils. Accession 9088996 was collected in Dimmit County from the Texas Parks and Wildlife Department Chaparral Wildlife Management Area on a Duval fine sandy loam soil (USDA NRCS 2009b). Germplasm collections originated from the Sand Plains, Gulf Prairies and Marshes, Edwards Plateau, and Rio Grande Plain ecoregions of Texas, respectively. Collectors hand-stripped seed from as many plants as possible at each collection site.



Courtesy of CKWRI Wildlife Research Technologies Laboratory

DESCRIPTION

Accessions constituting Chaparral Germplasm represent 2 morphologically distinct types of hairy grama found in south Texas. Accessions 9086141 and 9086154 are sprawling, stoloniferous ecotypes, whose seedheads exhibit a high degree of vivipary (spikelets bear plantlets in lieu of seeds) in mid-late summer. Maximum seed production of these accessions occurs in fall months, and overall is 3 to 4 times greater than the other 2 accessions. These stoloniferous ecotypes have longer leaves, ranging from 18 to 30 cm (7 to 12 in) in length and 2+ mm (0.08 in) in width. Accessions 9089054 and 9088996 are caespitose ecotypes that produce seed-bearing spikelets throughout the year. Leaf length of these caespitose ecotypes is characteristically shorter, ranging from 9 to 14 cm (3.5 to 5.5 in) and < 2 mm in width. Spikes of the stoloniferous ecotypes average 3 cm (1.2 in) in length, whereas the spikes of caespitose ecotypes average 2 cm (0.8 in). Seedhead and maximum height of both types is 30 cm (12 in).

METHOD OF SELECTION

Seed from 24 native populations of hairy grama was planted in greenhouse plug containers to grow plants for field evaluations in 2003. Thirteen of the 24 accessions had little or no germination and were eliminated from consideration. The remaining 11 accessions were planted in replicated plots at Bladerunner Farms near Poteet, Texas. Only 5 of the 11 accessions survived and produced seed through fall 2004. Germination of seed produced in 2004 was low, averaging < 5%. We selected 4 of the 5 surviving accessions to plant at 3 Texas locations (Beeville, Monte Alto, and Kingsville) for further evaluation. Accessions selected from this evaluation were those with the highest survival and plant vigor, and included plant materials from each of the 4 ecoregions where hairy grama had been obtained. Vegetatively, all accessions performed well in this multi-site evaluation; however, germination of all accessions was low, averaging just 2.8%. Because of the poor seed germination potential (and negative implications for successfully planting seed in restoration plantings) but good plant performance, larger isolated seed increase blocks of each accession were planted with the hope of increasing seed quality with intensive management and agronomic inputs. Consultation with commercial seed producers of Poaceae gramas *Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths and *B. eriopoda* (Torr.) Torr. revealed that seed production of these species is extremely variable by year and can also be influenced by infestations of thrips and other insects, which greatly reduce seed fill.

In order to assess seed yields under maximum production conditions, 0.10 ha (0.25 ac) seed production fields of each accession were established. Fields were intensively irrigated and treated for insect pests throughout the growing season. One of the 4 fields was lost due to equipment operator error, but the remaining 3 fields were harvested throughout the growing season, seed was cleaned, bulked by accession, and tested by outside laboratories to assess seed production potential. Tetrazolium tests revealed 69% seed dormancy in 2 accessions, with 7% seed germination, while the third accession had 44% germination and 6% dormancy.

Tests of seed produced from all 4 selected accessions under intensive seed production conditions in 2006, 2007, and 2008 have shown acceptable production for commercialization of Chaparral Germplasm. Seed germination has averaged 25, 24, and 25%, and seed dormancy 69, 64, and 60%, respectively. Bulk seed yields of these accessions have averaged 240 kg/ha (220 lb/ac), and cleaned seed averages 30% pure live seed (PLS).

Because of the relatively low production potential of hairy grama seed, it should be used as a component of a mixture of species in rangeland and highway right-of-way seed mixes. Seeding trials of Chaparral Germplasm have shown best emergence when planted at a rate of 2 kg PLS per ha (2 lb/ac). Emergence of seed is sporadic, often occurring during a 2- to 3-y period after planting, due in large part to the high degree of inherent seed dormancy. Seeded plants show exceptional drought tolerance.

ECOLOGICAL CONSIDERATION

Hairy grama is a naturally occurring species in Texas and planting would not constitute an introduction of an exotic species into local ecosystems. This release will provide roadside planting materials for south Texas, and its use may help reduce the planting of exotic grasses that may spread into adjacent habitats and negatively affect native plant and animal species.

ANTICIPATED CONSERVATION USE

Chaparral Germplasm is the first known release of hairy grama. It will be useful as a component of rangeland seed mixes and for highway right-of-way revegetation. Hairy grama has potential use as a vegetative cover for non-mow areas of urban landscapes and in ornamental lawn plantings. It will be an excellent plant for reclamation or stabilization of caliche, stony, or shallow upland soils, and sandy textured soils.

ANTICIPATED AREA OF ADAPTATION

Best performance of Chaparral Germplasm is anticipated in the major land resource area (MLRA) 83A-E and 150. Because one collection included in the blend originated near the eastern edge of MLRA 42 and another occurred near the southern extent of the Edwards Plateau, good performance may be observed in MLRA 42 and 81A-D, although this use has yet to be tested. Evaluation plantings in north central Texas and southern Oklahoma have had poor winter survival and sporadic seed production.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and distributed through the Texas Foundation Seed Service. Limited quantities of seed for research and evaluation purposes are available on request from South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-107.

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Breeder seed block of one component of Atascosa Germplasm growing near Poteet, Texas

NOTICE OF RELEASE OF

ATASCOSA GERMPLASM TEXAS GRAMA

SELECTED CLASS OF NATURAL GERMPLASM

Forrest S Smith, Paula D Maywald, William R Ocumpaugh, John Lloyd-Reilley, Shelly D Maher, and Keith A Pawelek

ABSTRACT

A blend of selected germplasms of Texas grama (*Bouteloua rigidiseta* (Steud.) Hitchc. [Poaceae]) has been released for roadside revegetation and wildlife habitat restoration in south Texas. This release will be referred to as Atascosa Germplasm Texas grama. The 6 accessions constituting the release were selected from an evaluation of plants grown from seed obtained at 21 locations in the Rio Grande Plain of south Texas. Texas grama is a low-growing, early successional native bunchgrass that grows well on shallow, rocky soils, making it an ideal plant for roadside revegetation. Accessions making up the blend have been increased in isolation, and seed is blended following harvest to ensure genetic diversity in seed distributed to commercial producers. Selections were made based on perennial habit, seed germination, and good performance at multiple evaluation locations. A critical need for ecotypic native seed for restoration and revegetation exists in south Texas, especially for roadsides and degraded rangelands. Texas grama should meet these needs because of its natural adaptation to disturbed sites, and prolific seed production and colonization ability.

Smith FS, Maywald PD, Ocumpaugh WR, Lloyd-Reilley J, Maher SD, Pawelek KA. 2010. Notice of release of Atascosa Germplasm Texas grama: selected class of natural germplasm. Native Plants Journal 11(3):299–304.

KEY WORDS

Bouteloua rigidiseta, Texas, restoration, Rio Grande Plain, Poaceae

NOMENCLATURE

Plants: USDA NRCS (2009a)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research, Beeville, Texas; Bladerunner Farms, Poteet, Texas; and Rio Farms Inc, Monte Alto, Texas.

Photos by Forrest S Smith

Species | *Bouteloua rigidiseta* (Steud.) Hitchc.
Common name | Texas grama
Accession number | 9093401

Six accessions of this low-growing, early successional native bunchgrass constitute this release of Atascosa Germplasm Texas grama. Adapted to shallow, rocky soils and having prolific seed production and colonization abilities, this release is ideal for roadside revegetation.

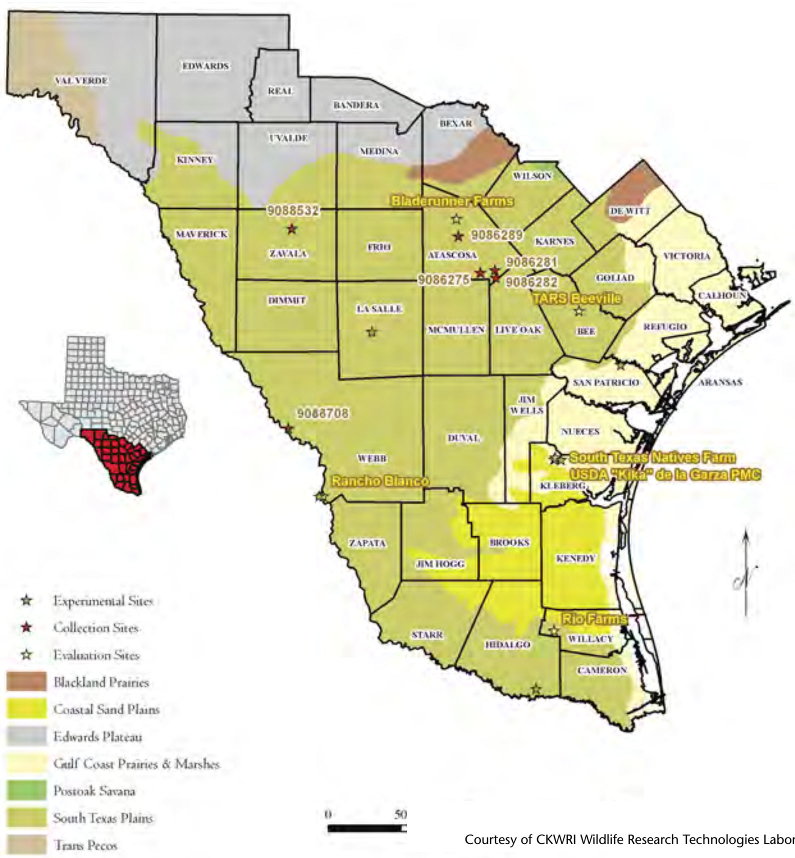
Atascosa Germplasm Texas grama (*Bouteloua rigidiseta* (Steud.) Hitchc. [Poaceae]) was released in 2007 as a Texas Selected Native Plant Germplasm. Texas grama was selected for evaluation by South Texas Natives and collaborators for potential use in rangeland seed mixes and as a component of revegetation mixes for highway rights-of-way in south Texas. An aggressive, low-growing, native bunchgrass, Texas grama grows well on a variety of soils including shallow, rocky, and gravelly sites.

Texas grama is commonly classified as an increaser or invader of disturbed sites and is commonly found in overgrazed rangelands, brush areas, and along roadsides (Correll and Johnston 1996). It is a component of a variety of sites in south Texas, from clay and clay loam soils in the Coastal Bend of Texas (Gould and Box 1965; Hatch and others 1999), to well-drained sands, loams, and clays in the Texas Hill County (Loflin and Loflin 2006). Texas grama can also be a dominant species of short-grass communities in central Texas (Fowler and Dunlap 1986). Texas grama is a short-lived perennial and is among the first warm-season grasses to flower each spring (Gould 1979).

A blend of accessions was desired for a Texas grama release to provide commercial producers and seed purchasers with seed possessing adaptations for good performance and persistence on a variety of planting sites and soils. Significant ecological studies conducted on *B. rigidiseta* by Miller and Fowler (1993, 1994) revealed that genetic differences strongly influenced reproductive traits in populations studied, genetic differentiation occurs for a variety of traits, and site-specific adaptation exists. Texas grama is self compatible but the breeding system has not been fully documented (Miller and Fowler 1993); chromosome number is 2n = 40 (Gould 1979). Cross pollination of accessions is possible, but stand life of 7 y on production fields should prevent significant genetic shifts in the release.

JUSTIFICATION

Prior to release of Atascosa Germplasm, seed of this species was not available for commercial seed production or use in restoration and revegetation plantings in south Texas. Its characteristics make it an ideal native species to meet the goals of agencies, such as the Texas Department of Transportation, for native plants to stabilize roadsides following construction and to reduce mowing costs associated with taller vegetation.



Courtesy of CKWRI Wildlife Research Technologies Laboratory

COLLECTION SITE INFORMATION

Atascosa Germplasm Texas grama comprises collections originating from 6 locations in the Rio Grande Plain of south Texas. Accessions 9089281 and 9089282 were collected from Weigang sandy clay loam soils on highway rights-of-way in Atascosa and Live Oak counties. Accession 9086289 and 9089275 were collected from Monteloa clay soil (USDA NRCS 2009b) on a private ranch in Atascosa County, and 9088532 from a private ranch in Zavala County on a Webb fine sandy loam soil (USDA NRCS 2009b). The final component of the blend, accession 9088708, was collected along a county road right-of-way in Webb County from a Maverick/Catarina clay soil complex (USDA NRCS 2009b). Original seed was hand-collected from as many plants as possible at each location.

DESCRIPTION

Accessions constituting Atascosa Germplasm Texas grama have considerable variability in vegetative characteristics. Mature plants are 34 to 45 cm (13 to 17 in) tall; foliage height is 20 to 32 cm (7 to 12 in). Basal diameter of clumps varies among accessions from 5 to 12 cm (2 to 4 in), and diameter of foliage is 18 to 25 cm (7 to 10 in). Seed stalks bear 11 to 15 spikelets on the upmost 5 to 8 cm (2 to 3 in) of the spikes. Leaf width varies from 2 to 3 mm (0.07 to 0.11 in) and 13 to 21 cm (5 to 8 in) in length. Two accessions in the blend can be characterized as having narrow bases with long, thin leaves, while the other accessions have thicker bases, more robust tillers, and shorter, broader leaves. Texas grama is commonly one of the first native grasses to produce seed each spring, and plants rarely become fully dormant in the winter. Plants are extremely uniform within accessions, and morphological plant characteristics appear to be extremely stable. Because the exact mode of reproduction is unknown for *B. rigidiseta,* each of the breeder lines were increased in isolation. Following harvest, seed is blended by equal percentage of pure live seed (PLS) and distributed to commercial producers. On average in seed production settings, 53% of the seed is nondormant and germinates within 28 d; mean seed dormancy is 20%. Depending on production year and climatic conditions, PLS of mechanical harvests averages 40 to 70%. Maximum seed yields obtained to date are 60 kg/ha (55 lb/ac). The release name "Atascosa" was chosen because 3 of the 6 accessions originate from Atascosa County.

METHOD OF SELECTION

Seed of 24 Texas grama collections from south Texas was planted in greenhouse flats in 2003. Transplants were planted in an irrigated, randomized complete block experiment with 2 replications of 10 plants per accession at Bladerunner Farms near Poteet, Texas. Of the 21 collections planted in this evaluation, 10 demonstrated strong perennial characteristics. Seed was collected from these accessions when ripe throughout the year and tested for seed germination and yield potential during the winter of 2003–2004. These tests identified 6 of the 10 strongly perennial collections as having good seed production characteristics.

Accessions with poor seed production or survival were removed from the experiment in 2004. Irrigation was discontinued in 2004. Visual evaluations conducted in fall 2004 showed the 6 remaining collections again had good vegetative performance and survival. These 6 accessions were subsequently planted for advanced evaluation at 3 locations. Vegetative characteristics were evaluated throughout 2005 at each location and showed good uniformity in seed maturation and seedhead height. Survival at all locations was very good. Seed germination was evaluated in this experiment and showed consistent germination among all accessions at 2 of the 3 sites. Following advanced evaluation, accessions 9089281 and 9089282 were combined, as were 9086275 and 9086289, because of identical plant characteristics and close proximity of collection sites. Because of a critical need for native seed for highway and rangeland revegetation projects, and strong indications of good performance of these accessions at multiple locations, a blend of the 4 lines was then made to release and attempt to commercialize.

Four breeder seed fields were established using transplants grown from seed harvested from isolated increases of the original seed collections. Each of the 0.1 ha (0.25 ac) seed fields was spatially separated from the others, because the mode of reproduction of this species is unknown. This method of increase was chosen to ensure that genetic erosion or adaptation to the increase site was minimized if outcrossing occurred. Seed harvested from these fields is blended following harvest by equal percentage of pure live seed and distributed to commercial producers.

Seeding trials of Atascosa Germplasm Texas grama have been conducted at several locations throughout south Texas. Good performance, especially during drought conditions, has been documented at plantings in the western Rio Grande Plain and Lower Rio Grande Valley regions of south Texas. Experimental plantings on a highway right-of-way near Kingsville, Texas, demonstrated good performance of Texas grama on extremely dry or shallow microsites. Atascosa Germplasm is one of the only native grasses evaluated that can establish and persist in plantings made on rocky, dry, or shallow soils. It should be used as a component of a seed mixture of native grasses when planted, as emergence and persistence appear to be limited to specific areas of most planting sites, and seed production potential (facilitating large amounts of commercially available seed) is relatively low. Hence, costs for large quantities of seed are anticipated to be higher than for many native species.

ECOLOGICAL CONSIDERATION

Texas grama is a naturally occurring species in Texas and planting it would not constitute an introduction of an exotic species into local ecosystems. This release provides roadside planting materials for south Texas, and its use may help reduce the planting of exotic grasses that may spread into adjacent habitats and negatively affect native plant and animal species.

ANTICIPATED CONSERVATION USE

Atascosa Germplasm is the first known release of Texas grama. It will be useful as a component of rangeland seed mixes and for highway right-of-way revegetation. Texas grama has potential use as a vegetative cover for non-mow areas of urban landscapes and in ornamental plantings. It will be an excellent plant for reclamation or stabilization of caliche, stony, or shallow upland soils.

ANTICIPATED AREA OF ADAPTATION

Best performance of Atascosa Germplasm is anticipated in the major land resource area (MLRA) 83A-E and 150. Because several of the collections included in the blend originated near the southern extent of the Edwards Plateau, good performance may be observed in MLRA 81A-D, although this use has yet to be tested. Evaluation plantings of this germplasm in north central Texas and southern Oklahoma have had poor survival and seed quality indicating poor adaptation, despite *B. rigidiseta* being a common component of the natural vegetation of these areas.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and distributed through the Texas Foundation Seed Service. Limited quantities of seed for research and evaluation purposes are available on request from South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-108.

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Representative plants of a component of Catarina blend bristlegrass.

Photo by Shelly D Maher

NOTICE OF RELEASE OF

CATARINA BLEND BRISTLEGRASS

SELECTED CLASS OF NATURAL GERMPLASM

John Lloyd-Reilley, Shelly D Maher, William R Ocumpaugh, Paula D Maywald, and Forrest S Smith

ABSTRACT

Four selected germplasms of bristlegrass (*Setaria vulpiseta* (Lam.) Roem. & Schult. and *S. leucopila* (Scribn. & Merr.) K. Schum. [Poaceae]) have been released for rangeland plantings and wildlife habitat enhancement plantings in the Rio Grande Plain of Texas. Catarina blend bristlegrass is a mix of 4 bristlegrass releases (Kika648 Germplasm, Kika819 Germplasm, Kika820 Germplasm, and Kika677 Germplasm) selected from an extensive evaluation at multiple sites in south Texas. Accessions included in the blend are increased in isolation and blended prior to sale in order to maintain the genetic integrity of each release. These germplasms represent the first commercially available release of bristlegrass that has been tested and is adapted to south Texas.

Lloyd-Reilley J, Maher SD, Ocumpaugh WR, Maywald PD, Smith FS. 2010. Notice of release of Catarina blend bristlegrass: selected class of natural germplasm. Native Plants Journal 11(3):305–309.

KEY WORDS

Setaria vulpiseta, *Setaria leucopila*, Rio Grande Plain, Texas, Poaceae

NOMENCLATURE

Plants: USDA NRCS (2005)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

USDA Natural Resources Conservation Service, E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; and Texas AgriLife Research, Beeville, Texas.

