

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. "KIKI" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

NOTICE OF RELEASE OF VENADO GERMPLASM AWNLESS BUSHSUNFLOWER

SELECTED CLASS OF NATURAL RELEASE

Texas A&M University-Kingsville, Caesar Kleberg Wildlife Research Institute, *South Texas Natives* Program and the United States Department of Agriculture, Natural Resources Conservation Service, E. "Kika" de la Garza Plant Materials Center announce the release of a selected ecotype of awnless bushsunflower (*Simsia calva* (Engelm. & A. Gray) A. Gray) (USDA 2011) for the Rio Grande Plains ecoregion of south Texas. Accessions comprising Venado Germplasm were tested under the accession numbers 9088578, 9088713, 9089117, and 9089015. Seed of the Venado Germplasm awnless bushsunflower release will be identified by USDA NRCS accession number 9109773.

This plant will be referred to as Venado Germplasm awnless bushsunflower 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 awnless bushsunflower originating from or indicating good performance in south Texas. The only other existing commercial sources of awnless bushsunflower seed are derived from the cultivar 'Plateau' originating from Kerr County, Texas in the Edwards Plateau of Texas (USDA SCS 1988, USDA NRCS 2010); or from sources without proof of origin or measured performance (NAS 2011). Venado Germplasm was tested in comparison to available commercial sources including 'Plateau' in initial evaluation and Venado Germplasm showed indication of superior performance at multiple evaluation locations within the area of intended use.

Collection Site Information: Accessions comprising Venado Germplasm were collected from remnant native stands of awnless bushsunflower on native rangelands in the Rio Grande Plains of South Texas.

Accession **9089117** was collected by Paula Maywald and Alfonso "Poncho" Ortega-S, Jr. of the *South Texas Natives* Program from the right of way of Texas Highway 173 in Medina County, Texas near 29° 16' 23' N latitude and 99° 05' 00" W longitude on September 21, 2002. Soil series and texture of the collection site was Valco clay loam (USDA NRCS 2011).

Accession **9088578** was collected by Forrest Smith and Cody Lawson of the *South Texas Natives* Program from the right of way of Bee County Road 138 in Bee County near 28° 39' 25" N latitude and 97° 57' 08" W longitude on May 21, 2002. Soil series and texture of the collection site was Pernitas sandy clay loam (USDA NRCS 2011).

Accession **9088713** was collected by Forrest Smith and Cody Lawson of the *South Texas Natives* Program from the Cerrito Prieto Ranch in Webb County, Texas on June 12, 2002. Latitude and longitude of the collection site were not recorded. Soil texture of the collection site was reported by the collectors as loamy.

Accession **9089015** was collected by Forrest Smith and Cody Lawson of the *South Texas Natives* Program from the Texas Parks and Wildlife Department Chaparral Wildlife Management Area in La Salle County, Texas near 28° 20' 48" N latitude and 99° 22' 55" W longitude on August 12, 2002. Soil series and texture of the collection site was Duval very fine sandy loam (USDA NRCS 2011).

Description: Awnless bushsunflower is a native, perennial forb or sub-shrub. Mature foliage height ranges from 30-90 cm (1-3 ft). Mature plants form mounds in open settings, or vines through brush or thick vegetation. The base of the plant is often woody (Richardson 1995) and the roots are characterized by a woody or slightly fusiform underground organ (Correll and Johnston 1996) (taproot). Plants bloom throughout the year in South Texas with adequate moisture availability, but most commonly in spring, summer, and fall. Leaves are opposite, rough-hairy to the touch, and are triangular shaped up to 4.5 cm (1.75 in) in length (Richardson and King 2011). Leaves can be arrow-head shaped, or with distinct lobes in some years. Stems are erect, scabrous and have numerous short hairs and a few scattered longer hairs (Everitt et al. 1999). Flowering heads are 3.5-5 cm broad, solitary on long peduncles, with involucre hemispheric or bowl shaped, and the receptacles are slightly convex, and chaffy. Disk flowers are orange-yellow (Richardson 1995). Achenes (seeds) are flattened, to 6 mm (0.25 in), commonly with a wing around the edge (Richardson and King 2011). There are approximately 330,000 seeds per pound (727 seeds per gram) of awnless bushsunflower (SCS 1988).