Photo by Forrest S Smith

Species | Blend of *Setaria vulpiseta* (Lam.) Roem. & Schult. and 3 lines of *S. leucopila* (Scribn. & Merr.) K. Schum.
Common name | plains bristlegrass, streambed bristlegrass
Accession number | 9029648, 9029677, 9038819, 9038820

Catarina blend bristlegrass represents the first commercially available release of this species that is adapted to south Texas. The blend is a mix of 4 releases evaluated at multiple sites, and has been released for rangeland plantings and wildlife habitat enhancement.

Catarina blend bristlegrass seed is a mechanical mix of 4 selected accessions, each a Texas Selected Native Plant Germplasm eligible for seed certification under the Texas Department of Agriculture and Texas Administrative Code guidelines (TAC 2007), and is available for use in the Rio Grande Plain of Texas. The 4 selected class releases are referred to as Kika648 plains bristlegrass (*Setaria vulpiseta* (Lam.) Roem. & Schult. [Poaceae]) and USDA Natural Resources Conservation Service (NRCS) accession number 9029648; Kika677 Germplasm streambed bristlegrass (*S. leucopila* (Scribn. & Merr.) K. Schum.) and USDA NRCS accession number 9029677; Kika819 Germplasm streambed bristlegrass and USDA NRCS accession number 9038819; and Kika820 Germplasm streambed bristlegrass and USDA NRCS accession number 9038820.

These germplasms are commercially marketed as a mechanical blend to overcome limitations and to incorporate important attributes of each accession into commercially available seed. Catarina blend bristlegrass is the only bristlegrass germplasm that originates from, has been tested in, and is adapted to the Rio Grande Plain of south Texas. The only other commercial release of bristlegrass is 'Stevan' (an Arizona cultivar), and it fails to meet current standards for use of native seed in the Rio Grande Plain as outlined by the USDA NRCS Range Planting Code 550 standards (USDA NRCS 2007).

JUSTIFICATION

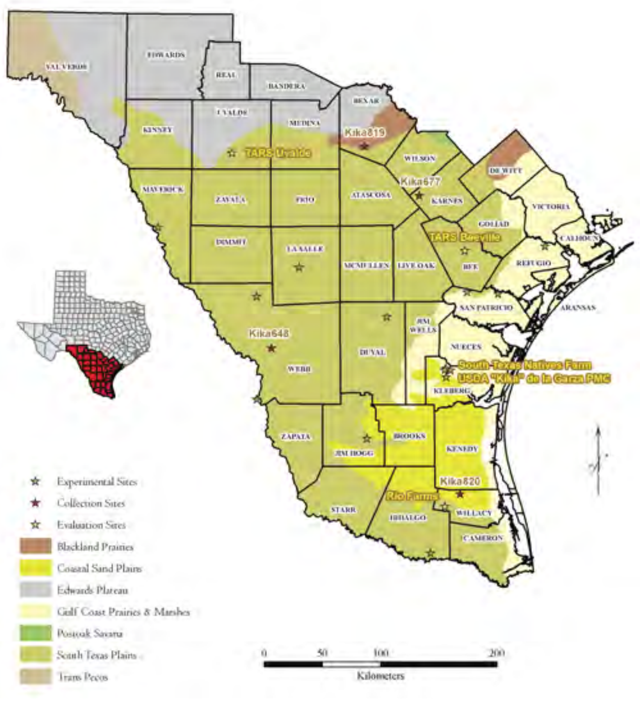
Catarina blend bristlegrass does meet the USDA NRCS Range Planting standards and is further justified for release because no commercial sources of bristlegrass are currently available and adapted for use in south Texas.

COLLECTION SITE INFORMATION

Accessions making up the Catarina blend bristlegrass were collected from native plants at 4 locations throughout the Texas Rio Grande Plain (Webb, Karnes, Bexar, and Willacy counties). Original collections were hand-harvested from stands observed during seed collection efforts across the region. Seed was hand-stripped from as many plants as possible at the collection site, cleaned, assigned an individual accession number, and stored for evaluation. Accessions selected for the Catarina blend bristlegrass originate from a variety of range sites and soil types.

DESCRIPTION

Catarina blend bristlegrass is a blend of 2 bristlegrass species, *Setaria vulpiseta*



Courtesy of CKWRI Wildlife Research Technologies Laboratory

(plains bristlegrass) and *S. leucopila* (streambed bristlegrass). Plains bristlegrass (Kika648 Germplasm) is a warm-season perennial bunchgrass with stiffly erect stems. Foliage height ranges from 60 to 120 cm (2 to 4 ft) tall, turning a pale yellow color at maturity. Stems are in dense clumps (Hitchcock 1971; Gould 1975; Correl and Johnston 1996). Plants of plains bristlegrass are long-lived and will produce seed from May through November under favorable conditions. Streambed bristlegrass (Kika677 Germplasm, Kika819 Germplasm, and Kika820 Germplasm) is a warm-season perennial bunchgrass with stiffly erect stems. Mature foliage height ranges from 60 to 120 cm (2 to 4 ft) tall and is usually pale or with a whitish or grayish color. Stems are in dense clumps, infrequently branched, and rough. Plants of streambed bristlegrass are long-lived and will produce seed from May through November under favorable conditions in south Texas (Hitchcock 1971; Gould 1975; Correl and Johnston 1996). Accessions constituting Catarina blend bristlegrass show genetic variation in plant size, leaf blade width, seedhead length, pubescence, and coloration. The 4 releases are increased in isolated fields to maintain their genetic integrity. Seed harvested from each increased accession is blended by proportions of pure live seed (PLS) following harvest. Accessions included in the release have shown superior performance in several ecological and agronomic performance categories, including a high proportion of full seed and lower mean seed dormancy, of accessions sampled from the target ecoregion of the release.

METHOD OF SELECTION

Initial evaluations of bristlegrass 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 Texas. After initial evaluation, 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 10 plants each of 9038819, 9038820, 9003939 (Arizona PMC release 'Stevan'), and a Texas "common" commercial source. During 1996, we took biweekly seed harvests to determine total seed yield and in October 1996 evaluated the plots for total biomass production and survival. Accessions 9038819 and 9038820 showed superior performance. Despite numerous trials to obtain germination above 10%, work with bristlegrass was abandoned in the late 1990s due to poor laboratory germination results.

In 2001, in conjunction with the development of South Texas Natives, interest was revived in bristlegrass and a new initial evaluation was started on 30 accessions exclusively from south Texas. In 2003, 14 accessions were chosen from the PMC field evaluation plot and were taken to the Texas AgriLife Research Station at

Beeville for evaluation. Visual rankings (1 [best] to 9 [worst]) were recorded from May through November for each replication of each accession at both evaluation sites for plant vigor, foliage density, uniformity, development stage, seed production, biomass production, and plant height. Ripe seed was collected from each accession throughout the growing season and tested for seed germination in germination chambers (3 replications x 50 seeds per accession, 12 h light at 30 °C [86 °F], and 12 h dark at 18 °C [64 °F]). Germination was recorded for each accession for 28 d.

Four accessions were selected for seed increase and release based on analysis of visual field evaluation, proportion of full seed, level of seed dormancy, seed harvest, origin location, and soil type. Accession 9029648 was chosen based on its origin from a Catarina clay soil in Webb County, its cold tolerance, and it was one of only 2 accessions to show high germination (48%). Accession 9029677 was chosen because it consistently had the highest seed germination (72%), good cold tolerance, and its origin from a Monteola clay in Karnes County. Accession 9038819 was chosen based on its consistent field evaluations, longevity, and high seed yields of 308 kg/ha (275 lb/ac). It also came from a Lewisville silty clay from Bexar County. Accession 9038820 was chosen because it consistently had the highest forage yields and highest seed yields (610 kg/ha [544 lb/ac]) of any accession, and it was the only accession chosen from a Sarita fine sand soil in Willacy County. In addition, accessions 9038819 and 9038820 have very high seed dormancy (90 to 99%). Blending these 4 accessions provides for good stands of seeded bristlegrass, along with good forage, seed production, and long-term survival.

Following selection, accessions were increased using the tested seed. Transplants (1200) of each accession were grown and planted in isolated breeder blocks. Seed from these isolated breeder blocks of each accession is individually harvested to maintain genetic integrity and to minimize the potential for genetic drift or adaptation to the breeder field site. The individual accessions were released to commercial growers as Foundation Seed through the Texas Foundation Seed Service for establishment of certified seed fields of each bristlegrass accession. Catarina bristlegrass is the mechanical blending of these 4 bristlegrass accessions in appropriate proportions of PLS to provide commercial bristlegrass seed that is adapted to various soils and locations throughout south Texas.

ECOLOGICAL CONSIDERATION

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 nonexistent. Also, release of this species will make available a native species that is adapted for use in south Texas.

ANTICIPATED CONSERVATION USE

Catarina blend bristlegrass will provide a native grass species for rangeland revegetation and wildlife habitat plantings in the Rio Grande Plain of south Texas.

ANTICIPATED AREA OF ADAPTATION

Catarina blend bristlegrass is well adapted for use in the southern portions of Texas. This coincides with the major land resource area (MLRA) 83A-E and 150.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by the E "Kika" de la Garza Plant Materials Center and distributed through the Texas Foundation Seed Service. Certified seed may be grown within the State of Texas. Limited quantities of seed for research or evaluation purposes will be available on request from John Lloyd-Reilley (john.reilley@tx.usda.gov).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-109.

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Representative plants of Welder Germplasm shortspike windmillgrass

NOTICE OF RELEASE OF

WELDER GERMPLASM SHORTSPIKE WINDMILLGRASS

SELECTED CLASS OF NATURAL GERMPLASM

John Lloyd-Reilley, Shelly D Maher, William R Ocumpaugh, Paula D Maywald, and Forrest S Smith

ABSTRACT

A selected germplasm of shortspike windmillgrass (*Chloris* x *subdolichostachya* Müll. Berol. (pro sp.) [Poaceae]) has been released for roadside plantings, critical site revegetation, and rangeland plantings in the Rio Grande Plain of Texas. Welder Germplasm shortspike windmillgrass is a selected accession collected from San Patricio County, Texas, and evaluated at multiple sites across south Texas. This germplasm represents the first commercially available release of shortspike windmillgrass.

Lloyd-Reilley J, Maher SD, Ocumpaugh WR, Maywald PD, Smith FS. 2010. Notice of release of Welder Germplasm shortspike windmillgrass: selected class of natural germplasm. Native Plants Journal 11(3):317–320.

KEY WORDS

Chloris x *subdolichostachya,* Rio Grande Plain, Texas, Poaceae

NOMENCLATURE

Plants: USDA NRCS (2005)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

USDA Natural Resources Conservation Service, E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; and Texas AgriLife Research, Beeville, Texas.

Photos by Shelly D Maher

Species | *Chloris* x *subdolichostachya* Müll. Berol. (pro sp.)
Common name | shortspike windmillgrass
Accession number | 9085260

This selected germplasm of shortspike windmillgrass was collected from San Patricio County and evaluated at multiple sites across south Texas. It is the first commercially available release of shortspike windmillgrass and is intended for roadside plantings, revegetation of critical sites, and rangeland plantings in the Rio Grande Plain of Texas.

Welder Germplasm shortspike windmillgrass (*Chloris* x *subdolichostachya* Müll. Berol. (pro sp.) [Poaceae]), a Texas Selected Native Plant Germplasm, is eligible for seed certification under the Texas Department of Agriculture and Texas Administrative Code guidelines (TAC 2007) and is available for use in the Rio Grande Plain of Texas. As a selected class release, this selection will be referred to as Welder Germplasm shortspike windmillgrass and USDA Natural Resources Conservation Service accession number 9085260.

JUSTIFICATION

This germplasm is the first release of a shortspike windmillgrass germplasm that originates from the Rio Grande Plain of south Texas (USDA NRCS 2008). Welder Germplasm is justified for release because no commercial sources of shortspike windmillgrass are currently available in the State of Texas. It was selected and evaluated as a native alternative to bermudagrass (*Cynodon dactylon* (L.) Pers. [Poaceae]) for roadside plantings and critical site revegetation.

COLLECTION SITE INFORMATION

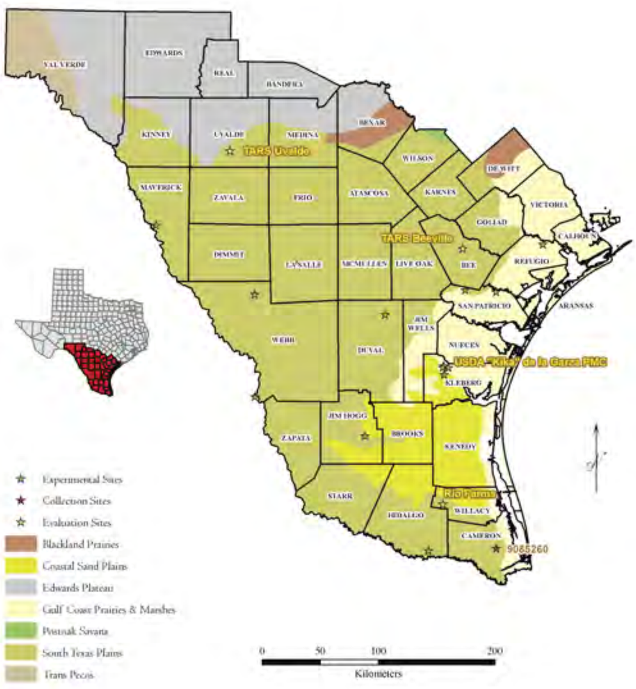
Welder Germplasm shortspike windmillgrass was collected from the Welder Wildlife Refuge in San Patricio County, Texas, on an Orelia sandy clay loam soil with a 1% slope. The original seed was hand-stripped from as many plants as possible at the collection site, cleaned, assigned an individual accession number, and stored for evaluation.

DESCRIPTION

Welder Germplasm shortspike windmillgrass is a warm-season, native grass hybrid that according to Gould (1975) is formed when hooded windmillgrass (*Chloris cucullata* Bisch.) hybridizes with *Chloris verticillata* Nutt. or *Chloris andropogonoides* Fourn. in areas where their ranges overlap. The hybrids are generally intermediate morphologically between the parents. This species is a strongly stoloniferous perennial grass that grows 30 to 90 cm (1 to 3 ft) tall. Plants of shortspike windmillgrass will produce seed from May to October, with the majority coming in September and October (Hitchcock 1971; Correl and Johnston 1996). Welder Germplasm has shown superior performance in several ecological and agronomic performance categories as well as rapid seed germination rates in its evaluations across south Texas.

METHOD OF SELECTION

Welder Germplasm was initially evaluated at the E "Kika" de la Garza Plant



Courtesy of CKWRI Wildlife Research Technologies Laboratory

Materials Center (PMC), Kingsville, Texas, in 2000 and 2001. A total of 43 accessions of windmillgrass were collected throughout Texas and were included in the study. Viability of original seed was determined by sowing seeds in a 98-cell seedling tray filled with commercially available potting medium. Trays were placed in a greenhouse with growing conditions of 12 h with daytime temperature maintained near 30 °C (86 °F), and 12 h with night temperature near 18 °C (64 °F), and watered daily to maintain adequate soil moisture for optimum germination. This greenhouse evaluation of original seed resulted in the selection of 35 accessions for field evaluation. Those selected had a minimum of 20 plants after 60 d in the greenhouse.

From the initial field evaluation plots of these 35 accessions, 2 accessions revealed superior characteristics based on vigor, growth form and development, and disease resistance. Advanced evaluation plots of these 2 accessions were established in 2002 at the PMC in Kingsville and the Texas AgriLife Research Station in Beeville. At each location 2 replications of 10 transplants of each accession were established in a randomized spaced plant (90 cm [36 in] between plants) complete block design on 90-cm (36-in) rows. Plants were irrigated to ensure establishment during the initial growing season. Plantings were not irrigated after the first year. In 2002, visual rankings (1 [best] to 9 [worst]) were given from May through November to each replication of each accession for plant vigor, foliage density, uniformity, development stage, seed production, biomass production, and plant height. In 2003, visual rankings were again recorded from March through November for each replication. Ripe seed was collected from each accession throughout the growing season in 2002 and 2003 and tested for seed germination (28 d) in germination chambers (3 replications x 50 seeds per accession, 12 h light at 30 °C [86 °F], and 12 h dark at 18 °C [64 °F]).

Welder Germplasm was selected for seed increase and release based on the rankings of its plant characteristic and germination tests in 2002–2003. The goal was to release a shortspike windmillgrass that would have a quick germination rate (typically within the first 3 d) while exhibiting a moderate germination percentage (roughly 70%) and with some dormant seed retention (20 to 30%) to deal with unpredictable weather conditions. Accessions were also evaluated for stoloniferous growth habit and seed production. All the shortspike windmillgrass collections exhibited these traits. Welder Germplasm was chosen over other accessions because of its superior seedling growth rate and aggressive stoloniferous growth habit. Observations quickly revealed that the Welder Germplasm possessed the traits needed to provide critical revegetation needs and was capable of competing with introduced species such as bermudagrass and old world bluestems (*Dichanthium* Willem. [Poaceae] and *Bothriochloa* Kuntze [Poaceae]) on roadside plantings. Thus, a single accession, Welder Germplasm, was released for the south Texas region.

Following selection, Welder Germplasm was increased by dividing up the original plant clumps from the observation plot at the PMC and planting 1300 divisions in an isolated seed increase plot. Seed collected from these plants was used to expand the plot. Seed from this breeder block is harvested and made available to commercial growers as Foundation Seed through the Texas Foundation Seed Service for establishment of certified seed fields of Welder Germplasm shortspike windmillgrass.

ECOLOGICAL CONSIDERATION

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 nonexistent. Also, release of this species will make available an additional native species for use in south Texas.

ANTICIPATED CONSERVATION USE

Welder Germplasm shortspike windmillgrass will provide a native grass species for roadside plantings, critical area revegetation, and rangeland plantings.

ANTICIPATED AREA OF ADAPTATION

Welder Germplasm shortspike windmillgrass is well adapted for use in the southern portions of Texas, coinciding with major land resource area (MLRA) 83A-E and 150.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by the E "Kika" de la Garza Plant Materials Center and distributed through the Texas Foundation Seed Service. Certified seed may be grown within the State of Texas. Limited quantities of seed for research or evaluation purposes will be available on request from John Lloyd-Reilley (john.reilley@tx.usda.gov).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-111.

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Seedheads of hooded windmillgrass

NOTICE OF RELEASE OF

MARIAH GERMPLASM HOODED WINDMILLGRASS

SELECTED CLASS OF NATURAL GERMPLASM

John Lloyd-Reilley, Shelly D Maher, William R Ocumpaugh, Paula D Maywald, and Forrest S Smith

ABSTRACT

A selected germplasm of hooded windmillgrass (*Chloris cucullata* Bisch. [Poaceae]) has been released for roadside plantings, critical site revegetation, and rangeland plantings in the Rio Grande Plain of Texas. Mariah Germplasm hooded windmillgrass is a selected accession collected from Kenedy County, Texas, and evaluated at multiple sites across south Texas. This germplasm represents the first commercially available release of hooded windmillgrass.

Lloyd-Reilley J, Maher SD, Ocumpaugh WR, Maywald PD, Smith FS. 2010. Notice of release of Mariah Germplasm hooded windmillgrass: selected class of natural germplasm. Native Plants Journal 11(3):311–315.

KEY WORDS
Chloris cucullata, Rio Grande Plain, Texas, Poaceae

NOMENCLATURE
USDA NRCS (2005)

COLLABORATORS
USDA Natural Resources Conservation Service, E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; and Texas AgriLife Research, Beeville, Texas.

Photos by Forrest S Smith

Species | *Chloris cucullata* Bisch.
Common name | hooded windmillgrass
Accession number | 9085313

Collected from Kenedy County, this selected accession of hooded windmillgrass was evaluated at multiple sites across south Texas. Anticipated use of germplasm is roadside plantings, critical site revegetation, and rangeland plantings.

Mariah Germplasm hooded windmillgrass (*Chloris cucullata* Bisch. [Poaceae]), a Texas Selected Native Plant Germplasm, is eligible for seed certification under the Texas Department of Agriculture and Texas Administrative Code guidelines (TAC 2007) and is available for use in the Rio Grande Plain of Texas. As a selected class release, this selection will be referred to as Mariah Germplasm hooded windmillgrass and USDA Natural Resources Conservation Service (NRCS) accession number 9085313.

JUSTIFICATION

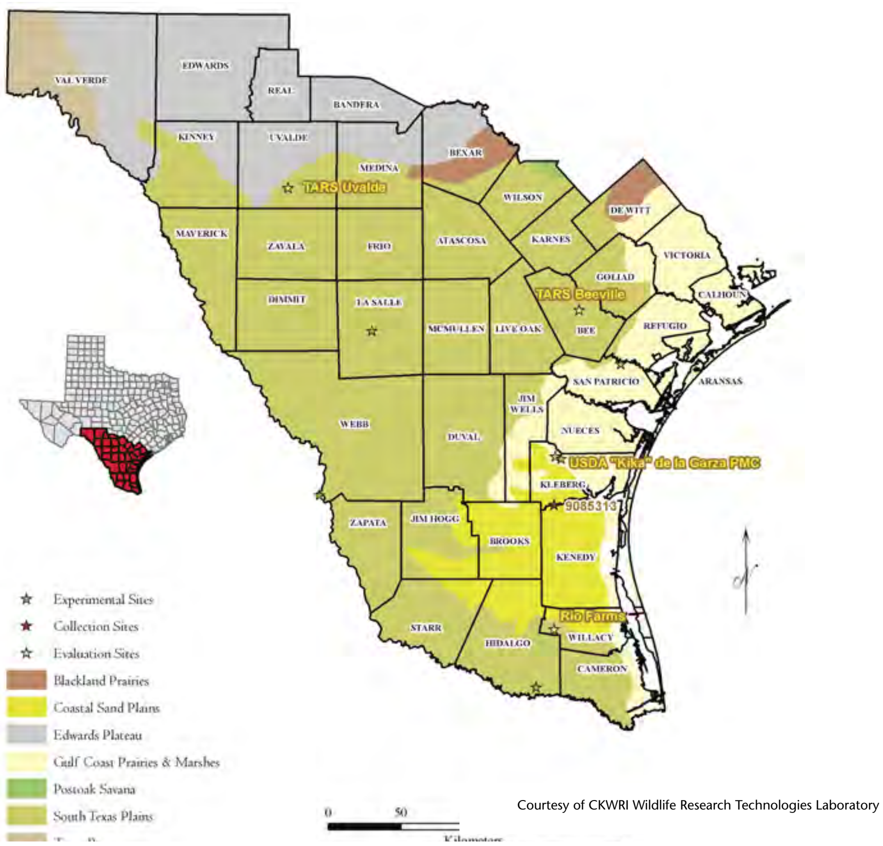
This germplasm is the first release of a hooded windmillgrass germplasm that originates from the Rio Grande Plain of south Texas (USDA NRCS 2008). Mariah Germplasm is justified for release because no commercial sources of hooded windmillgrass are currently available in Texas. It was selected and evaluated as a native alternative to bermudagrass (*Cynodon dactylon* (L.) Pers. [Poaceae]) for roadside plantings and critical site revegetation.

COLLECTION SITE INFORMATION

Mariah Germplasm hooded windmillgrass was collected from a ranch in Kenedy County, Texas, on a Delfina loamy fine sand soil with a 1% slope. The original seed was hand-stripped from as many plants as possible at the collection site, cleaned, assigned an individual accession number, and stored for evaluation.

DESCRIPTION

Mariah Germplasm hooded windmillgrass is a warm-season, native perennial grass that grows 15 to 60 cm (0.5 to 2 ft) in height (Hitchcock 1971; Gould 1975). Plants of hooded windmillgrass will produce seed monthly May to November under favorable conditions (Correl and Johnston 1996). Mariah Germplasm produces monthly summer seed crops typical of most hooded windmillgrass accessions but also reveals a moderate stoloniferous growth habit. This characteristic provides greater foliar coverage and additional erosion control benefits. Mariah Germplasm has shown superior performance in several ecological and agronomic performance categories as well as high and rapid seed germination rates in its evaluations across south Texas.



Courtesy of CKWRI Wildlife Research Technologies Laboratory

METHOD OF SELECTION

Mariah Germplasm was initially evaluated at the E "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas, in 2000 and 2001. A total of 43 accessions of windmillgrass were collected throughout Texas and were included in the study. Viability of original seed was determined by sowing seeds in a 98-cell seedling tray filled with commercially available potting medium. Trays were placed in a greenhouse with growing conditions of 12 h with daytime temperature maintained near 30 °C (86 °F), and 12 h with night temperature near 18 °C (64 °F), and were watered daily to maintain adequate soil moisture for optimum germination. This greenhouse evaluation of original seed resulted in the selection of 35 accessions for field evaluation. Those selected had a minimum of 20 plants after 60 d in the greenhouse.

From the initial field evaluation plots of these 35 accessions, 2 accessions revealed superior characteristics based on vigor, growth form and development, and disease resistance. Advanced evaluation plots of these 2 accessions were established in 2002 at the PMC in Kingsville and the Texas AgriLife Research Station in Beeville. At each location, 2 replications of 10 transplants of each accession were established in a randomized spaced plant (90 cm [36 in] between plants) complete block design, on 90-cm (36-in) rows. Plants were irrigated to ensure establishment during the initial growing season. Plantings were not irrigated after the first year. In 2002, visual rankings (1 [best] to 9 [worst]) were given from May through November to each replication of each accession for plant vigor, foliage density, uniformity, development stage, seed production, biomass production, and plant height. In 2003, visual rankings were again recorded from March through November for each replication. Ripe seed was collected from each accession throughout the growing season in 2002 and 2003 and tested for seed germination (28-d) in germination chambers (3 replications x 50 seeds per accession, 12 h light at 30 °C [86 °F], and 12 h dark at 18 °C [64 °F]).

Mariah Germplasm was selected for seed increase and release because of its unique plant characteristics and analysis of germination tests in 2002–2003. The goal was to release a hooded windmillgrass that would have low seed dormancy (< 10%), high 3-d germination rate, produce multiple seed crops, and produce satisfactory seed yields. Mariah Germplasm had all these characteristics; however, it also had the singular characteristic of a stoloniferous growth habit that set it apart from the other hooded windmillgrass accessions. Because hooded windmillgrass was targeted for roadside plantings and erosion control, and because the spreading growth habit exhibited by Mariah Germplasm enhanced its abilities for its targeted purpose, a single accession was released for the south Texas region.

Following selection, Mariah Germplasm was increased by dividing original plant clumps from the observation plot at the PMC and planting 1300 divisions in an isolated seed increase plot. Seed collected from these plants was used to expand the plot. Seed from this breeder block is harvested and made available to commercial growers as Foundation Seed through the Texas Foundation Seed Service for establishment of certified seed fields of Mariah Germplasm hooded windmillgrass.

ECOLOGICAL CONSIDERATION

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 nonexistent. Also, release of this species will make available an additional native species for use in south Texas.

ANTICIPATED CONSERVATION USE

Mariah Germplasm hooded windmillgrass is well adapted for use in the southern and central portions of Texas.

ANTICIPATED AREA OF ADAPTATION

Mariah Germplasm hooded windmillgrass will provide a native grass species for roadside plantings, critical area revegetation, and rangeland plantings. This coincides with the major land resource area (MLRA) 78A-C, 80A-B, 81A-D, 82A-B, 83A-E, and 150.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by the E "Kika" de la Garza Plant Materials Center and distributed through the Texas Foundation Seed Service. Certified seed may be grown within Texas. Limited quantities of seed for research or evaluation purposes will be available on request from John Lloyd-Reilley (john.reilley@tx.usda.gov).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-110.

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Representative example of pink pappusgrass

NOTICE OF RELEASE OF

MAVERICK GERMPLASM PINK PAPPUSGRASS

SELECTED CLASS OF NATURAL GERMPLASM

Forrest S Smith, William R Ocumpaugh, John Lloyd-Reilley, Keith A Pawelek, Shelly D Maher, Andrew W Scott Jr, and Juan Garza

ABSTRACT

A selected germplasm of pink pappusgrass (*Pappophorum bicolor* Fourn. [Poaceae]) has been released for rangeland seeding, highway rights-of-way revegetation, and wildlife habitat restoration plantings in south Texas. Maverick Germplasm pink pappusgrass is a blend of 7 accessions selected from an evaluation at multiple sites in the intended area of use. Selections were made based on multi-year evaluation of plant characteristics and germination tests of seed collected from each location. Following selection, components of the germplasm were increased in isolation and blended following harvest to ensure seed was included from each of the selected accessions. Accessions included in the blend originate from 7 different counties and distinct soil types. This germplasm represents the first commercial release of pink pappusgrass, an important component of native rangeland plant communities in south Texas.

Smith FS, Ocumpaugh WR, Lloyd-Reilley J, Pawelek KA, Maher SD, Scott AW Jr, Garza J. 2010. Notice of release of Maverick Germplasm pink pappusgrass: selected class of natural germplasm. Native Plants Journal 11(3):283–288.

KEY WORDS

Pappophorum bicolor, Texas, Poaceae

NOMENCLATURE

Plants: USDA NRCS (2009a)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research, Beeville and Uvalde, Texas; Rio Farms Inc, Monte Alto, Texas; and Rancho Blanco, Laredo, Texas.

Photos by Forrest S Smith

DESCRIPTION

Maverick Germplasm pink pappusgrass is a warm-season perrenial bunchgrass that grows 60 to 91 cm (24 to 36 in) tall. Basal circumference of mature plants is 25 to 38 cm (10 to 15 in) with the canopy commonly 38 to 60 cm (15 to 24 in) wide. Individual leaves are 43 to 60 cm (17 to 24 in) long and 0.5 to 1.5 cm (0.25 to 0.75 in) wide. Foliage is dark green in color, covered in a waxy cuticle, and stem nodes are purple. Seedheads are 15 to 22 cm (6 to 9 in) in length with purple or pink-tinged individual spikelets. Pink pappusgrass will produce seeds and foliage year-round in south Texas if adequate soil moisture is present and freezing temperatures do not occur. Maverick Germplasm has some variation in height, seedhead density, and foliage density because of the blending of accessions. Seed maturation and general growth stage of all 7 accessions is extremely similar. Accessions that make up the release were increased by plantings grown from original seed collections; transplants of each accession were spatially isolated from one another and from wild populations of *Pappophorum.* Seed harvested from these isolated fields is blended after harvest by equal percentage of pure live seed (PLS) to constitute Maverick Germplasm Breeder Seed, which is distributed to commercial seed growers. Accessions included in the release have superior performance in several ecolog-

Species | *Pappophorum bicolor* Fourn.
Common name | pink pappusgrass
Accession number | 9093444

Seven accessions, evaluated at multiple sites, have been blended to create a selected germplasm of pink pappusgrass for seeding on rangelands and rights-of-way, and to restore wildlife habitat.

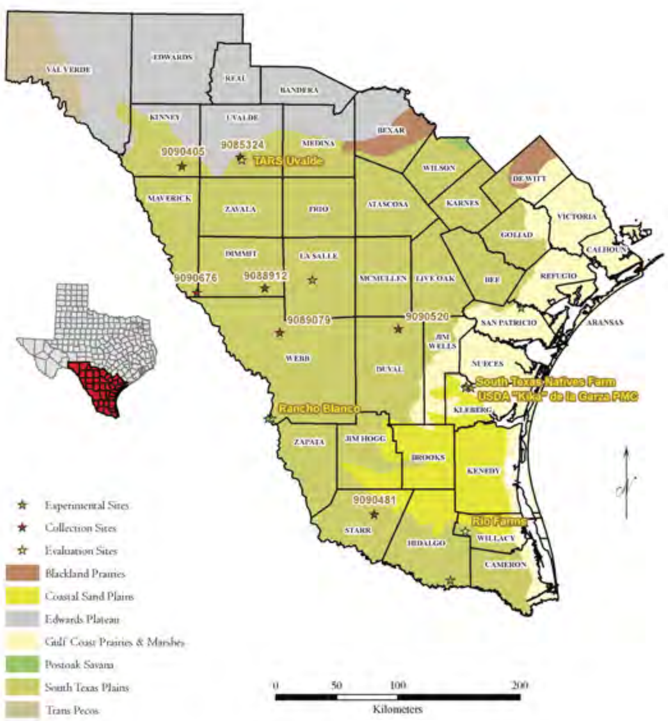
Maverick Germplasm pink pappusgrass (*Pappophorum bicolor* Fourn. [Poaceae]) was released as a Texas Selected Native Plant Germplasm in 2010. Maverick Germplasm will be identified by the USDA Natural Resources Conservation Service (NRCS) accession number 9093444. Pink pappusgrass is a widespread native grass species found throughout the Gulf Prairies and Marshes, Sand Sheet, and Rio Grande Plain ecoregions and southern portions of the Edwards Plateau, and eastern Trans-Pecos Mountains and Basins ecoregions of Texas, and adjacent areas of northern Mexico. It is often a codominant native grass species of grassland and savanna plant communities in south Texas (Meyer and Brown 1985) with grass species (Poaceae) such as Arizona cottontop (*Digitaria californica* (Benth.) Henr.), bristlegrasses (*Setaria* P. Beauv.), gramas (*Bouteloua* Lag.), windmillgrasses (*Chloris* Sw.), and false Rhodesgrass (*Trichloris* Fourn. ex Benth.). Pink pappusgrass provides fair forage for livestock (Hatch and others 1999). It commonly grows on gravelly and sandy soils (Hatch and Pluhar 1993) and is also found on saline range sites (Fanning and others 1965).

JUSTIFICATION

Wild harvests of pink pappusgrass seed have been occasionally marketed by commercial seed producers in south Texas; however, prior to this release, tested, source-identified seed of pink pappusgrass was not available for restoration and revegetation use. Landowners, government agencies, and conservation programs in south Texas have a critical need for certified native seed with known origin, quality, and adaptation.

COLLECTION SITE INFORMATION

Accessions constituting Maverick Germplasm pink pappusgrass were collected from native plants at 7 locations in south Texas. Original collections were hand-harvested during 2000–2004 from stands encountered in extensive seed collection efforts in the region. Collections were cleaned, assigned individual accession numbers, and stored for evaluation. Maverick Germplasm components originate from private ranches in Maverick, Webb, Kinney, Uvalde, Dimmit, Starr, and Duval counties and from Jimenez gravelly loam, Moglia clay loam, Ector Stony clay, unknown silty clay loam, Brundage fine sandy loam, McAllen fine sandy loam, and Pernitas fine sandy loam soil types (USDA NRCS 2009b).



Courtesy of CKWRI Wildlife Research Technologies Laboratory

ical and agronomic performance categories, and have a higher proportion of full seed combined with lower seed dormancy than that of other collections of pink pappusgrass evaluated. Pink pappusgrass and other *Pappophorum* species are assumed to have an apomictic or self-pollinated mode of reproduction. Chromosome number is reported as 2n = 100 (Gould 1975). Genetic recombination among different populations is thought to be limited (Garner and others 2006). This assumption supports the release of a blend of populations for use across a broad geographic area, as single populations may be poorly adapted to some sites (ecotypic specialists) or well adapted to a wide range of sites (ecotypic generalist). Our evaluation of accessions indicated that both types of adaptation may exist in the species.

METHOD OF SELECTION

Seed of 70 original collections of *Pappophorum* obtained from south Texas was planted in the greenhouse in winter 2004. The accessions included pink pappusgrass (55), whiplash pappusgrass (*P. vaginatum* Buckley) (6) (see Smith and others 2010), and mixed collections of both species (9). Because these 2 species grow together in similar habitats (Reeder 2008), all accessions were evaluated together. Sixty-eight of the 70 collections produced enough plants for the establishment of 2 replications of 10 plants for evaluation plots at 3 Texas locations (60 plants/accession total) in 2005. These transplants were grouped in randomized split block evaluation plots at Rio Farms (near Monte Alto on sandy loam soil), Texas AgriLife Research Station–Uvalde (near Uvalde on silty clay loam soil), and Rancho Blanco (near Laredo on silt loam soil). Additional seedlings were planted in nursery plots at the E "Kika" de la Garza Plant Materials Center (near Kingsville on clay soil). Evaluation sites represent a variety of soils where pappusgrasses occur, and broad climatic variability in rainfall and temperature. This variety of evaluation sites was desired to facilitate selection of pappusgrass accessions that performed well across the south Texas region and to identify plant material that might be superiorly adapted to all sites or to a single location for inclusion in a commercial release.

Evaluation data were collected monthly in 2005 by visually ranking the performance of the accessions in a number of categories relating to plant performance and commercial seed production potential. All plantings were fully irrigated in 2005 to ensure establishment and expression of growth potential and seed production of each accession. Ripe seed was harvested from each accession at each evaluation location during the growing season and tested for seed germination (3 replications of 50 seeds per accession per site) during the winter of 2005–2006. In 2006, plots were not irrigated allowing accessions to be evaluated under natural conditions. Exceptional-to-extreme drought conditions at most of the evaluation sites prevented collection of seed for testing in 2006 but facilitated evaluation of the accessions under adverse growing conditions common in the region.

Analysis of evaluation data and germination test results revealed accessions with good plant performance at all sites, others with good performance at a single site, and considerable variation in proportion of full seed and seed dormancy. Final selections to be evaluated further included 3 accessions that performed well at all sites, superior performing accessions from each site (3), and one accession with an exceptionally high proportion of full seed and low seed dormancy. Averaged across all evaluations, selected accessions collectively have more full seed, higher percentage seed germination (low seed dormancy), and greater seed production potential than nonselected accessions.

Advanced evaluation plots of the 7 selected accessions were planted in isolated seed increase blocks for further evaluation in 2007. Timing of seed maturity, seedhead height, and performance in an intensive production setting were monitored closely to ensure that commercial production of these selections would be possible. All accessions exhibited similar seedhead heights and maturity dates that would facilitate growing them as blended germplasm in a common field. Seed was harvested from these plots to compare seed dormancy and germination of the accessions in a common setting and to assess seed yield potential. This seed was also used to grow 0.13 ha (0.34 ac) breeder seed blocks of each accession to produce seed for the released blend. All seed increase plots were grown in isolation because conclusive evidence of the reproductive biology of *Pappophorum* is unavailable. Following harvest, seed of each breeder field was tested for quality, blended in equal quantities based on percentage of pure live seed (PLS), and distributed to commercial seed producers as Foundation Seed. Only seed harvested from plantings of Foundation Seed can be used to establish certified seed production fields.

Extensive seeding trials of pappusgrasses were conducted in the development of Maverick Germplasm. Mix-tures of pink and whiplash pappusgrass were seeded in experiments at 4 locations from 2005–2008. Best results have been obtained when pappusgrasses were seeded at a rate of 3.4 kg PLS per ha (3.0 lb PLS per ac). Pappusgrasses emerge best from seed in early-mid fall in south Texas. Seed can be covered with a talc-based coating to facilitate planting, as uncoated seed is difficult to plant and meter accurately. Both broadcast and drill seedings have produced acceptable results. The inclusion of both Maverick Germplasm and Webb Germplasm whiplash pappusgrass in seed mixes is recommended to ensure good performance on most sites.

ECOLOGICAL CONSIDERATION

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 to other native plant species would likely be minimal to non-existent. Availability of ecotypic seed of this species provides an additional native species for revegetation and restoration seed mixes in the region; it also provides a native species useful in efforts to diversify exotic grass–dominated habitats and thereby increase habitat quality for wildlife. Maverick Germplasm is anticipated to be used extensively in highway rights-of-way plantings in the region, potentially replacing the use of exotic species such as buffelgrass (*Pennisetum ciliare* (L.) Link [Poaceae]) in roadside seed mixes.