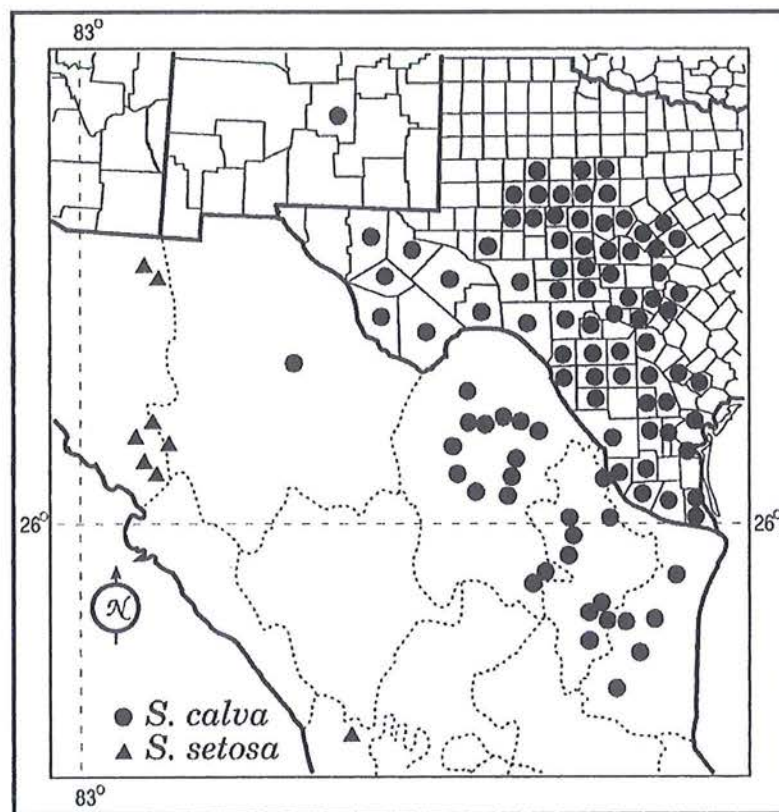
Chromosome number for awnless bush sunflower is reported to be $n=17$ in a number of studies, with no reported variance (Solbrig et al. 1972, Watson 1973, Keil and Stuessy 1977, Spooner 1990). Observations and flower structure suggest awnless bush sunflower is insect pollinated. No evidence of self-incompatibility is apparent in the literature reviewed.

Awnless bushsunflower is found on sandy loam and caliche soils along with clay dunes in south Texas (Everitt et al. 1999), clay dunes (Richardson 1995), and it is abundant throughout the Rio Grande Plains (Correll and Johnston 1996). Awnless bush sunflower is suggested to have been a co-dominate forb with perennial grasses under former pristine conditions in the Western Rio Grande Plains of South Texas (Ruthven et al. 2000). Beyond south Texas, awnless bush sunflower is found throughout central portions of the state, in the Trans-Pecos Mountains and Basins ecoregion of Texas, and into southeastern New Mexico (Spooner 1990).

Awnless bushsunflower is an excellent pollinator plant. The North American Butterfly Association ranks this species as one of the top 20 plants for providing nectar for butterflies in

butterfly gardens in South Texas (NABA 2011). Awnless bushsunflower is the host plant for the bordered patch butterfly (*Chlosyne lacinia*) (Richardson and King 2011). The leaves of awnless bush sunflower are eaten by white-tailed deer (*Odocoileus virginianus*) (Everitt et al 1999). Mean crude protein value of awnless bushsunflower is reported to be 16%, and the species may have high potential for use as adequate supplemental forage (e.g. food plot plant species) for deer from summer to fall (Schweitzer et al. 1993). Awnless bush sunflower is considered a preferred food of deer, sheep, and goats (USDA NRCS 2010). Recent work by the Caesar Kleberg Wildlife Research Institute (Fulbright pers comm.) suggests awnless bush sunflower is one of the most preferred food plants of white-tailed deer in western south Texas.

Figure 1. Distribution of awnless bushsunflower in Texas, New Mexico and southern New Mexico (Spooner 1990).