ANTICIPATED CONSERVATION USE

Maverick Germplasm will be useful for rangeland, highway right-of-way, and upland wildlife habitat plantings. It has demonstrated good competitive ability in areas dominated by the exotic plants buffelgrass and Kleberg's bluestem (*Dichanthium annulatum* (Forssk.) Stapf [Poaceae]) and may be useful in efforts to restore or diversify these areas to improve native ecological conditions.

ANTICIPATED AREA OF ADAPTATION

Maverick Germplasm is known to be adapted to the region south of lat 29°27'N, bounded by the Gulf of Mexico on the east, and Rio Grande River to the west and south. This area encompasses major land resource area (MLRA) 83A-E and 150. Good adaptation and performance is likely in adjacent areas, such as MLRA 42, 81A, 81B, and 81D.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and distributed through the Texas Foundation Seed Service to commercial growers. Limited quantities of seed for research and evaluation purposes are available on request from South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

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Seedhead of whiplash pappusgrass

NOTICE OF RELEASE OF

WEBB GERMPLASM WHIPLASH PAPPUSGRASS

SELECTED CLASS OF NATURAL GERMPLASM

Forrest S Smith, William R Ocumpaugh, John Lloyd-Reilley, Keith A Pawelek, Shelly D Maher, Andrew W Scott Jr, and Juan Garza

ABSTRACT

A selected germplasm of whiplash pappusgrass (*Pappophorum vaginatum* Buckley [Poaceae]) has been released for rangeland seeding, saline soil revegetation, and wildlife habitat restoration plantings in south Texas. Webb Germplasm whiplash pappusgrass is a blend of 3 accessions selected from an evaluation at multiple sites in the intended area of use. Selections were made based on visual evaluations of plant characteristics and germination tests of seed collected from each location. Following selection, components of the germplasm were increased in isolation and blended following harvest to ensure inclusion of seed of each selected accession. Accessions included in the blend originate from 3 counties and distinct soil types. This germplasm represents the first commercial release of a whiplash pappusgrass ecotype originating from south Texas.

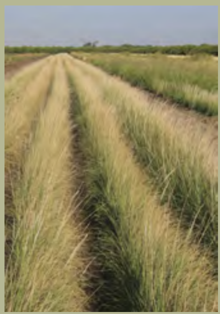
Smith FS, Ocumpaugh WR, Lloyd-Reilley J, Pawelek KA, Maher SD, Scott AW Jr, Garza J. 2010. Notice of release of Webb Germplasm whiplash pappusgrass: selected class of natural germplasm. Native Plants Journal 11(3):275–280.

KEY WORDS
Pappophorum vaginatum, Texas, Poaceae

NOMENCLATURE
Plants: USDA NRCS (2009a)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS
South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research, Beeville and Uvalde, Texas; Rio Farms Inc, Monte Alto, Texas; and Rancho Blanco, Laredo, Texas.

Photos by Forrest S Smith



Species | *Pappophorum vaginatum* Buckley
Common name | whiplash pappusgrass
Accession number | 9093443

A selected germplasm of whiplash pappusgrass, representing a blend of 3 accessions collected from a variety of soil types, has been released for revegetation and wildlife habitat restoration plantings in south Texas.

Webb Germplasm whiplash pappusgrass (*Pappophorum vaginatum* Buckley [Poaceae]) was released as a Texas Selected Native Plant Germplasm in 2010. Webb Germplasm will be identified by the USDA Natural Resources Conservation Service (NRCS) accession number 9093443.

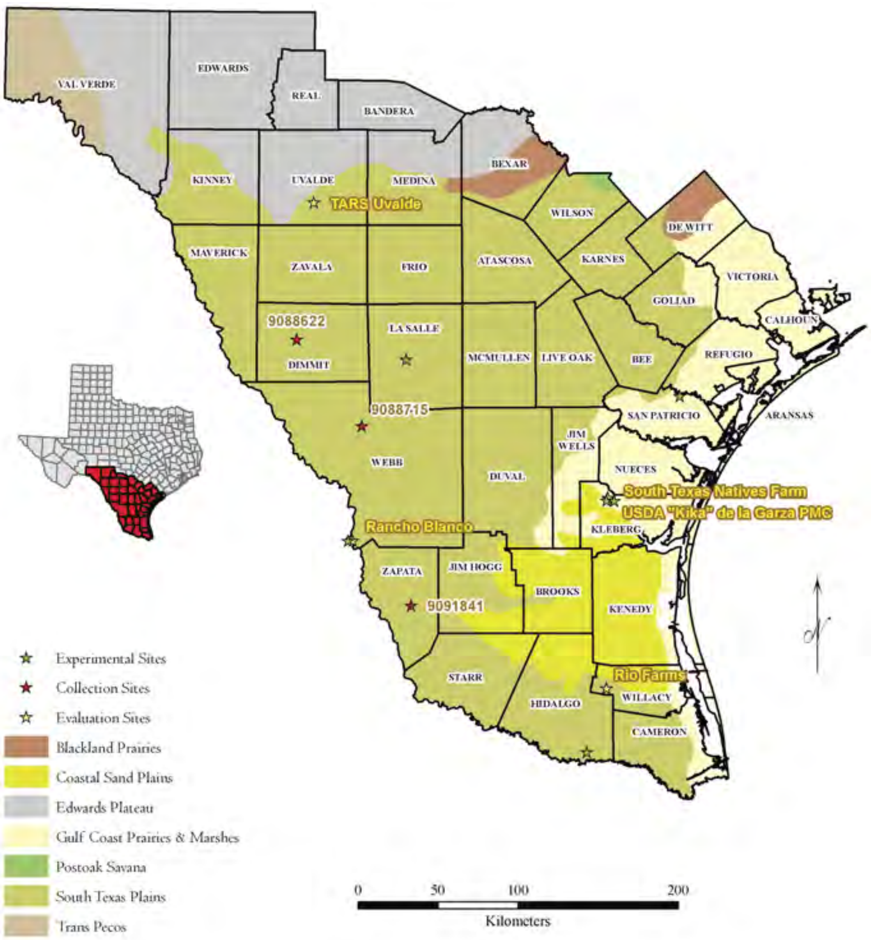
Whiplash pappusgrass is a widespread native grass species found throughout the Gulf Prairies and Marshes, Sand Sheet, and Rio Grande Plain ecoregions of Texas. It can also be found in the southern portions of the Edwards Plateau and eastern Trans-Pecos Mountains and Basins ecoregions and in adjacent areas of northern Mexico west to Arizona (USDA NRCS 2009a). Whiplash pappusgrass is often found growing with pink pappusgrass (*P. bicolor* Fourn. [Poaceae]) and is often misidentified as such. Plants from Texas have also historically been identified as *P. mucronulatum* Nees. (Gould and Box 1965; Gould 1975); however, Reeder and Toolin (1989) suggest *P. vaginatum* as the correct name for North American populations. Whiplash pappusgrass is often found growing on coastal, saline, and alkaline sites in low areas (Hitchcock 1950), on calcareous soils (Gould and Box 1965), and near ship channels and spoil islands of the lower coast of the Gulf of Mexico (Hatch and others 1999). We also obtained collections of populations from a variety of upland sites, where *P. vaginatum* is present as a minor component of the vegetation community with the more dominant upland species *P. bicolor*.

JUSTIFICATION

Prior to this release, ecotypic seed of whiplash pappusgrass for restoration and revegetation use in south Texas was not commercially available. A critical need for certified native seed with known origin, quality, and adaptation for use by landowners, agencies, and in conservation programs exists in south Texas.

COLLECTION SITE INFORMATION

Accessions constituting Webb Germplasm whiplash pappusgrass were collected from native plants at 3 locations in south Texas. Original collections were hand-harvested from stands encountered during extensive seed collection efforts across the region from



Courtesy of CKWRI Wildlife Research Technologies Laboratory

2000–2004. Collections were cleaned, assigned individual accession numbers, and stored for evaluation following collection. Collections that make up Webb Germplasm were obtained from Copita fine sandy loam, Catarina clay, and Brundage fine sandy loam soil types (USDA NRCS 2009b) in Webb, Zapata, and Dimmit counties.

DESCRIPTION

Webb Germplasm whiplash pappusgrass is a warm-season perennial bunchgrass that grows 55 to 106 cm (22 to 42 in) tall. Basal circumference of mature plants is 25 to 38 cm (10 to 15 in) with a canopy commonly 45 to 66 cm (18 to 26 in) wide. Individual leaves are 43 to 60 cm (17 to 24 in) long and 0.5 to 1.5 cm (0.25 to 0.75 in) wide. Foliage is usually a lime-green color; leaves are covered in a waxy cuticle and stem nodes lack color. Seedheads are 15 to 25 cm (6 to 10 in) in length, and individual spikelets are a cream or white color. Whiplash pappusgrass will produce foliage and seed year-round in south Texas if adequate soil moisture is present and freezing temperatures do not occur. Webb Germplasm is uniform in height, seedhead density, and foliage density because of the similar morphology of the selected accessions. Accessions were increased by planting transplants grown from seed of the original seed collections and were spatially isolated from one another and from wild populations of *Pappophorum.* Seed harvested from these isolated fields is blended after harvest by equal percentage of pure live seed (PLS) to constitute Webb Germplasm Breeder Seed that is distributed to commercial seed growers. Accessions selected for inclusion in the release have shown greater performance in vegetative evaluation categories and evidence of a greater proportion of full seed with low seed dormancy at multiple evaluation locations within the intended area of use. Chromosome number of the species is reported as 2n = 40 or 60 (Reeder and Toolin 1989). Whiplash pappusgrass and other *Pappophorum* species are assumed to have an apomictic or self-pollinated mode of reproduction. Genetic recombination among different populations is thought to be limited (Garner and others 2006). Our evaluation of accessions indicates a high degree of uniformity in whiplash pappusgrass ecotypes from south Texas, but the species naturally grows across a wide gradient of soil textures and properties. Ecotypes selected from Catarina clay and Brundage fine sandy loams may be well adapted to high salinity and sodium concentrations present on mesic sites in the region, whereas the accession originating from a Copita fine sandy loam may be better adapted for well-drained, upland sites.

METHOD OF SELECTION

Seed of 70 original collections of *Pappophorum* obtained from south Texas was planted in the greenhouse in winter 2004. The evaluated population of accessions included whiplash pappusgrass (6), pink pappusgrass (55) (see Maverick Germplasm pink pappusgrass [Smith and others 2010]), and mixed collections of both species (9). Because these 2 species grow together in similar habitats (Reeder 2008), all accessions were evaluated together. Sixty-eight of the 70 collections produced enough plants for establishment of 2 replications of 10 plants for evaluation plots at 3 Texas locations (60 plants total) in 2005. These transplants were planted in randomized split block evaluation plots at Rio Farms (near Monte Alto on sandy loam soil), Texas AgriLife Research Station–Uvalde (near Uvalde on silty clay loam soil), and Rancho Blanco (near Laredo on silt loam soil). Additional seedlings were planted in nursery plots at the E "Kika" de la Garza Plant Materials Center (near Kingsville on clay soil). Evaluation sites represent a variety of soils where pappusgrasses grow and broad variability in rainfall and temperature, desired characteristics to facilitate selection of pappusgrass accessions that perform well across south Texas and that identify plant material superiorly adapted to all sites or a single location for inclusion in this release.

Evaluation data were collected monthly in 2005 on all accessions by visually ranking the performance of the accessions in a number of categories relating to plant performance and commercial seed production potential. All plantings were fully irrigated in 2005 to ensure establishment and expression of growth potential and seed production. Ripe seed was harvested from each accession at each evaluation location during the growing season and tested for seed germination (3 replications of 50 seeds per accession per evaluation site) in winter of 2005–2006. In 2006, plots were not irrigated and accessions were evaluated under natural conditions. Exceptional-to-extreme drought conditions at most of the evaluation sites prevented the collection of seed for testing in 2006 but did facilitate evaluation of the accessions under adverse growing conditions common in the region.

Analysis of evaluation data and germination test results of the 6 collections of whiplash pappusgrass resulted in selection of 3 accessions for further evaluation. Morphologically, the 6 accessions were very uniform. We selected accessions exhibiting good survival at all evaluation locations, consistent vegetative performance, a high proportion of full seed, and low seed dormancy. One of the non-selected accessions had consistently poor performance in most evaluation categories, and another had a high proportion of full seed and low seed dormancy but poor vegetative performance. A third accession was eliminated from consideration because it performed well at only one site, in contrast to the selected accessions that had above average performance at 2 or more sites.

Advanced evaluation plots of the 3 selected accessions were planted in 2007 as isolated seed increase blocks. Timing of seed maturity, seedhead height, and performance in an intensive production setting were monitored closely to ensure that commercial seed production would be possible. All accessions exhibited similar seedhead heights and maturity dates that would facilitate growing them as a blended germplasm in a common field. Seed was harvested from these plots to compare seed germination of the accessions in a common setting and assess seed yield potential. This seed was also used to establish 0.13 ha (0.34 ac) breeder seed blocks of each accession to produce seed for the released blend. All seed increase plots were grown in isolation from one another because conclusive evidence of the reproductive biology of *Pappophorum* is unavailable. Following harvest, seed of each breeder field was tested for quality, blended by equal percentage of pure live seed (PLS), and distributed to commercial seed producers as Foundation Seed. Only seed harvested from plantings of this Foundation Seed can be sold or used to establish certified seed fields.

Extensive seeding trials of pappusgrasses were also conducted in the development of Webb Germplasm. Mixtures of pink and whiplash pappusgrass were planted in experiments at 4 locations from 2005–2008. Best results have been obtained when pappusgrasses were seeded at a rate of 3.4 kg PLS per ha (3 lb PLS per ac). Pappusgrasses germinate best in early-to-mid fall in south Texas. Seeds can be covered with a talc-based coating to facilitate planting, as uncoated seed is difficult to plant and meter accurately. Broadcast and drill seedings have produced acceptable results. The inclusion of both Webb Germplasm whiplash pappusgrass and Maverick Germplasm pink pappusgrass in seed mixes is recommended to ensure good performance on most sites.

ECOLOGICAL CONSIDERATION

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 to other native plant species would likely be minimal to nonexistent. Availability of ecotypic seed of this species provides an additional native species for revegetation and restoration seed mixes in the region, as well as provides a native species useful in efforts to diversify exotic grass–dominated habitats to increase habitat quality for wildlife. Release of whiplash pappusgrass also provides restoration material appropriate for use on coastal areas such as dredge spoil islands and disposal sites and on widespread saline and alkaline soils in the western Rio Grande plains.

ANTICIPATED CONSERVATION USE

Webb Germplasm will be useful for rangeland and upland wildlife habitat plantings. It has demonstrated good competitive ability in areas dominated by the exotic plants buffelgrass (*Pennisetum ciliare* (L.) Link [Poaceae]) and Kleberg's bluestem (*Dichanthium annulatum* (Forssk.) Stapf [Poaceae]) and may be useful in efforts to restore or diversify these areas to improve native ecological conditions. Webb Germplasm may also be useful in the revegetation of mesic, saline, and alkaline sites.

ANTICIPATED AREA OF ADAPTATION

Webb Germplasm is known to be adapted to the region south of lat 29°27'N, bounded by the Gulf of Mexico on the east, and Rio Grande River to the west and south. Good adaptation exists in major land resource area (MLRA) 83A-E, 150, and 151 with good performance likely in MLRA 42, 81A, 81D, and adjacent areas of northern Mexico. Adaptation of this release to other areas where *P. vaginatum* is found is unknown.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and distributed through the Texas Foundation Seed Service to a single commercial grower. Limited quantities of seed for research and evaluation purposes are available on request from South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

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Breeder seed field of STN-561 Germplasm Hookers plantain

NOTICE OF RELEASE OF

DIVOT TALLOW WEED BLEND

SELECTED CLASS OF NATURAL GERMPLASMS

Forrest S Smith, Paula D Maywald, William R Ocumpaugh, John Lloyd-Reilley, Shelly D Maher, and Keith A Pawelek

ABSTRACT

A blend of 2 selected germplasms of tallow weed or plantain (*Plantago* spp. [Plantaginaceae]) has been released for wildlife habitat restoration, rangeland seed mixes, and wildlife food plot plantings in south Texas. Divot Tallow Weed Blend comprises the releases STN-561 Germplasm Hookers plantain (*Plantago hookeriana* Fisch. & C.A. Mey.) and STN-496 Germplasm redseed plantain (*Plantago rhodosperma* Decne.). Tallow weeds are cool-season, annual native plants that provide winter forage to wildlife and livestock and produce seed eaten by game birds and other wildlife. These releases are being marketed as a blend to facilitate commercial production and ease of use for consumers. Selection of STN-496 and STN-561 Germplasms was based on seedling vigor, superior seed production in comparison with other collections from the target ecoregion, and growth characteristics facilitating commercial seed production and harvest. Commercial seed producers are required to grow the releases that make up Divot Tallow Blend separately and to blend seed in equal quantities following harvest. The releases can also be marketed independently as source-identified seed.

Smith FS, Maywald PD, Ocumpaugh WR, Lloyd-Reilley J, Maher SD, Pawelek KA. 2010. Notice of release of Divot tallow weed blend: selected class of natural germplasms. Native Plants Journal 11(3):289–294.

KEY WORDS

Plantago rhodosperma, Plantago hookeriana, redseed plantain, Hookers plantain, Texas, Plantaginaceae

NOMENCLATURE

Plants: Hatch and others (2001)
Animals: ITIS (2009)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Texas AgriLife Research, Beeville and Uvalde, Texas; Rio Farms Inc, Monte Alto, Texas; and Rancho Blanco, Laredo, Texas.

Photos by Forrest S Smith

Species | *Plantago* spp. *hookeriana* and *P. rhodosperma*
Common name | tallow weed, plantain
Accession number | equal portions of 9088561 and 9090496

Divot tallow weed blend comprises equal amounts of the releases of STN-561 Germplasm Hookers plantain and STN-496 Germplasm redseed plantain for revegetation and wildlife food plot use in south Texas.

Divot Tallow Weed Blend is a blend of selected germplasms of Hookers plantain (*Plantago hookeriana* Fisch. & C.A. Mey.) and redseed plantain (*Plantago rhodosperma* Decne.) (Plantaginaceae). Seed sold as Divot Tallow Weed Blend must contain equal portions of the release STN-496 Germplasm redseed plantain and STN-561 Germplasm Hookers plantain. The blend is eligible for certification as a Texas Selected Native Plant Germplasm. Both germplasms were originally evaluated under the USDA Natural Resources Conservation Service (NRCS) accession numbers 9088561 and 9090496. Divot was chosen for the blend name because one of the germplasms originated from a Divot clay loam soil type. Tallow weed is used for the name because it is a regionally recognized plant name familiar to consumers and should aid marketing efforts.

JUSTIFICATION

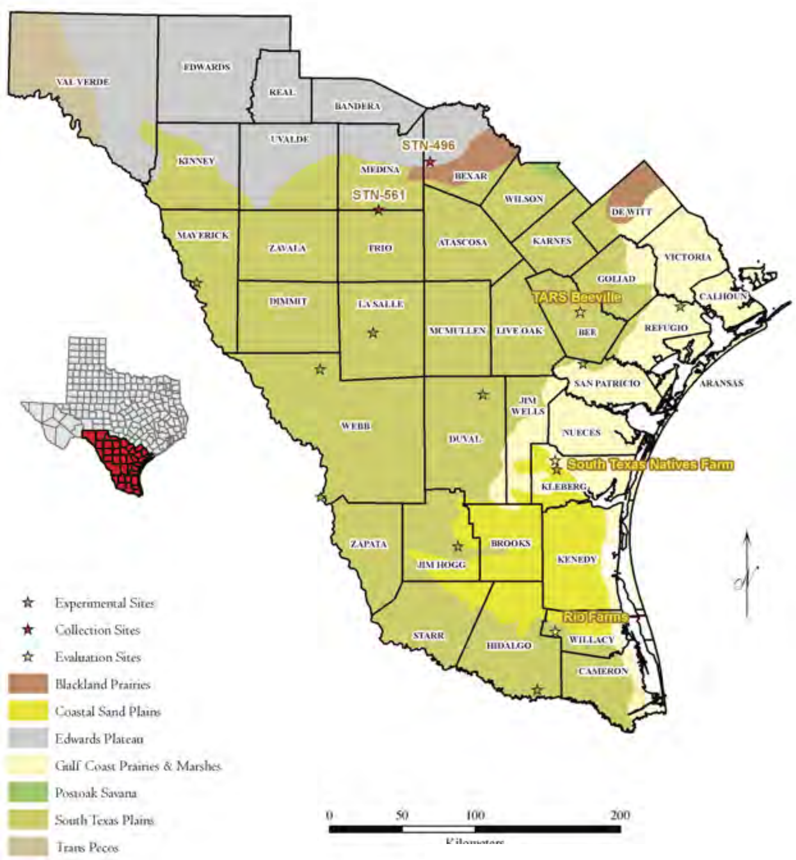
This release provides 2 native forb species for restoration and conservation plantings. These plants produce forage for wildlife and livestock, and seed is consumed by wildlife. This release is recommended for use in upland rangeland plantings, as a wildlife food plot component, and as a temporary cool-season native cover crop on reclamation sites.

COLLECTION SITE INFORMATION

STN-496 Germplasm redseed plantain was collected from a native population growing in Bexar County, Texas, on an Ekrant cobbly clay soil type. STN-561 Germplasm Hookers plantain was collected from a native population growing in Medina County, Texas. Collectors noted this collection growing on a sandy loam soil; however, GPS coordinates and USDA NRCS soil data suggest the site is a Divot clay loam soil type (USDA NRCS 2009).

DESCRIPTION

Redseed and Hookers plantains are cool-season, annual plants. Size and foliage characteristics vary depending on moisture availability, but mature plants of both species are commonly 15 to 30 cm (6 to 12 in) tall. Plantains emerge from seed in mid to late fall in south Texas.



Courtesy of CKWRI Wildlife Research Technologies Laboratory

Redseed plantain forms a prostrate winter rosette at ground level at emergence. Redseed plantain is found on rocky soils in brushlands and on slopes, and occasionally on sandy soils and gravel bars of washes and streams (Correll and Johnston 1996). It is common on clay or heavier sands in prairies and openings in the Rio Grande Plains and Coastal Prairies of south Texas (Everitt and others 1999). Hookers plantain forms a grasslike winter rosette after emergence. It is found on sandy, gravelly, or rocky soils in open woods, dunes, savannas, and clay flats (Correll and Johnston 1996). It is frequent on sandy soils in prairies, openings, and waste places in the Rio Grande Plains and Coastal Prairies of south Texas (Everitt and others 1999). Significant foliage and seed stalk growth typically initiate in mid-February in south Texas for both species, with variable maturity and seed ripening between March and June depending on moisture availability. The pollination biology of these species is unknown; however, evaluations show a strong likelihood for apomictic breeding, as no off types or change in plant characteristics have been noted in multiple species and accession plots in 3 generations of observation. Plants within accessions are extremely uniform. Seed increases of each accession were begun with seed from the original collections to ensure genetic integrity of the release. Commercial producers are required to grow each germplasm separately and to blend seed following harvest. STN-561 and STN-496 germplasms typically ripen at different intervals, preventing seed production of the blend in a single field.

METHOD OF SELECTION

Plantains were selected for evaluation and possible use in restoration in south Texas because of their region-wide distribution, importance to wildlife, and ease of commercial production and establishment. Plantains have the potential to provide cool-season forage and may be useful in food plot plantings for wildlife. Personnel from South Texas Natives obtained 27 collections of plantain from south Texas during 2001–2004. Collections included 3 *Plantago* species: *P. aristata* Michx., *P. rhodosperma*, and *P. hookeriana*. Each species is commonly restricted to specific soils, with *P. rhodosperma* found on clay and fine-textured soils, *P. hookeriana* found on sandy loam and loam soils, and *P. aristata* found on sand or coarse-textured soils. Consultation with commercial producers yielded concerns in marketability of a number of separate releases of this genus. Therefore the decision was made to evaluate all species concurrently and attempt to select accessions representative of each species for a multiple species blend, beneficial to seed producers and consumers in south Texas.

Initial evaluations consisted of laboratory germination tests to assess seed quality of the original collections and populations of each species. These tests suggested broad variability in seed fill and seed dormancy. Subsequently, accessions were planted for field evaluation (split plot design with 2 replications of 10 plants per accession). From this initial evaluation, we selected 7 accessions for advanced evaluation and initial seed increase. Selections were made using observations on plant vigor, seed production, and vegetative characteristics facilitative of commercial production.

Advanced evaluations consisted of isolated seed production rows, of which subplots were sampled to estimate seed production. Two *P. rhodosperma* accessions and single accessions of *P. aristata* and *P. hookeriana* were identified as superior seed producers in this trial. Increase of these 4 accessions the subsequent year on 0.1 ha (0.25 ac) increase fields resulted in final selection between the *P. rhodosperma* accessions, principally because of STN-496 Germplasm's high seed yield. The *P. aristata* accession was dropped from consideration because of the species' designation as a prohibited weed seed in Texas seedlots, despite excellent performance.

Seeding trials and experimental plantings have shown good emergence in rangeland plantings of the Divot Blend. In a series of plantings at 8 locations throughout south Texas, initial data indicate that emergence is strongly correlated to soil type, with STN-496 Germplasm emerging on fine-textured soils and STN-561 Germplasm emerging on coarse-textured soils. The recommended seeding rate for pure stands is 11 kg pure live seed (PLS) per ha (10 lb PLS per ac).

ECOLOGICAL CONSIDERATION

Redseed and Hookers plantains are naturally occurring species in Texas and planting would not constitute an introduction of an exotic species into local ecosystems. These plants provide forage and seed that are consumed by many wildlife species. This release also makes available 2 native forb species for restoration and conservation plantings and provides a native plant option for wildlife food plots.

ANTICIPATED CONSERVATION USE

Divot Tallow Weed Blend will provide a cool-season, native, annual forb for restoration and wildlife habitat plantings in south Texas. This release may have potential for use in efforts to diversify areas dominated by exotic grasses and to provide food sources to livestock and wildlife such as white-tailed deer (*Odocoileus virginianus*) and game birds such as Bobwhite Quail (*Colinus virginianus*), Mourning Dove (*Zenaida macroura*), and Rio Grande

Wild Turkey (*Meleagris gallopavo intermedia*). The blend may also be useful as a native annual plant for use as a cool-season cover crop on erodible soils and reclamation sites.

ANTICIPATED AREA OF ADAPTATION

Divot Tallow Weed Blend should be adapted to a variety of sites throughout south Texas. This blend has shown good adaptation for use in major land resources area (MLRA) 83A-E and 150. Because selections constituting the blend originate within 80 km (50 mi) from the southern extent of the Edwards Plateau, good performance is likely in MLRA 81A-D. Current testing has not completely substantiated the northern or western limits of adaptability of these germplasms.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives in conjunction with the Texas Foundation Seed Service. Certified seed must be grown from seed obtained from South Texas

Natives. Limited quantities of seed can be obtained for research or evaluation purposes by contacting South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-106.

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Breeder field of Zapata Germplasm

NOTICE OF RELEASE OF

ZAPATA GERMPLASM RIO GRANDE CLAMMYWEED

SELECTED CLASS OF NATURAL GERMPLASM

Forrest S Smith, Paula D Maywald, John Lloyd-Reilley, Shelly D Maher, Keith A Pawelek, Andrew W Scott Jr, and Juan Garza

ABSTRACT

A selected germplasm of Rio Grande clammyweed (*Polanisia dodecandra* (L.) DC. ssp. *riograndensis* Iltis [Capparaceae]) has been released for rangeland restoration and wildlife habitat enhancement plantings in south Texas. Zapata Germplasm Rio Grande clammyweed is a warm-season annual forb originating from seed collected from native plants in Dimmitt and Zapata counties of south Texas. Collections were selected based on high proportion of full seed, low levels of seed dormancy, and high seed production potential. Zapata Germplasm is a fast-establishing native plant in rangeland plantings, provides excellent habitat to butterflies and other pollinators, and produces seed eaten by a variety of game birds. This release will provide a competitive annual forb useful for providing quick cover in rangeland plantings and will contribute to quality habitat for many wildlife species and pollinators. Zapata germplasm represents the first release of this species.

Smith FS, Maywald PD, Lloyd-Reilley J, Maher SD, Pawelek KA, Scott AW Jr, Garza J. 2010. Notice of release of Zapata Germplasm Rio Grande clammyweed: selected class of natural germplasm. Native Plants Journal 11(3):269–273.

KEY WORDS

Polanisia dodecandra, *riograndensis*, restoration, Texas, Capparaceae

NOMENCLATURE

Plants: USDA NRCS (2009a)
Birds: ITIS (2009)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS

South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas; USDA Natural Resources Conservation Service, E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Rio Farms Inc, Monte Alto, Texas.

Photos by Forrest S Smith

Species | *Polanisia dodecandra* (L.) DC. ssp. *riograndensis* Iltis
Common name | Rio Grande clammyweed
Accession number | 9093442

A selected germplasm of Rio Grand clammyweed, a warm-season annual forb, has been released for rangeland restoration and wildlife habitat enhancement plantings in south Texas.

Zapata Germplasm Rio Grande clammyweed (*Polanisia dodecandra* (L.) DC. ssp. *riograndensis* Iltis [Capparaceae]) was released as a Texas Selected Native Plant Germplasm by the South Texas Natives program of the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville, the USDA Natural Resources Conservation Service (NRCS) E "Kika" de la Garza Plant Materials Center, and Rio Farms Inc in 2009. Zapata Germplasm Rio Grande clammyweed has been assigned the USDA NRCS accession number 9093442. The name Zapata Germplasm was chosen because one of the accessions included in the blend originated from Zapata County, Texas.

Rio Grande clammyweed is an early-successional native forb that rapidly colonized disturbed sites in south Texas. Commercially available seed of this species may be used in a variety of areas and soils, including sand, clay, and gravel soils on upland sites (Richardson 1995), as well as sand and sandy clay sites along south Texas beaches and islands (Richardson 2002).

JUSTIFICATION

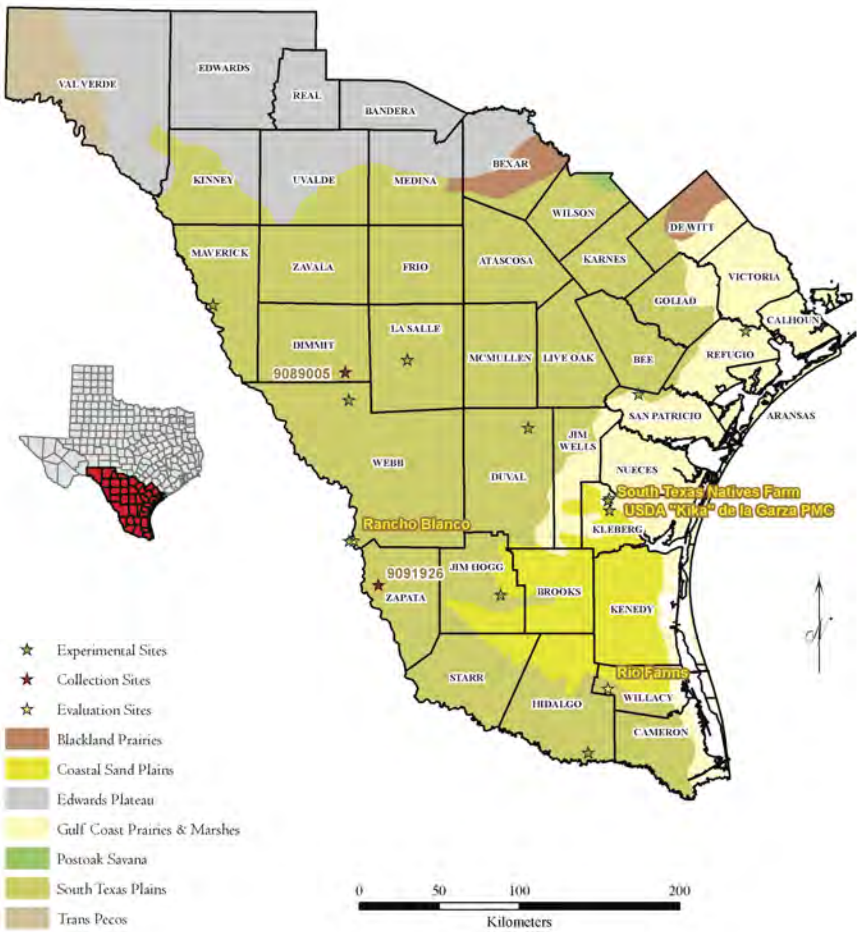
As a colonizing native species, Rio Grande clammyweed establishes easily from seed and provides excellent soil stabilization benefits rapidly after planting on disturbed sites. It is competitive with many invasive exotic grasses found in south Texas.

COLLECTION SITE INFORMATION

Accessions comprising Zapata Germplasm Rio Grande clammyweed were collected from native populations at 2 Texas locations in the Rio Grande Plain Ecoregion. This release is a blend of accession 9089005 collected from a Brundage fine sandy loam soil in Dimmitt County and accession 9091926 from a loamy sand soil in Zapata County (USDA NRCS 2009b).

DESCRIPTION

Zapata Germplasm Rio Grande clammyweed is a warm-season, annual herbaceous plant that grows 30 to 90 cm (1 to 3 ft) tall. Rio Grande clammyweed produces pink- to rose-colored



Courtesy of CKWRI Wildlife Research Technologies Laboratory

flowers from March through November in south Texas. Seed is produced in narrow capsules that ripen indeterminately and split upon maturity. Seed of Rio Grande clammyweed can easily be distinguished from other clammyweeds by characteristic blisters and ridges (Iltis 1969). Clammyweed commonly occurs in sandy, gravelly (sometimes limestone), or alluvial silty soil, near riverbanks, coastal dunes, and 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 (Correll and Johnston 1996). Rio Grande clammyweed is typically found in early successional or pioneer seral stage plant communities and is often one of the first native plants to colonize an area following soil disturbance. Observations and flower structure suggest that Rio Grande clammyweed is an open pollinated species, evidenced by large populations of pollinating insects that utilize flowering plants.

Accessions comprising Zapata Germplasm Rio Grande clammyweed were increased from the original seed collections. Seed increase blocks were geographically isolated to prevent crossing of the accessions during increase. Seed from increase blocks is harvested separately, bulked by equal percentage of (+/– 10%) pure live seed (PLS), and distributed to interested growers.

METHOD OF SELECTION

Rio Grande clammyweed was identified as having potential to benefit native plant restoration efforts and for use as a wildlife food source. Seven Rio Grande clammyweed collections were obtained from private ranches in south Texas from 2001–2004. From each collection, transplants were evaluated in a split plot design with a minimum of 2 replications of 10 plants of each accession at 3 Texas sites: Rio Farms near Monte Alto, Rancho Blanco near Laredo, and the USDA NRCS E "Kika" de la Garza Plant Materials Center near Kingsville. Plantings were irrigated to ensure establishment and weeded as necessary. Plots were examined monthly, or when significant changes in survival, growth, or vigor were noted among the population. Evaluation criteria included measures of survival, vigor (foliage density, biomass production, and seed production), and commercial production potential (uniformity, development stage, and plant height). Seed was collected from each planting to assess seed fill and germination in comparative environments. Results of our evaluations indicated that 3 of the accessions had similar characteristics and good seed production potential (that is, growth forms facilitating mechanical harvest, high proportion of full seed, and low seed dormancy), warranting further increase. Isolated seed increase plots were established with transplants grown from the original seed collections at Rio Farms Inc to evaluate these accessions in a seed production setting for potential release. One of the planted accessions exhibited a shorter growth period and lower seed production than the other 2 accessions and was eliminated from consideration. Accessions 9089005 and 9091926 were subsequently selected for release.

Isolated seed increase fields of these 2 accessions were direct-seeded in 2008. Seed harvested from this and future increases of accession 9089005 and 9091926 will be bulked by equal percentage PLS and released as Zapata Germplasm Rio Grande clammyweed to interested commercial growers. This strategy has been devised in an attempt to provide to commercial producers seed having representative genetic diversity of selections with proven performance at a variety of locations across the ecoregion. Commercial seed fields have a 7-y limit on production to prevent significant genetic shifts in the release.

Field plantings using Zapata Germplasm Rio Grande clammyweed have documented its ease of establishment and utility in restoration efforts. Plantings in the Lower Rio Grande Valley documented this release as the first of 31 planted native species to emerge, flower, and produce seed. In a series of 7 rangeland plantings seeded in the late summer and fall of 2008, and despite being only 5% of the seed mixture, Zapata Germplasm Rio Grande clammyweed was the second most abundant planted species 30 d after planting.

ECOLOGICAL CONSIDERATION

Rio Grande clammyweed is a naturally occurring species in Texas and planting it would not constitute an introduction of an exotic species into local ecosystems. This plant provides exceptional habitat to a variety of pollinators, provides food to numerous wildlife species, and its release makes available a native species that will aid in restoration and wildlife habitat plantings in south Texas.

ANTICIPATED CONSERVATION USE

Zapata Germplasm Rio Grande clammyweed will provide an annual, warm-season forb for restoration plantings and wildlife habitat plantings. Clammyweed also has potential for use in horticultural or wildflower plantings because of its showy flowers and ability to attract large numbers of butterflies and pollinators. Rio Grande clammyweed is an excellent native plant species for food plot plantings to benefit or attract economically important game birds such as White-winged Doves (*Zenaida asiatica*), Mourning Doves (*Zenaida macroura*), and Bobwhite Quail (*Colinus virginianus*), all of which readily consume the seed. Rio Grande clammyweed is seasonally competitive with many invasive exotic grasses found in south Texas. This plant may be useful in efforts to diversify stands of these grasses for wildlife, especially with the aid of monocot-specific herbicides.

ANTICIPATED AREA OF ADAPTATION

Rio Grande clammyweed grows in a variety of sites throughout south Texas. Zapata Germplasm Rio Grande clammyweed is well adapted for use in major land resource area (MLRA) 83A-E and 150. Current testing has not completely substantiated the northern or western limits of adaptability.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by South Texas Natives and the Texas Foundation Seed Service. Certified seed may be grown within the State of Texas, from seed obtained from South Texas Natives. Limited quantities of seed can be obtained for research or evaluation purposes from South Texas Natives (stn@tamuk.edu).

ACKNOWLEDGMENT

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Orange zexmenia flower and Desert Checkered-Skipper (*Pyrgus philetas* W.H. Edwards [Lepidoptera:Hesperiideae:Pyrginae]). Photo by Shelly D Maher

NOTICE OF RELEASE OF

GOLIAD GERMPLASM ORANGE ZEXMENIA

SELECTED CLASS OF NATURAL GERMPLASM

**John Lloyd-Reilley, Shelly D Maher,
Paula D Maywald, and Forrest S Smith**

ABSTRACT

A selected germplasm of orange zexmenia (*Wedelia texana* (A. Gray) B.L. Turner [Asteraceae]) has been released for rangeland plantings and wildlife habitat enhancement plantings in the central and southern regions of Texas. Goliad Germplasm orange zexmenia is a blend of 7 selected accessions from an extensive evaluation at multiple sites in south Texas. Accessions constituting the release are increased from the original seed collections of native populations to maintain the genetic integrity of each accession. This germplasm represents the first commercially available release of orange zexmenia that has been tested and adapted to its intended area of use.

Lloyd-Reilley J, Maher SD, Maywald PD, Smith FS. 2010. Notice of release of Goliad Germplasm orange zexmenia: selected class of natural germplasm. Native Plants Journal 11(3):321–326.

KEY WORDS
Wedelia texana, Texas, Asteraceae

NOMENCLATURE
Plant: USDA NRCS (2008)
Butterfly: ITIS (2009)
Major Land Resource Areas: USDA NRCS (2006)

COLLABORATORS
USDA Natural Resources Conservation Service, E "Kika" de la Garza Plant Materials Center, Kingsville, Texas; and South Texas Natives, Caesar Kleberg Wildlife Research Institute, Texas A&M University, Kingsville, Texas.