Potential Uses: Venado Germplasm awnless bushsunflower is recommended for use in rangeland plantings, wildlife habitat improvement plantings, conservation reserve plantings, roadside plantings, pollinator plantings, critical site revegetation including oil and gas field reclamation, native landscaping, and food plot plantings for white-tailed deer.

Method of Breeding and Selection

Initial Evaluation: Venado Germplasm was selected for release based on evaluations conducted from 2002-2011. An ecotypic seed release of awnless bush sunflower was desired for South Texas because: 1) the prevalence and importance of the species in the region; 2) lack of an ecotypic commercial seed source of the species; 3) observed sporadic performance of ‘Plateau’ awnless bushsunflower when planted in south Texas, and 4) lack of seed sources of awnless bushsunflower adapted to the extreme southern portions of the Rio Grande plain where ‘Plateau’ is marginally adapted (SCS 1988).

A variety of evaluation sites were utilized in selection of accessions for advanced evaluation. (Table 1). Evaluation sites were selected to be representative of 3 important potential use areas and soils in the region. These included fine-textured soils in the west and north portions of the Rio Grande Plain (Uvalde Co.), coarse textured soils in the South Texas Sand sheet and periphery (Hidalgo Co.), and fine textured soils in the central Rio Grande Plain and Gulf Coast Prairies and Marshes (Kleberg Co.).

Thirty-five accessions of awnless bushsunflower from the intended area of use of a potential release were assembled for the evaluation (Table 2). Standards for evaluation of assembled accessions used in some plots were ‘Plateau’ awnless bushsunflower (SCS 1988) and a common source sold by Native American Seed Company in Junction, Texas (NAS 2011). Collections evaluated were obtained from native populations from a variety of edaphic and climatic conditions over a 3 year period. Collectors attempted to obtain seed from as many plants as possible from each population at each collection site, commonly from more than 50 individuals.

Although widespread in distribution in south Texas (Figure 1), awnless bush sunflower collections were obtained primarily from sandy loam (51% of collections) and clay loam soils (31% of collections) in south Texas, despite significant collection effort on other soils.

Once obtained from the field, original seed collections were cleaned, assigned accession numbers and stored at the USDA NRCS E. “Kika” de la Garza Plant Materials Center (PMC). Transplants of each accession were grown in the greenhouse for evaluation and then planted at various evaluation sites.

Table 1. Initial evaluation locations used for selection of evaluations comprising Venado Germplasm awnless bushsunflower.

Evaluation site	County	Soil series and texture (USDA 2011)
USDA NRCS E. “Kika” de la Garza PMC	Kleberg	Cranell sandy clay loam
Rio Farms	Hidalgo	Delfina fine sandy loam
Texas AgriLife Research Station Uvalde	Uvalde	Uvalde silt loam

USDA NRCS E. "Kika" de la Garza Plant Materials Center 2003 Evaluation

Fifteen accession of awnless bush sunflower were seeded in 100 cell plant bands at the PMC in December 2002. Germination counts of all accession in the greenhouse trays were recorded and presented in Table 3. Thirteen of 15 accessions produced enough plants to be transplanted into paired-row field plantings of up to 50 plants per accession at the PMC. Plots were irrigated at establishment only. Within one month of planting bordered patch butterfly larvae severely damaged many plants in the study, and were subsequently controlled using Seven insecticide. Seed was collected from each accession when ripe in 2003, and was tested for active seed germination under standard testing procedures in a growth chamber (12 hrs dark at 20° C (68° F) / 12 hrs light at 30° C (86° F)) used by the PMC and *South Texas Natives* Program for warm-season plant species. Evaluation of this temperature regime for germination tests of awnless bush sunflower (Owens and Call 1985) indicated the highest level of germination can be reached at an earlier date in germination chamber tests with this temperature regime, as compared to lower temperature regimes. Results of the 2003 harvested seed are presented in Table 4. Field evaluations for survival, plant vigor, foliage density, resistance, uniformity, and seed production were made from August-October 2003. None of the accessions exhibited superior performance in these criteria in 2003 at the PMC (PMC 2005). As a result of weak transplants, many accessions had poor survival in 2003 at the PMC and reestablishment of the field plot was desired for 2004.