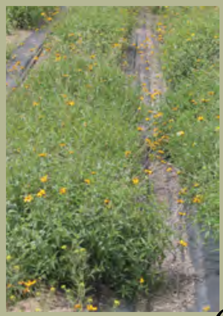


Photo by Forrest S Smith62

Species | *Wedelia texana* (A. Gray) B.L. Turner
Common name | orange zexmenia
Accession number | 9093441

Based on an extensive evaluation at multiple sites across south Texas, this selected germplasm, a blend of 7 accessions, is the first commercially available release. It is intended for rangeland and wildlife enhancement plantings in the central and southern portions of Texas.

Orange zexmenia (*Wedelia texana* (A. Gray) B.L. Turner [Asteraceae]), a Texas Selected Native Plant Germplasm, is eligible for seed certification under the Texas Department of Agriculture and Texas Administrative Code guidelines (TAC 2007). It is available for use in the central and southern regions of Texas. As a selected class release, this selection will be referred to as Goliad Germplasm orange zexmenia and USDA Natural Conservation Resources Service (NRCS) accession number 9093441.

JUSTIFICATION

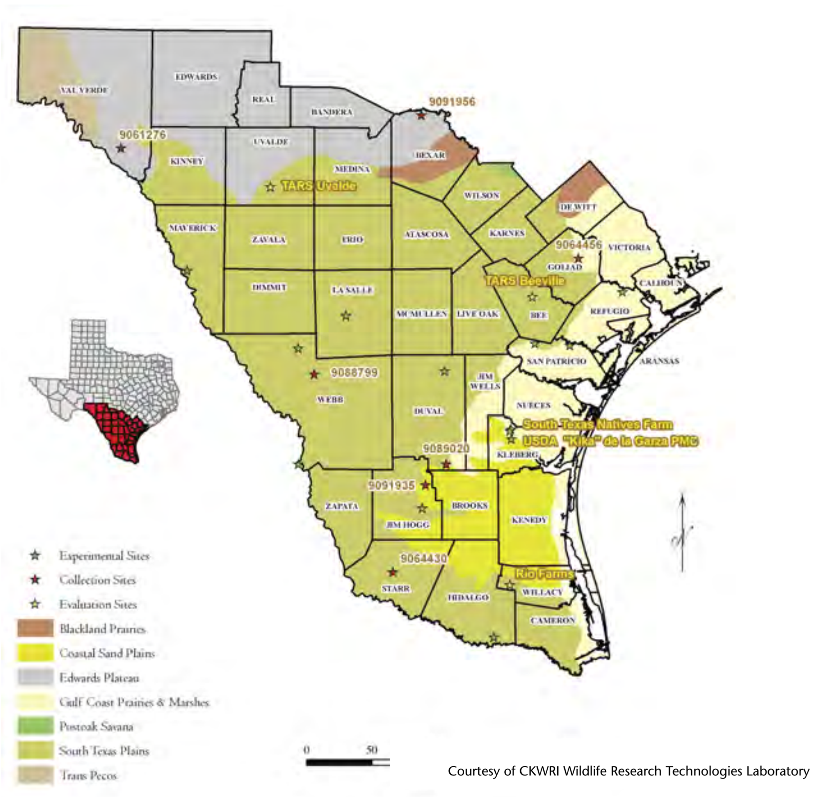
This germplasm is the first release of an orange zexmenia germplasm that originates from Texas. It has been tested and is adapted to the central and southern regions of the state. It has potential for immediate use in range seedings (Everitt and Drawe 1974; Arnold and Drawe 1979; Schweitzer and others 1993; Nelle 1994) for restoration, diversification, and wildlife habitat (Gould 1975; Ajilvsgi 1984). As such, it meets the USDA NRCS Range Planting Code 550 standards (USDA NRCS 2007). The name Goliad Germplasm was chosen because one of the 7 accessions constituting the germplasm originated from a native population in Goliad County, Texas, and the name represents the central region of Texas.

COLLECTION SITE INFORMATION

Accessions making up Goliad Germplasm orange zexmenia were collected from native stands at 7 locations throughout the central and southern regions of Texas representing a variety of range sites and soil types. Seed was hand-stripped from as many plants as possible at each collection site. Collections were cleaned, assigned individual accession numbers, and stored for evaluation at the E "Kika" de la Garza Plant Materials Center in Kingsville, Texas.

DESCRIPTION

Goliad Germplasm orange zexmenia is a native Texas sub-shrub that grows 50 to 100 cm (19 to 39 in) tall (Ajilvsgi 1984; Correll and Johnston 1996). This perennial produces seed from March to December. Accessions constituting Goliad Germplasm show some genetic variation in plant size, leaf characteristics, pubescence, and coloration. Accessions are increased from the original collection of a native population to maintain their genetic integrity. Accessions included in the release have shown superior performance in several ecological and agronomic performance categories.



Courtesy of CKWRI Wildlife Research Technologies Laboratory

METHOD OF SELECTION

Viability of original seed, geographic origin, and soil type of collection location were criteria for initial evaluation of each of 42 accessions of orange zexmenia collected by Texas NRCS Field Offices and the South Texas Natives program from 1990–2003. Other evaluation information included specific collection locale (ranch, county road, and so on), county of the collection site, and major soil type where plants were found.

Viability of original seed was determined by sowing seeds in 98-cell seedling flats filled with commercially available potting medium. Trays were placed in greenhouses with growing conditions of 12 h with daytime temperature maintained near 30 °C (86 °F), and 12 h with night temperature near 18 °C (64 °F), and watered as necessary to maintain adequate soil moisture for optimum germination. The greenhouse planting produced the seedlings for all the initial evaluation plots.

Initial evaluations of orange zexmenia began in 1994 at the USDA NRCS E "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. 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. In conjunction with the development of the South Texas Natives Project, renewed interest and priority status was revived for orange zexmenia. A new evaluation was started in spring 2001. Fourteen collections of orange zexmenia were transplanted to field plots at the PMC. Seed was collected from these accessions and germination tests were performed for 2001 and 2002 harvests.

The field plot was evaluated for plant performance from 2001 through 2003. Plant characteristics evaluated were survival, density, resistance, uniformity, and seed production. Based on plant performance during the 1994 and 2001 evaluations, 3 accessions were selected for release by the PMC: 9061276-Val Verde County, 9064430-Starr County, and 9064456-Goliad County.

South Texas Natives also planted evaluation plots in 2005. Seventeen accessions were planted at Rio Farms (8 Apr 2005, Delfina fine sandy loam soil) and 22 accessions at AgriLife Research Station–Uvalde (6 Apr 2005, Uvalde silty clay loam soil). Seed was collected 3 times during the summer of 2005 at AgriLife Research Station–Uvalde, bulked by accession, and tested 27 Jun 2006 for germination. No germination tests were conducted on seed grown at Rio Farms.

These sites represent a broad geographic distribution (125 to 355 km [77 to 220 mi] between sites), differing climatic conditions, and 3 common soil types (sandy loam, silty clay loam, and clay) where native populations of orange zexmenia commonly occur. At each location a minimum of 2 replications of 10 transplants of each accession were established in a randomized spaced plant (30 cm [12 in] between plants) complete block design on 90-cm (36-in) rows. Plants were irrigated to ensure establishment during the initial growing season. Plantings were not irrigated after the first year of establishment. Visual rankings (1 [best] to 9 [worst]) were taken monthly from May through November on each replication of each accession at each planting site for plant vigor, foliage density, uniformity, development stage, seed production, biomass production, and plant height. Ripe seed was collected from each accession throughout the growing season and tested for seed germination in germination chambers (3 replications x 50 seeds per accession, 12 h light at 30 °C [86 °F], and 12 h dark at 18 °C [64 °F]). Seed germination was recorded for each accession at 3-d intervals for 30 d.

Accessions were ranked by performance in field evaluations and seed germination. South Texas Natives chose accessions 9088799-Webb County, 9091935-Jim Hogg County, 9089020-Duval County, and 9091956-Bexar County for release because these accessions had greater than mean performance in the most evaluation categories.

Following selection by South Texas Natives and the PMC, the 7 accessions were increased using the original seed (G0) in isolated seed increase fields to maintain genetic diversity. Transplants (450) of each accession were then grown from G1 seed and planted side-by-side in a foundation block. Seed from the foundation field is maintained on an accession basis and is harvested individually and blended with proportions of each accession to maintain the genetic representation of each accession. The foundation blend is released to commercial growers through the Texas Foundation Seed Service for establishment of certified seed fields of Goliad Germplasm orange zexmenia.

ECOLOGICAL CONSIDERATION

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 nonexistent. Also, release of this species will make available an additional native species for rangeland planting.

ANTICIPATED CONSERVATION USE

Goliad Germplasm orange zexmenia will provide a native forb species for rangeland revegetation and wildlife habitat plantings in the central and southern regions Texas.

ANTICIPATED AREA OF ADAPTATION

Orange zexmenia is hardy in 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 major land resource area (MLRA) 42, 81A-D, 83A-E, and 150.

AVAILABILITY OF PLANT MATERIALS

Foundation Seed is produced by the USDA NRCS E "Kika" de la Garza Plant Materials Center and distributed through the Texas Foundation Seed Service. Certified seed may be grown within the State of Texas. Limited quantities of seed for research or evaluation purposes will be available on request from John Lloyd-Reilley (john.reilley@tx.usda.gov).

ACKNOWLEDGMENT

This is Caesar Kleberg Wildlife Research Institute Manuscript 10-112.

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APPENDIX C

RELEASE BROCHURES FOR SPECIES FORMALLY RELEASED

Introduction

La Salle Germplasm Arizona cottontop (*Digitaria californica* (Benth.) Henr.) is a blend of 12 collections from the Rio Grande Plains of Texas. This release is a cooperative effort of *South Texas Natives*, the USDA-NRCS E. “Kika” de la Garza Plant Materials Center, and the Texas Agricultural Experiment Station in Beeville. Collections comprising this release were selected for seed quality and production, plant vigor, forage production, and adaptability throughout the South Texas area.

Description

La Salle Germplasm Arizona cottontop is a warm season perennial bunchgrass native to southhe seed head measures 2 to 5 inches and bears a number of fluffy white seeds. Plants are 3 to 5 feet in height and can produce the cotton-like seedheads throughout the year. La Salle Germplasm will readily reseed itself, and individual plants are long lived.

Uses & Adaptation

Salle Germplasm was developed for use in native rangeland restoration and wildlife plantings in the Rio Grande Plains of Texas. La Salle Germplasm provides good forage for livestock and cover and food for many species of native wildlife. It performs well on most soil types, including sandy loam, clay, and clay loam soil types, with the exception of very sandy soils. This germplasm is compatible in plantings with other native species. The good seedling vigor and rapid germination make La Salle Germplasm an excellent choice for planting after brush control or other disturbance. La Salle Germplasm also shows promise for use in adding diversity to stands of exotic grasses, since establishment into existing stands of bufflegrass has been observed.

La Salle Germplasm has shown good performance in the South Texas Plains, Gulf Prairie and Marshes, and Coastal Sand Plains regions of South Texas. Although testing in adjacent ecoregions is lacking, adaptability in eco-regions such as the southern Edwards Plateau and eastern Trans Pecos Mountains is possible but may be limited.

Seed Quality Traits

Seed quality ranges from 40-80% pure live seed. Active seed germination of La Salle Germplasm is excellent when compared to other native grasses, averaging 63%. Up to 93% of active germination takes place 3-5 days from the onset of favorable conditions. Seed dormancy ranges from 10-15%. La Salle Germplasm contains approximately 677,000 seeds per pound.

Planting Methods

Recommended rangeland seeding rate for pure stands is 1½ to 2 pounds pure live seed per acre. Excellent results are achieved when La Salle Germplasm is seeded in the spring to late summer. When La Salle Germplasm is used in a mixture, seeding rate should be adjusted according to the percentage of Arizona cottontop desired on the site. Application of a seed coating is recommended to facilitate planting. Coated seed can be drilled or broadcasted. Seed should not be planted deeper than ¼ inch. Best results are possible in clean, well prepared seedbeds; however, La Salle Germplasm will establish over time in existing vegetation. Plantings of La Salle Germplasm should be deferred from grazing or disturbance for 1 year after planting.

nagement

Stands of La Salle Germplasm should be monitored closely to prevent overgrazing. La Salle Germplasm will perform best under rotational grazing systems. Plants should be allowed to set seed yearly to ensure vigorous stands. Mowing or burning old growth while dormant helps to stimulate seed and forage production. Plants can be mowed to 3 inches yearly with no adverse effects.

Availability

Breeder seed of La Salle Germplasm Arzona cottontop is maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

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La Salle

Germplasm Arizona Cottontop

Digitaria californica (Benth.) Henr.

South Texas Natives

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Introduction

Dilley Germplasm slender grama (*Bouteloua repens* (Kunth) Scribn. & Merr.) is a blend of 4 collections from the Rio Grande Plains of Texas. This release is a cooperative effort of *South Texas Natives*, the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, and the Texas Agricultural Experiment Station in Beeville. Collections comprising Dilley Germplasm were selected for long term survival, seed production and quality, and adaptation across the South Texas area.

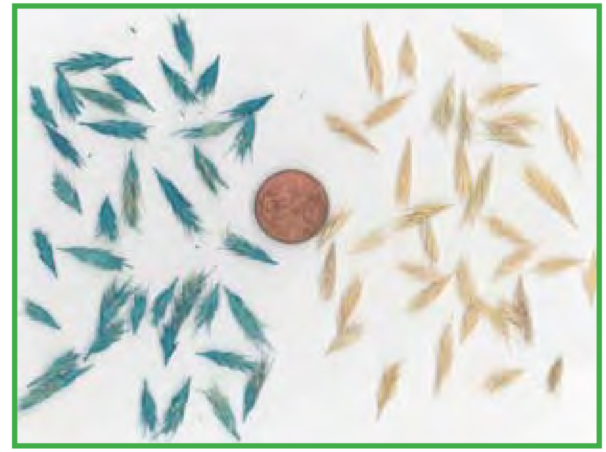
Description

Dilley Germplasm slender grama is a warm season perennial grass native to southern Texas. It is low-growing, 1-2½ feet in height. The grass produces multiple heads that bear 5-9 seed spikes, each bearing 5-8 seeds. Dilley Germplasm will flower and produce seed throughout the year. Individual plants are long lived, and Dilley Germplasm frequently reseeds itself.

Uses & Adapatation

Dilley Germplasm was developed for use in highway right-of-way seeding, native rangeland restoration, and wildlife plantings in the Rio Grande Plains of Texas. Dilley Germplasm will persist on sand, sandy loam, clay, and clay loam soil types, and it is compatible in plantings with other native species. Slender grama is considered an early invader or increaser plant on most range sites, and it competes well with introduced species. Dilley Germplasm's fast seed production, establishment, and spreading habit make it an excellent planting choice for highly disturbed sites like highway rights of way or areas susceptible to erosion. The poor forage value of Dilley Germplasm increases its utility in erosion control and in disturbed areas in which grazing animals cannot be excluded.

Dilley Germplasm has shown good performance in the South Texas Plains, Gulf Prairie and Marshes, and Coastal Sand Plains regions of South Texas. Although testing in adjacent ecoregions is lacking, adaptability in eco-regions such as the southern Edwards Plateau and eastern Trans Pecos Mountains and Basins is possible but may be limited.



Seed Quality Traits

Seed quality averages 35% pure live seed. Fifteen to 30% of Dilley Germplasm spikes bear actively germinating seeds. Dormant seed averages 60-85%. Dilley Germplasm contains approximately 116,300 seeds per pound.

Planting Methods

Recommended rangeland seeding rate for pure stands is 20 pounds pure live seed per acre. When Dilley Germplasm is used in a mixture, seeding rate should be adjusted according to the percent of slender grama desired on the site. A seed coating should be applied to facilitate planting. Although uncoated seed can be broadcast seeded, the relatively light seed weight makes proper distribution difficult. Coated seed can be drilled or broadcasted, and seed should not be planted deeper than ¼ inch. Best results are possible in clean, well prepared seedbeds; however, Dilley Germplasm will establish over time in existing vegetation. Plantings should be deferred from grazing or disturbance for 1 year after planting.

Management

Plants should be allowed to set seed yearly to ensure vigorous stands. Mowing or burning old growth while dormant helps to stimulate seed and forage production. Plants can be mowed to 3 inches yearly with no adverse effects.

Availability

Breeder seed of Dilley Germplasm slender grama is maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

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Dilley

Germplasm Slender Grama

Bouteloua repens (Kunth) Scribn. & Merr.

South Texas Natives

United States Department of Agriculture
Natural Resources Conservation Service

Introduction

Chaparral Germplasm hairy grama (*Bouteloua hirsuta* Lag. var. hirsuta) is a blend of 4 collections from the Rio Grande Plains of Texas. This release is a cooperative effort of *South Texas Natives*, the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, and the Texas Agricultural Experiment Station in Beeville. Collections comprising Chaparral Germplasm were selected for long term survival, seed production and quality, and adaptation across the South Texas area.

Description

Chaparral Germplasm hairy grama is a warm season perennial grass native to southern Texas. The low-growing dense bunchgrass grows 1-2½ feet tall. The plants produce multiple seed heads, each bearing a spike containing 18-70 seeds. Chaparral Germplasm will flower and produce seed throughout the year. Individual plants are long lived.

Uses & Adaptation

Hairy grama is an important component of many range sites throughout South Texas. Chaparral Germplasm was developed for use in highway rights-of-way seeding, native rangeland restoration, and wildlife plantings in the Rio Grande Plains of Texas. Chaparral Gsermplasm will persist on sand, sandy loam, clay, and clay loam soil types. This germplasm is compatible in plantings with other native species. Chaparral Germplasm's fast seed production, establishment, and spreading habit make it an excellent planting choice for highly disturbed sites like highway rights of way or areas susceptible to erosion.

Chaparral Germplasm has shown good performance in the South Texas Plains, Gulf Prairie and Marshes, and Coastal Sand Plains regions of South Texas. Although testing in adjacent ecoregions is lacking, adaptability in eco-regions such as the southern Edwards Plateau and eastern Trans Pecos Mountains and Basins is possible but may be limited.

Seed Quality Traits

Seed quality averages 10% pure live seed. Active seed germination of Chaparral Germplasm is low, ranging from 2-12%; however, the tremendous number of seeds produced offsets its active seed germination rate. Chaparral Germplasm contains approximately 800,000 seeds per pound.

Planting Methods

Recommended rangeland seeding rate for pure stands is 1-2 pounds pure live seed per acre. Optimum planting time is from spring to early fall. When Chaparral Germplasm is used in a mixture, seeding rate should be adjusted according to the percentage of hairy grama desired on the site. Application of a seed coating is recommended to facilitate planting. Uncoated seed of Chaparral Germplasm tends to clump, making uniform planting distribution difficult. Coated seed can be drilled or broadcasted. Seed should not be planted deeper than ⅛ inch. Best results are possible in clean, well prepared seedbeds; however, Chaparral Germplasm will establish over time in existing vegetation. Plantings should be deferred from grazing or disturbance for 1 year after planting.

Management

Chaparral Germplasm has a good to fair grazing value, depending on the range site and soil type. Plants should be allowed to set seed yearly to ensure vigorous stands. Mowing or burning old growth while dormant helps to stimulate seed and forage production. Chaparral Germplasm can be mowed to 4 inches with no adverse effects.

Availability

Breeder seed of Chaparral Germplasm hairy grama is maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

For More Information

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Chaparral

Germplasm Hairy Grama

Bouteloua hirsuta Lag. var. *hirsuta*

South Texas Natives

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Introduction

Atascosa Germplasm Texas grama (*Bouteloua rigidiseta* Steud.) is a blend of 4 collections from the Rio Grande Plains of Texas. This release is a cooperative effort of *South Texas Natives*, the USDA NRCS E. "Kika" de la Garza Plant Materials Center, and the Texas Agricultural Experiment Station in Beeville. Collections comprising Atascosa Germplasm were selected for long term survival, seed production and quality, and adaptation across the South Texas area.

Description

Atascosa Germplasm Texas grama is a warm season perennial grass native to southern Texas. The low-growing, dense bunchgrass grows 1-2½ feet in height and produces multiple heads, each bearing a spike containing 5-14 seed spikes with 3-5 seeds per spike. Atascosa Germplasm will flower and produce seed throughout the year and frequently reseeds itself.

Uses & Adaptation

Texas grama is an important component of many range sites throughout South Texas. Atascosa Germplasm was developed for use in highway right-of-way seeding, native rangeland restoration, and wildlife plantings in the Rio Grande Plains of Texas. Atascosa Germplasm will persist on sand, sandy loam, clay, and clay loam soil types, and it is compatible in plantings with other native species. Atascosa Germplasm's fast seed production, establishment and spreading habit make it an excellent planting choice for highly disturbed sites like highway right of ways or areas susceptible to erosion.

Atascosa Germplasm has shown good performance in the South Texas Plains, Gulf Prairies and Marshes, and Coastal Sand Plains regions of South Texas. Although testing in adjacent ecoregions is lacking, adaptability in the southern Edwards Plateau and eastern Trans Pecos Mountains and Basins is possible.

Seed Quality Traits

Seed quality averages 55% pure live seed. Active seed germination averages 35%, and dormant seed averages 27%. Atascosa Germplasm contains approximately 104,000 seeds per pound.

Planting Methods

Recommended rangeland seeding rate for pure stands is 15 pounds pure live seed per acre. Optimum planting time is late summer to early fall. When Atascosa Germplasm is used in a mixture, seeding rate should be adjusted according to the percentage of Texas grama desired on the site. Application of a seed coating has no adverse affects on seed germination. Uncoated seed tends to clump, making uniform planting distribution difficult. Coated seed can be drilled or broadcasted. Seed should not be planted deeper than ¼ inch. Best results are possible in clean, well prepared seedbed; however, Atascosa Germplasm will establish over time when seeding into existing vegetation. Grazing should be deferred for one year after planting.

Management

Atascosa Germplasm plants should be allowed to set seed yearly to ensure vigorous stands. Mowing or burning old growth while dormant helps to stimulate seed and forage production. It can be mowed to 4 to 6 inches without adverse effects. Atascosa Germplasm has poor grazing value.

Availability

Breeder seed of Atascosa Germplasm Texas grama is maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

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Atascosa

Germplasm Texas Grama

Bouteloua rigidiseta Steud.

South Texas Natives

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

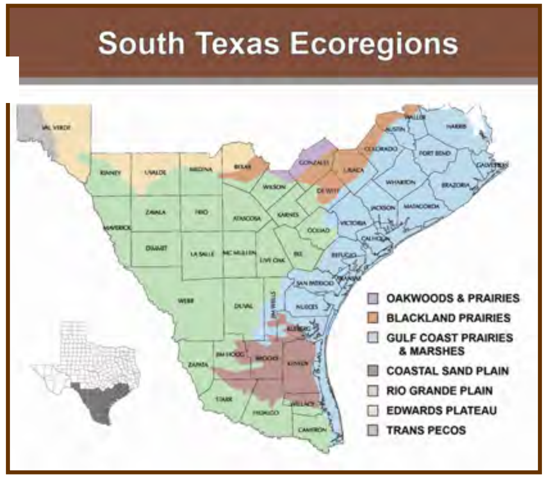
Description

The Catarina blend of bristlegrass is a commercial blend of four bristlegrass collections from South Texas. One component is a plains bristlegrass [*Setaria vulpiseta* (Lam.) Roemer & J.A. Schultes] collected in Webb County, Texas. The other three components are streambed bristlegrass [*Setaria leucopila* (Scribn.& Merr.) K. Schum.] collected in Karnes, Bexar, and Willacy Counties, Texas.

The releases forming Catarina blend of bristlegrass were a cooperative release between the USDA-NRCS Plant Materials Program, *South Texas Natives*, and the Texas Agricultural Experiment Station at Beeville. Both of these species of bristlegrass are native, perennial bunchgrasses. They produce seed from May to November. Their mature foliage height ranges from 1 to 4 feet tall.

es and Adaptation

e Catarina blend of bristlegrass is recommended for use in upland wildlife



plantings and in rangeland seed mixes. It can be used in many types of conservation plantings, such as riparian buffers and filter strips.

It has performed well at locations in the Rio Grande Plain, Gulf Coast Prairies and Marshes, and Rolling Plains regions of Texas. Plains and streambed bristlegrass also occur naturally in the High Plains, Edwards Plateau, and Trans Pecos regions. The Catarina blend of bristlegrass may be adapted to these regions as well, but this has not been verified through field testing.

Planting Methods

Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring, or where there are few cool-season weeds, bristlegrass can be seeded in the fall.

Bristlegrass can be seeded using a grass drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. There are approximately 368,100 to 567,500 seeds per pound of bristlegrass.

Seed should be planted 1/8 to 1/4 inch deep. A seeding rate of 2 pounds of pure live seed (PLS) per acre is recommended. This corresponds to planting 20 live seeds per square foot. When planting a mixture, the rate of bristlegrass should be reduced according to the total percentage desired in the mixture. It should be noted that some of the collections that make up the Catarina blend have high seed dormancy.

Management

Catarina blend bristlegrass should not be grazed the first year. Once the stand is established, rotational grazing can be used. It is recommended that a 4-10 inch stubble height be maintained.

Availability

The four germplasms that make up the Catarina blend (Kika648 Germplasm, Kika677 Germplasm, Kika819 Germplasm and Kika820 Germplasm) were released in 2006. Breeder and foundation seed will be maintained by the E. Kika de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service. Breeder seed may be obtained by contacting the PMC.

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Catarina Blend
Bristlegrass

Setaria leucopila
(Scribn. & Merr.) K. Schum.
and
Setaria vulpiseta
(Lam.) Roemer & J.A. Schultes

E. "Kika" de la Garza Plant Materials Center Kingsville, Texas

South Texas Natives

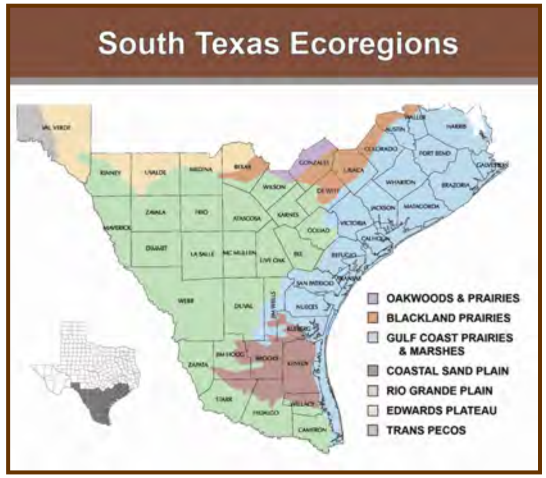
Description

Welder Germplasm shortspike windmillgrass (*Chloris × subdolichostachya Muell. (pro sp.)* [*cucullata × verticillata*]) was collected in San Patricio County, Texas. Shortspike windmillgrass is a naturally occurring hybrid between the native grasses *Chloris cucullata* and *Chloris verticillata*. Welder Germplasm is a cooperative release between the USDA-NRCS Plant Materials Program, *South Texas Natives*, and the Texas Agricultural Experiment Station at Beeville. It is a perennial grass which produces seed and also spreads vegetatively by stolons. The mature foliage height ranges from 1 to 3 feet tall. It may produce seed heads from May to October, but most of the seed is produced in September and October.

Uses and Adaptation

Welder Germplasm is recommended for use in roadside plantings, critical site revegetation, and rangeland seed mixes. It can be used in many types of conservation plantings, such as grassed waterways, riparian buffers, filter strips, and pond embankments.

Welder Germplasm has performed well at locations in the Rio Grande Plain, Gulf Coast Prairies and Marshes, Rolling Plains, and Pineywoods regions of Texas. Shortspike windmillgrass also occurs naturally in the Blackland Prairie, Edwards Plateau, and Oak Woods and Prairies regions. Welder Germplasm may be adapted to these regions as well, but this has not been verified through field testing.



Planting Methods

Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring, or where there are few cool-season weeds, windmillgrass can be seeded in the fall.

Welder Germplasm can be seeded using a grass drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. Sand can be mixed with seed to aid in distribution. There are approximately 3,000,000 seeds per pound of shortspike windmillgrass.

Seed should be planted 1/8 to 1/4 inch deep. It is better to plant too shallow than too deep. A seeding rate of 1/4to 1/2 pound of pure live seed (PLS) per acre is recommended. This corresponds to planting 20 to 40 live seeds per square foot. When planting a mixture, the rate of windmillgrass should be reduced according to the total percentage desired in the mixture.

Management

Welder Germplasm shortspike windmillgrass can be grazed the first year once the stand is established. Contact you local NRCS office to develop a grazing management plan. It is recommended that it be mowed or grazed to a 2 to 3 inch stubble height at least once per year. Welder Germplasm should not be burned.

Availability

Welder Germplasm was released in 2006. Breeder and foundation seed will be maintained by the E. Kika de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service. Breeder seed may be obtained by contacting the PMC.

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Welder Germplasm

Shortspike Windmillgrass

***Chloris × subdolichostachya* Muell. (pro sp.) [*cucullata × verticillata*]**

E. "Kika" de la Garza Plant Materials Center Kingsville, Texas

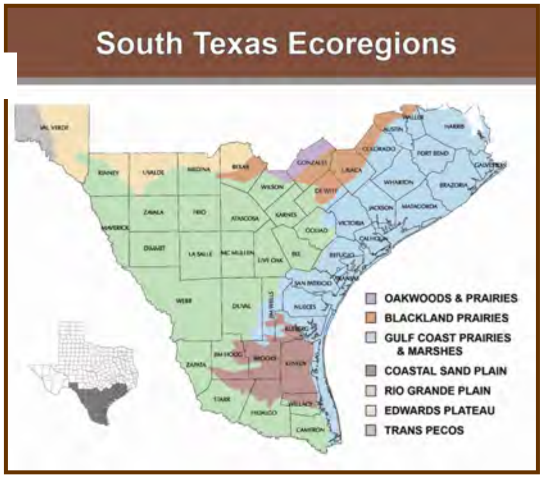
South Texas Natives

Description

Mariah Germplasm hooded windmillgrass (*Chloris cucullata* Bisch.) was collected in Kenedy County, Texas. Mariah Germplasm is a cooperative release between the USDA-NRCS Plant Materials Program, *South Texas Natives*, and the Texas Agricultural Experiment Station at Beeville. Hooded windmillgrass is a native, perennial bunchgrass with a mature foliage height ranging from 0.5 to 1 foot. It produces seed heads from May through October. However, unlike most hooded windmillgrass populations, Mariah Germplasm also spreads vegetatively by stolons.

Uses and Adaptation

Mariah Germplasm is recommended for use in roadside plantings, critical site revegetation, and rangeland seed mixes. It can be used in many types of



conservation plantings, such as grassed waterways, riparian buffers, filter strips, and pond embankments.

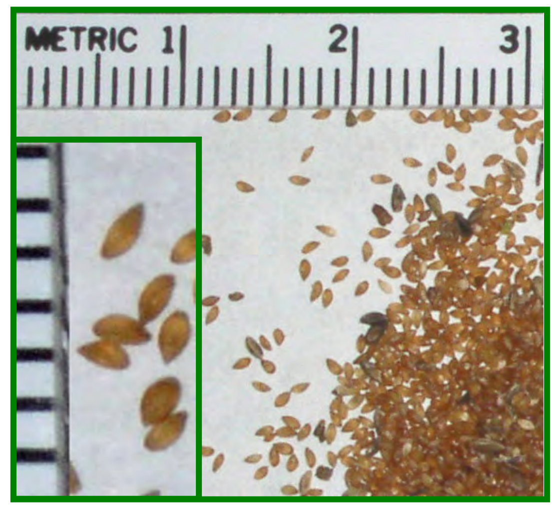
Mariah Germplasm has performed well at locations in the Rio Grande Plain, Gulf Coast Prairies and Marshes, Rolling Plains, and Pineywoods regions of Texas. Hooded windmillgrass also occurs naturally in the Edwards Plateau and Trans Pecos regions. Mariah Germplasm may be adapted to these regions as well, but this has not been verified through field testing.

Planting Methods

Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring, or where there are few cool-season weeds, windmillgrass can be seeded in the fall.

Mariah Germplasm can be seeded using a grass drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. Sand can be mixed with seed to aid in distribution. There are approximately 2,500,000 seeds per pound of hooded windmillgrass.

Seed should be planted 1/8 to 1/4 inch deep. It is better to plant too shallow than too deep. A seeding rate of 1/3 to 2/3 pound of pure live seed (PLS) per acre is recommended. This corresponds to planting 20 to 40 live seeds per square foot. When planting a mixture, the rate of windmillgrass should be reduced according to the total percentage desired in the mixture.



Management

Mariah Germplasm hooded windmillgrass can be grazed the first year once the stand is established. Contact you local NRCS office to develop a grazing management plan. It is recommended that it be mowed or grazed to a 2 to 3 inch stubble height at least once per year. Mariah Germplasm should not be burned.

Availability

Mariah Germplasm was released in 2006. Breeder and foundation seed will be maintained by the E. Kika de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service. Breeder seed may be obtained by contacting the PMC.

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Mariah Germplasm

Hooded Windmillgrass

Chloris cucullata **Bisch.**

E. "Kika" de la Garza Plant Materials Center Kingsville, Texas

South Texas Natives

Description

Maverick Germplasm is a blend of 7 populations of pink pappusgrass (*Pappophorum bicolor* E. Fourn.) from the South Texas Plains. Pink pappusgrass is a co-dominant bunchgrass found on a variety of soils in the region. Maverick Germplasm is a cooperative release of the *South Texas Natives* Program of the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville, the USDA NRCS E. "Kika" de la Garza Plant Materials Center, and Texas AgriLife Research Station-

Beeville. This grass grows 2-5' tall and produces seed and foliage from March through November. Selections included in Maverick Germplasm were chosen by evaluations of 70 collections of pappusgrass from South Texas at 4 locations for multiple years. Selected accessions have superior active seed germination, greater overall seed production, and higher plant vigor ratings than other collections evaluated.

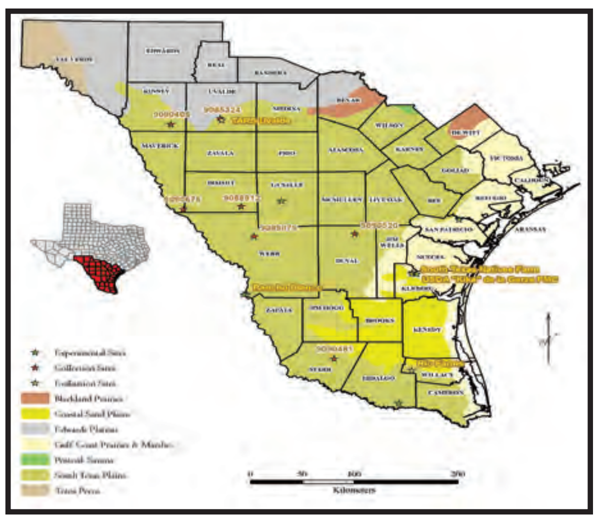
Uses & Adaptation

Maverick Germplasm is recommended for use in rangeland seed mixes, highway right of way plantings, retired cropland restoration plantings, and for use in efforts to diversify invasive grass monocultures. Maverick Germplasm provides good forage for livestock, and is an excellent bunchgrass that provides good cover for wildlife. It may also be useful in urban wildscaping and ornamental plantings. The foliage provides deep green color and seedheads are an attractive pink coloration.

This release is adapted to a variety of soils. Components originate from gravelly loam, clay loam, and sandy loam soils. Maverick Germplasm is also adapted to saline soils common throughout South Texas. This release will perform best in the South Texas Plains, Coastal Sand Plains, and Gulf Coast Prairies and Marshes eco-regions of Texas. Good performance is expected in the southern Edwards Plateau, eastern Trans Pecos, and throughout northern Mexico, however it has not been tested in these areas.

Planting Methods

Best stands of Maverick Germplasm are obtained by drilling coated seed into a firm, well-prepared seedbed in late August-early



October in South Texas. Plantings done at other times of the year typically have no emergence until late summer/early autumn, regardless of moisture availability. Coated or uncoated seed can also be planted by broadcasting, but culti-packing or light dragging is recommended to prevent seed loss to animals or wind. Seed should be planted no deeper than ¼" below the soil surface. For calibration purposes, Maverick Germplasm contains approximately 322,000 uncoated seeds per bulk pound. Maverick Germplasm should be planted at a rate of 3 pounds pure live seed per acre for solid stands. The seeding rate in mixed species plantings should be adjusted according to the desired amount of pink pappusgrass for the planting site. Increasing the seeding rate above recommended rates does not result in better stands of Maverick Germplasm.

Maverick Germplasm can also be established with vegetative transplants. Transplants should be planted when adequate soil moisture is present. Rapid spread and recruitment has been observed in transplant established stands. On most sites, a mixture of Maverick Germplasm pink pappusgrass and Webb Germplasm whiplash pappusgrass will provide the best results.

Management

Newly planted stands of Maverick Germplasm should not be grazed for 1 year after planting to allow establishment and development of adequate rootstock. Plants can be grazed to 4” stubble height with no adverse affects. Pink pappusgrass plants should be allowed to produce seed annually to insure stand health. Pink pappusgrass is a long-lived perennial that is extremely drought and fire tolerant once established.

Availability

Maverick Germplasm pink pappusgrass was released in 2010. Breeder and foundation seed are maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives*.

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Maverick

Germplasm Pink Pappusgrass

Pappophorum bicolor E. Fourn.

South Texas Natives

USDA NRCS Natural Resources Conservation Service

AgriLIFE RESEARCH Texas A&M System

Description

Webb Germplasm is a blend of 3 populations of whiplash pappusgrass (*Pappophorum vaginatum* Buckley) from the South Texas Plains. Whiplash pappusgrass grows on coastal, saline, and alkaline sites in low areas, and on calcareous soils. Whiplash pappusgrass is also found in upland range sites in mixed stands with pink pappusgrass (*Pappophorum bicolor* E. Fourn.). Webb Germplasm is a cooperative release between the South Texas Natives Program of the Caesar Kleberg

Wildlife Research Institute at Texas A&M University-Kingsville, the USDA NRCS E. "Kika" de la Garza Plant Materials Center, and Texas AgriLife Research Station-Beeville. This grass grows 3-5' tall, and produces seed and foliage from March through November. Selected accessions have superior active seed germination, greater seed production, and higher plant vigor, forage yield, and height ratings than other collections evaluated.

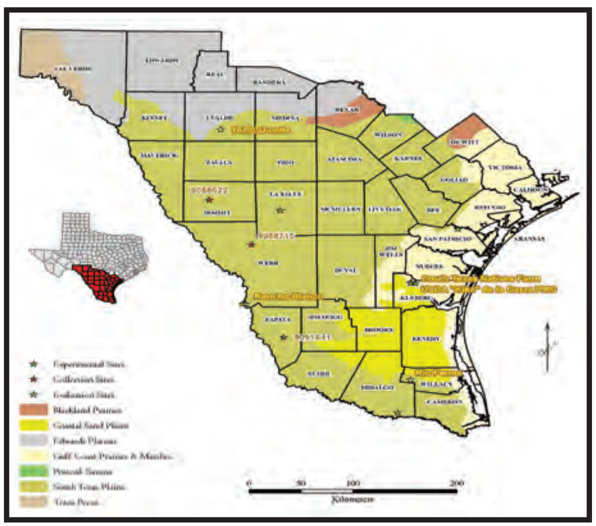
Uses & Adaptation

Webb Germplasm is recommended for use in rangeland seed mixes, for saline and alkaline site restoration, highway right of way plantings, retired cropland restoration plantings, and for use in efforts to diversify invasive grass monocultures. Webb Germplasm provides good forage for livestock, and is an excellent bunchgrass that provides good cover for wildlife.