USDA NRCS E. "Kika" de la Garza Plant Materials Center 2004 Evaluation

In December 2003, 16 accessions were seeded in the greenhouse to produce plants for an evaluation plot. Germination counts were made of each accession and are given in Table 5. Plants grown in winter 2003-2004 were added to the evaluation plot in spring 2004, and evaluated for a variety of criteria. Again, most accessions had similar field performance. Seed was collected from each accession when ripe, and tested for germination in winter 2005 (Table 6).

Table 2. Collection information for 34 accessions of awnless bushsunflower from South Texas included in initial evaluation studies used in the development of Venado Germplasm. Collections in bold type are selections included in Venado Germplasm, while those in italics were those selected for advanced evaluation.

Accession	Collection date	County	Location	Soil series and texture of collection site (USDA 2011)
9088546	<i>May 14, 2002</i>	<i>Frio</i>	<i>Cato Ranch</i>	<i>Zavco sandy clay loam</i>
9088578	May 21, 2002	Bee	Bee CR 138	Pernitas sandy clay loam
9088588	<i>May 21, 2002</i>	<i>Bee</i>	<i>Main St.</i>	<i>Papalote loamy fine sand</i>
9088590	<i>May 21, 2002</i>	<i>Bee</i>	<i>Unnamed CR</i>	<i>Pettus sandy clay loam</i>
9088605	<i>May 14, 2002</i>	<i>Frio</i>	<i>Near CR 1301</i>	<i>Bigfoot silty clay</i>
9088713	June 12, 2002	Webb	Cerrito Prieto Ranch	Loam*
9088770	<i>July 1, 2002</i>	<i>Webb</i>	<i>Cerrito Prieto Ranch</i>	<i>Duval fine sandy loam</i>
9089015	August 12, 2002	La Salle	Chaparral WMA	Dilley fine sandy loam
9089030	<i>August 15, 2002</i>	<i>Dimmit</i>	<i>Piloncillo Ranch</i>	<i>Duval fine sandy loam</i>
9088742	<i>June 19 2002</i>	<i>Jim Hogg</i>	<i>Tierra Rojo Ranch</i>	<i>Delmita fine sandy loam</i>
9089191	<i>October 19, 2002</i>	<i>Medina</i>	<i>Coyote Ranch</i>	<i>Castroville clay loam</i>
9089208	<i>October 18, 2002</i>	<i>Uvalde</i>	<i>Harris Ranch</i>	<i>Loam*</i>
9090501	<i>May 17, 2003</i>	<i>Frio</i>	<i>Half Ranch</i>	<i>Duval very fine sandy loam</i>
9090532	<i>June 3, 2002</i>	<i>Duval</i>	<i>Temple Ranch</i>	<i>Pernitas fine sandy loam</i>
9090563	<i>May 14, 2003</i>	<i>Dimmit</i>	<i>San Pedro Ranch</i>	<i>Dilley fine sandy loam</i>
9090564	<i>May 14, 2003</i>	<i>Dimmit</i>	<i>San Pedro Ranch</i>	<i>Dilley fine sandy loam</i>
9090642	<i>June 26, 2003</i>	<i>Dimmit</i>	<i>San Pedro Ranch</i>	<i>Dilley fine sandy loam</i>
9091816	<i>November 13, 2003</i>	<i>Bee</i>	<i>Tolepek Homestead</i>	<i>Weesatche fine sandy loam</i>
9091899	<i>May 24, 2004</i>	<i>Webb</i>	<i>Corazon Ranch</i>	<i>Catarina clay</i>
9091928	<i>July 21, 2004</i>	<i>Dimmit</i>	<i>La Bandera Ranch</i>	<i>Brundage fine sandy loam</i>
9091936	<i>April 4, 2004</i>	<i>Live Oak</i>	<i>Salarito Ranch</i>	<i>Clay loam*</i>
9093165	<i>July 22, 2004</i>	<i>Dimmit</i>	<i>Comanche Ranch</i>	<i>Tonio fine sandy loam</i>
9089117	September 21, 2002	Medina	Texas HWY 173	Valco clay loam
9089307	<i>May 2, 2002</i>	<i>Duval</i>	<i>FM 1329</i>	<i>Delmita fine sandy loam</i>
9086278	<i>May 29, 2002</i>	<i>Atascosa</i>	<i>74 Ranch</i>	<i>Elmendorf clay loam</i>
9086285	<i>May 8, 2002</i>	<i>Jim Wells</i>	<i>U.S. HWY 281</i>	<i>Pernitas sandy clay loam</i>
9086301	<i>May 2, 2002</i>	<i>Duval</i>	<i>FM 2295</i>	<i>Delmita fine sandy loam</i>
9088549	<i>May 14, 2002</i>	<i>Zavala</i>	<i>Westwind Ranch</i>	<i>Winterhaven silty clay loam</i>
9088601	<i>May 21, 2002</i>	<i>Live Oak</i>	<i>Lake Corpus Christ SP</i>	<i>Papalote fine sandy loam</i>
9089007	<i>August 13, 2002</i>	<i>Dimmit</i>	<i>Chaparral WMA</i>	<i>Duval fine sandy loam</i>
9089196	<i>October 19, 2002</i>	<i>Medina</i>	<i>Medina CR 722</i>	<i>Duval fine sandy loam</i>
9093181	<i>November 4, 2003</i>	<i>Bexar</i>	<i>Camp Bullis</i>	<i>Krum clay</i>
9091945	<i>March 30, 2004</i>	<i>Webb</i>	<i>Corazon Ranch</i>	<i>Maverick clay</i>
9091947	<i>March 30, 2004</i>	<i>Webb</i>	<i>Corazon Ranch</i>	<i>Maverick clay</i>
9091948	<i>July 22, 2004</i>	<i>Dimmit</i>	<i>Comanche Ranch</i>	<i>Brystal fine sandy loam</i>