This release has performed well in a variety of soils. Components of the release originated from clay and sandy loam soils. Webb Germplasm is also adapted to saline and alkaline soils common throughout South Texas. Webb Germplasm will perform best in the South Texas Plains, Coastal Sand Plains, and Gulf Coast Prairies and Marshes eco-regions of Texas. Good performance can be expected in the southern Edwards Plateau, eastern Trans Pecos, and throughout northern Mexico, however use in these areas has not been tested.

Planting Methods

Best stands of Webb Germplasm are obtained by drilling coated seed into a firm, well-prepared seedbed in late August-early October



in South Texas. Plantings done at other times of the year typically have no emergence until late summer or early autumn, regardless of moisture availability. Coated and uncoated seed can also be planted by broadcasting, but culti-packing or light dragging is recommended to prevent seed loss to animals or wind. Seed should be planted no deeper than ¼" below the soil surface. For calibration purposes, Webb Germplasm contains approximately 436,000 uncoated seeds per bulk pound. Webb Germplasm should be planted at a rate of 3 pounds pure live seed per acre for solid stands. The seeding rate in mixed species plantings should be adjusted according to the desired amount of whiplash pappusgrass for the planting site. Increasing the seeding rate above the recommended rate does not result in better stands of Webb Germplasm.

Webb Germplasm can also be established with vegetative transplants. Transplants should be planted when adequate soil moisture is present. Rapid spread and recruitment has been observed in transplant established stands. On most sites, a mixture of Webb Germplasm whiplash pappusgrass and Maverick Germplasm pink pappusgrass will provide the best results.

Management

Newly planted stands of Webb Germplasm should not be grazed for 1 year after planting to allow establishment and development of adequate rootstock. Later, it can be periodically grazed to 4” stubble height with no adverse affects. Plants should be allowed to produce seed annually to insure stand health. Whiplash pappusgrass is a long-lived perennial that is extremely drought and fire tolerant once established.

Availability

Webb Germplasm whiplash pappusgrass was released in 2010. Breeder and foundation seed are maintained by *South Texas Natives* in conjuction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives*.

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Webb

Germplasm Whiplash Pappusgrass

Pappophorum vaginatum
Buckley

South Texas Natives

USDA NRCS
Natural Resources Conservation Service

AgriLIFE RESEARCH
Texas A&M System

Introduction

Divot tallow weed is a blend of two species of plantain (commonly known as tallow weed) originating from south Texas. Divot tallow weed blend is a cooperative release between South Texas Natives, Texas Agrilife Research-Beeville, and the USDA-NRCS E. "Kika" de la Garza Plant Materials Center.

Description

Divot tallow weed blend is made up of the release STN-561 Germplasm Hookers plantain (*Plantago hookeriana* Fisch & Mey), collected in Medina County, Texas, and STN-496 Germplasm redseed plantain (*Plantago rhodosperma* Dcne.) collected in Bexar County, Texas. Redseed and Hookers plantains are cool-season, annual native plants that grow 6-12" in height. In irrigated food plot settings, solid stands of Divot tallow weed blend will produce an average of 2,000 lbs. of forage per acre. Seed production averages 350 lbs. of pure live seed per acre in commercial settings.

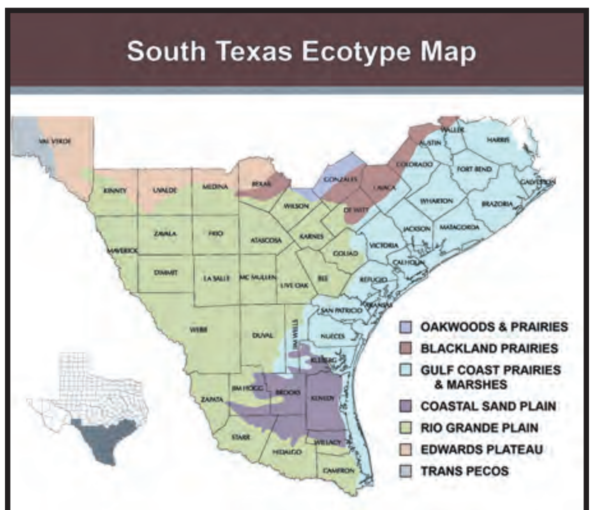
Uses & Adaptation

Tallow weeds produce seed eaten by bobwhite quail and mourning doves and forage consumed by livestock, white-tailed deer, bobwhite quail, Rio Grande wild turkey, and Texas tortoise. Divot tallow weed blend can be used as a component in upland wildlife, range, and conservation plantings and in cool season food plots for wildlife.

Redseed plantain is found throughout south Texas on clay, loam and other fine textured soils. Hookers plantain is typically found on sand, sandy loam, and coarse textured soils. Divot tallow weed blend has performed best at locations in MLRAs 83 (Rio Grande Plains) and 150 (Gulf Coast Prairies). The Divot Blend should be well adapted to most locations in south Texas.

Planting Methods

Divot tallow weed blend should generally be planted as part of a native seed mixture or as a food plot species for wildlife. A seeding rate of 10 pounds pure live seed (PLS) per acre is recommended for a solid stand. This corresponds to planting 20 live seeds per square foot. When planting a mixture, the rate of Divot tallow weed blend should be reduced according to the total percentage desired at the planting site. There are approximately 223,000 seeds per pound of plantain seed.



Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in mid-late fall or early winter (October-December) in south Texas.

Divot tallow weed blend can be seeded using a seed drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. Seed should be planted very shallow, approximately 1/8 inch deep. It is better to plant too shallow than too deep.

Management

Divot tallow weed blend establishes very quickly with adequate soil moisture and good growing conditions. Tallow weeds commonly form a winter rosette following emergence, and primary forage production occurs from early February through May. Areas planted with tallow weed should be deferred from grazing for a minimum of 30 days after planting to minimize trampling by livestock. Seed stalks typically emerge from March-May and plants may produce seed through June under favorable moisture conditions. Once established, Divot tallow weed blend readily re-seeds itself with moderate soil disturbance prior to the growing season, or significant rainfall.

Availability

Breeder seed of Divot tallow weed blend is maintained by *South Texas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

For More Information

South Texas Natives
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
MSC 218, 700 University Blvd
Kingsville, TX 78363

Phone: (361) 593-5550
http://ckwri.tamuk.edu/research-programs/south-texas-natives/
e-mail: forrest.smith@tamuk.edu

or

USDA-NRCS E. "Kika" de la Garza Plant Materials Center
3409 North FM 1355
Kingsville, TX 78363

Phone: (361) 595-1313
www.plant-materials.nrcs.usda.gov/stpmc/

Divot

Tallow Weed Blend

Plantago hookeriana Fisch & Mey
Plantago rhodosperma Dcne.

South Texas Natives

USDA NRCS Natural Resources Conservation Service

AgriLIFE RESEARCH Texas A&M System

Introduction

Zapata Germplasm Rio Grande clammyweed [*Polanisia dodecandra* (L.) DC. ssp. *riograndensis*], is a composite of two collections from Dimmit and Zapata Counties, Texas. Zapata Germplasm is a cooperative release between South Texas Natives and the USDA-NRCS E. "Kika" de la Garza Plant Materials Center.

Description

Rio Grande clammyweed is a native, annual forb with a mature foliage height ranging from 24 to 60 inches. It produces pink flowers and seed from March through November.

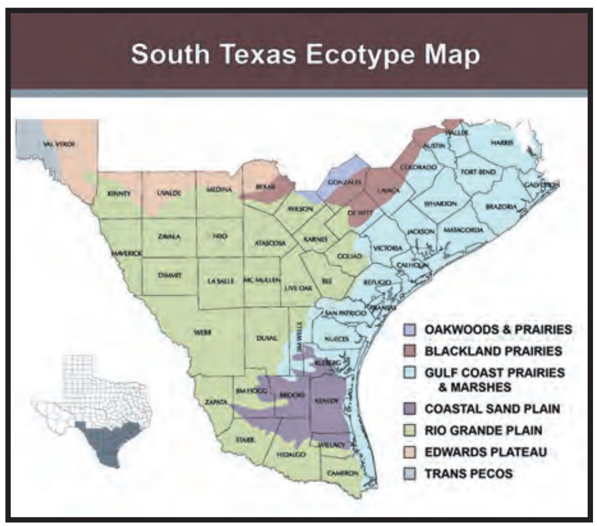
Uses & Adaptation

Rio Grande clammyweed produces seed eaten by a variety of game birds and wildlife. It is a good nectar source and outstanding attractant for a number of butterflies and pollinators, and harbors large insect populations beneficial to wildlife. Rio Grande clammyweed foliage is not grazed by livestock or wildlife. Zapata Germplasm is recommended for use in upland wildlife plantings, food plots for game birds, ive landscaping, and in range seeding mixes.

Rio Grande clammyweed is naturally found in sandy, gravelly or alluvial silty soils on both sides of the lower Rio Grande River and adjacent areas of south Texas. Zapata Germplasm has performed best at locations in MLRAs 83 (Rio Grande Plains) and 150 (Gulf Coast Prairies). As a component of a seed mix of native species, Rio Grande clammyweed is one of the first plants to germinate, establish and produce seed. Clammmyweed is an excellent nurse plant for many slow growing, native perennial grasses.

Planting Methods

Rio Grande clammyweed should generally be planted as part of a native seed mixture or as a food plot species for game birds.



A seeding rate of 8 pounds of pure live seed (PLS) per acre is recommended for a solid stand. This corresponds to planting 20 pure live seeds/sq. ft. When planting a mixture, the rate of Rio Grande clammyweed should be reduced according to the total percentage desired in the mixture. There are approximately 154,500 seeds per pound of clammyweed.

To plant, establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to seeding, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring or late summer-early fall, with consideration given to allow seed production and maturity before the onset of freezing temperatures. Rio Grande clammyweed typically requires 45-60 days from planting for seed to mature under ideal growing conditions.

Zapata Germplasm can be seeded using a seed drill, or broadcasted in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact may be necessary. Seed should be planted 1/8 to 1/4 inch deep. It is better to plant too shallow than too deep.

Management

Zapata Germplasm Rio Grande clammyweed establishes very quickly with adequate soil moisture and good growing conditions. Areas planted with Rio Grande clammyweed should be deferred from grazing for a minimum of 30 days after planting to minimize trampling by livestock. Once established, clammyweed will re-seed itself with moderate soil disturbance prior to the growing season. Once perrenial plant species establish on the planting site, clammyweed declines in abundance without additional soil disturbance.

Availability

Breeder seed of Zapata Germplasm Rio Grande clammyweed is maintained by *South exas Natives* in conjunction with the Texas Foundation Seed Service. Breeder seed can be obtained by contacting *South Texas Natives.*

For More Information

South Texas Natives
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
MSC 218, 700 University Blvd
Kingsville, TX 78363

Phone: (361) 593-5550
http://ckwri.tamuk.edu/research-programs/south-texas-natives/
e-mail: forrest.smith@tamuk.edu

or

USDA-NRCS E. "Kika" de la Garza Plant Materials Center
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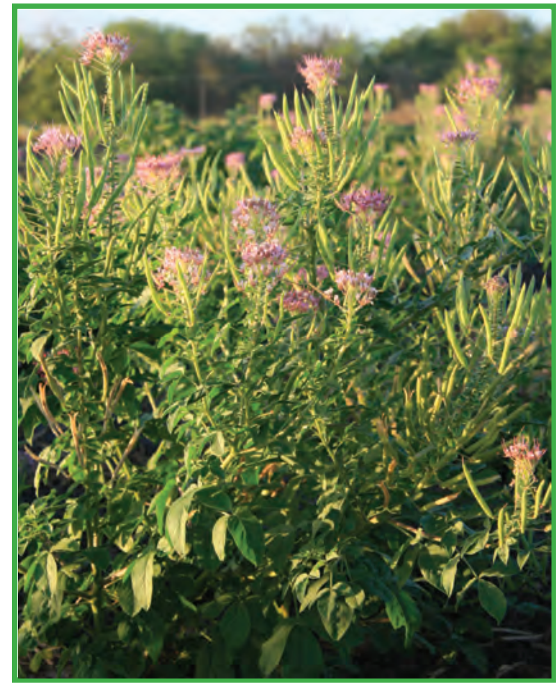
Kingsville, TX 78363

Phone: (361) 595-1313
www.plant-materials.nrcs.usda.gov/stpmc/

Zapata

Germplasm Rio Grande Clammyweed

Polanisia dodecandra (L.) DC. ssp. *riograndensis*



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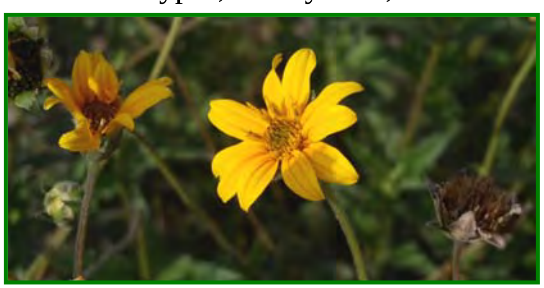
Description

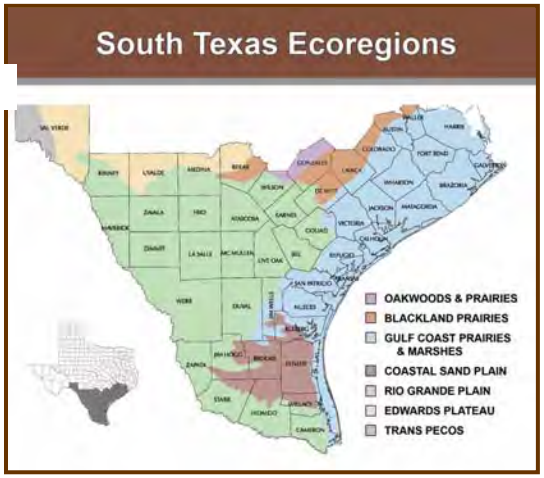
Goliad Germplasm orange zexmenia [*Wedelia texana* (A. Gray) B.L. Turner] is a composite of seven collections from Val Verde, Starr, Goliad, Webb, Duval, Jim Hogg, and Bexar Counties, Texas. Goliad Germplasm is a cooperative release between the USDA-NRCS Plant Materials Program and *South Texas Natives*. Orange zexmenia is a native, perennial sub-shrub with a mature foliage height ranging from 20 to 40 inches. It produces yellow to yellow-orange flowers from March through December.

Uses and Adaptation

Orange zexmenia is browsed by white-tailed deer, cattle, sheep, and goats. Bob white quail have been observed eating the seeds. It is also an adult nectar source for butterflies. Goliad Germplasm is recommended for use in 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.

Orange zexmenia is naturally found on varied soil types, brushy sites, and in





open spaces. 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.

Goliad Germplasm has performed well at locations 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.

Planting Methods

Orange zexmenia will generally be planted as part of a forb mixture. A seeding rate of 1/3 to 2/3 pound of pure live seed (PLS) per acre is recommended. This corresponds to planting 20 to 40 live seeds per square foot. When planting a mixture, the rate of orange zexmenia should be reduced according to the total percentage desired in the mixture. There are approximately 140,520 seeds per pound of orange zexmenia.

Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring, or where there are few cool-season weeds, orange zexmenia can be seeded in the fall.

Goliad Germplasm can be seeded using a grass drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. Seed should be planted 1/8 to 1/4 inch deep. It is better to plant too shallow than too deep.

Management

Goliad Germplasm orange zexmenia can be grazed the first year once the stand is established. Contact you local NRCS office to develop a grazing management plan.

Availability

Goliad Germplasm was released in 2008. Breeder and foundation seed will be maintained by the E. Kika de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service. Breeder seed may be obtained by contacting the PMC.

For More Information

Kika de la Garza Plant Materials Center
3409 North FM 1355
Kingsville, Texas 78363
Phone: (361) 595-1313
http://plant-materials.nrcs.usda.gov/stpmc/

or

Plant Materials Specialist
USDA-NRCS
WR Poage Federal Building
101 South Main Street
Temple, Texas 76501-7682
Phone: (254) 742-9888

or

South Texas Natives
CKWRI-TAMUK
MSC 218, 700 University Blvd.
Kingsville, Texas 78363
Phone: (361) 593-5550
http://www.southtexasnatives.org

or

Any USDA Natural Resources Conservation Service Office

Revised August 2008

United States Department of Agriculture
Natural Resources Conservation Service

Goliad Germplasm

Orange Zexmenia

Wedelia texana **(A. Gray) B.L. Turner**

E. "Kika" de la Garza Plant Materials Center Kingsville, Texas

South Texas Natives

APPENDIX D

RECOMMENDED SEEDING RATES FOR SPECIES FORMALLY RELEASED

Species	Variety name	Pure stand seeding rate in lbs PLS/acre
Slender grama	Dilley Germplasm	8.00
Texas grama	Atascosa Germplasm	15.00
Hairy grama	Chaparral Germplasm	2.00
Shortspike windmillgrass	Welder Germplasm	0.66
Hooded windmillgrass	Mariah Germplasm	0.50
Plains bristlegrass	Catarina Blend	2.00
Arizona cottontop	LaSalle Germplasm	2.00
Pink pappusgrass	Maverick Germplasm	3.00
Whiplash pappusgrass	Webb Germplasm	3.00
Canada wildrye	Lavaca Germplasm	10.00
False rhodesgrass	Kinney Germplasm	1.00
Redseed plantain	STN-561 Germplasm	10.00
Hookers plantain	STN-496 Germplasm	10.00
Rio Grande clammyweed	Zapata Germplasm	8.00
Orange zexmenia	Goliad Germplasm	0.50
Prairie acacia	South Texas Germplasm	1.00
Halls panicum	Oso Germplasm	1.00
Multiflowered false rhodesgrass	Hidalgo Germplasm	1.00
Big sacaton	Falfurrias Germplasm	1.00
Deer pea vetch	BeeRich Germplasm	10.00

APPENDIX E

CURRENT COMMERCIAL PRODUCERS OF SPECIES FORMALLY RELEASED

Species	Variety name	Commercial Producer(s)
Slender grama	Dilley Germplasm	Douglass W. King Seed Company
Texas grama	Atascosa Germplasm	Douglass W. King Seed Company
Hairy grama	Chaparral Germplasm	Douglass W. King Seed Company
Shortspike windmillgrass	Welder Germplasm	Turner Seed Company, Pogue Agri Partners
Hooded windmillgrass	Mariah Germplasm	Douglass W. King Seed Company
Plains bristlegrass	Catarina Blend	Pogue Agri Partners, Douglass W. King Seed Company
Arizona cottontop	LaSalle Germplasm	Pogue Agri Partners
Pink pappusgrass	Maverick Germplasm	Pogue Agri Partners
Whiplash pappusgrass	Webb Germplasm	Douglass W. King Seed Company
Canada wildrye	Lavaca Germplasm	Turner Seed Company
False rhodesgrass	Kinney Germplasm	Douglass W. King Seed Company
Redseed plantain	STN-561 Germplasm	Pogue Agri Partners
Hookers plantain	STN-496 Germplasm	Pogue Agri Partners
Rio Grande clammyweed	Zapata Germplasm	Douglass W. King Seed Company
Orange zexmenia	Goliad Germplasm	-
Prairie acacia	South Texas Germplasm	Pogue Agri Partners
Halls panicum	Oso Germplasm	Douglass W. King Seed Company
Multiflowered false rhodesgrass	Hidalgo Germplasm	Pogue Agri Partners
Big sacaton	Falfurrias Germplasm	Douglass W. King Seed Company
Deer pea vetch	BeeRich Germplasm	Pogue Agri Partners