*GPS coordinates for accession were not recorded thus exact soil series of the collection site cannot be determined. General soil texture recorded by the collectors is given.

Table 3. Sixty-day germination of original seed collections of 15 accessions of awnless bush sunflower in greenhouse seedling trays at the USDA NRCS Plant Materials Center, Kingsville, TX December 2002-February 2003. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation. One hundred to 600 seeds per collection were planted.

Accession	County of Origin	% Seed Germination @ 60 Days
9088590	Bee	36.17
9088588	Bee	36.83
9088578	Bee	19.50
9089030	Dimmit	14.00
9089007	Dimmit	2.00
9088605	Frio	13.50
<i>9088546</i>	<i>Frio</i>	<i>20.00</i>
9089015	La Salle	6.50
9088601	Live Oak	20.00
9088770	Webb	14.50
9088713	Webb	23.50
9088549	Zavala	21.00
9089196	Medina	0.00
9089191	Uvalde	1.53
<i>9089208</i>	<i>Uvalde</i>	<i>1.28</i>

Table 4. Twenty-eight day germination chamber germination of 2003 field plot grown seed of awnless bush sunflower accessions grown at the USDA NRCS E. "Kika" de la Garza Plant Materials Center. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation.

Accession	County of Origin	% Seed Germination @ 28 Days
9088590	Bee	61.33
9088588	Bee	25.00
9088578	Bee	26.00
9089030	Dimmit	35.33
9089007	Dimmit	14.00
9088605	Frio	18.67
<i>9088546</i>	<i>Frio</i>	<i>33.33</i>
9089015	La Salle	10.00
9088601	Live Oak	-*
9088770	Webb	49.00
9088713	Webb	32.67
9088549	Zavala	18.00
9089196	Medina	-*
9089191	Uvalde	27.00
<i>9089208</i>	<i>Uvalde</i>	<i>57.00</i>

*adequate numbers of plants for field plots were not produced, or seed was not produced.

Table 5. Sixty-day germination of original seed collections of 16 accessions of awnless bush sunflower in greenhouse seedling trays at the USDA NRCS Plant Materials Center, Kingsville, TX December 2003-February 2004. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation. One hundred to 600 seeds per collection were planted.

Accession	County of Origin	% Seed Germination @ 60 Days
9088590	Bee	58.10
9088588	Bee	67.55
9088578	Bee	40.40
9089030	Dimmit	5.60
9089007	Dimmit	13.50
9088605	Frio	20.40
<i>9088546</i>	<i>Frio</i>	<i>41.00</i>
9089015	La Salle	26.00
9088601	Live Oak	45.00
9088770	Webb	15.40
9088713	Webb	32.40
9088549	Zavala	-*
9089196	Medina	-*
9089191	Uvalde	18.25
<i>9089208</i>	<i>Uvalde</i>	<i>17.75</i>
9090532	Duval	6.50
9090501	Frio	8.90
9090642	Dimmit	8.25

*not seeded in 2003-2004 as no original seed of the collection was left.

Table 6. Twenty-eight day germination chamber germination of 2004 field plot grown seed of awnless bush sunflower accessions grown at the USDA NRCS E. “Kika” de la Garza Plant Materials Center. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation. One hundred to 600 seeds per collection were planted.

Accession	County of Origin	% Seed Germination @ 60 Days
9088590	Bee	8.00
9088588	Bee	4.00
9088578	Bee	17.33
9089030	Dimmit	10.00
9089007	Dimmit	10.00
9088605	Frio	4.00
<i>9088546</i>	<i>Frio</i>	<i>11.33</i>
9089015	La Salle	6.00
9088601	Live Oak	13.33
9088770	Webb	4.00
9088713	Webb	3.33
9088549	Zavala	4.00
9089196	Medina	—*
9089191	Uvalde	12.67
<i>9089208</i>	<i>Uvalde</i>	<i>20.00</i>
9090532	Duval	2.00
9090501	Frio	14.67
9090642	Dimmit	6.67

*not enough plants produced to establish a field plot or seed was not produced.

USDA NRCS E. “Kika” de la Garza Plant Materials Center 2005 Evaluation

In winter 2004-2005, accession 9090532 and 9 new collections of awnless bush sunflower were seeded in the greenhouse to provide plants for field evaluation. Greenhouse germination for this planting is given in Table 7. Four of the new accessions produced enough plants to be added to the field plot in March 2005 (PMC 2006). Accessions 9088590 and 9088578 exhibited superior field performance in vigor, foliage density, resistance to disease/pests, and seed production evaluation criteria. Seed was collected from accessions that produced seed in 2005, and tested for germination in winter 2007 (Table 8).

Table 7. Sixty-day germination of original seed collections of 16 accessions of awnless bush sunflower in greenhouse seedling trays at the USDA NRCS Plant Materials Center, Kingsville, TX December 2003-February 2004. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation One-hundred-600 seeds per collection were planted.

Accession	County of Origin	% Seed Germination @ 60 Days
9088590	Bee	..*
9088588	Bee	..*
9088578	Bee	..*
9089030	Dimmit	..*
9089007	Dimmit	..*
9088605	Frio	..*
<i>9088546</i>	<i>Frio</i>	..*
9089015	La Salle	..*
9088601	Live Oak	..*
9088770	Webb	..*
9088713	Webb	..*
9088549	Zavala	..*
9089196	Medina	..*
9089191	Uvalde	..*
<i>9089208</i>	<i>Uvalde</i>	..*
9090532	Duval	16.00
9090501	Frio	..*
9090642	Dimmit	..*
9091816	Bee	25.00
9091899	Webb	2.50
9091928	Dimmit	5.50
9091936	Live Oak	12.50
9091945	Webb	4.00
9091947	Webb	5.00
9091948	Dimmit	3.00
9093165	Dimmit	31.00
9093181	Bexar	25.00

*not seeded in 2004-2005

Table 8. Twenty-eight day germination chamber germination of 2005 field plot grown seed of awnless bush sunflower accessions grown at the USDA NRCS E. “Kika” de la Garza Plant Materials Center. Accessions in bold type are those selected for inclusion in Venado Germplasm, while accessions in italics were those selected for advanced evaluation.

Accession	County of Origin	% Seed Germination @ 60 Days
9088590	Bee	30.67
9088588	Bee	39.33
9088578	Bee	42.67
9089030	Dimmit	—*
9089007	Dimmit	14.67
9088605	Frio	58.00
<i>9088546</i>	<i>Frio</i>	<i>34.67</i>
9089015	La Salle	58.00
9088601	Live Oak	13.33
9088770	Webb	—*
9088713	Webb	—*
9088549	Zavala	—*
9089196	Medina	—*
9089191	Uvalde	31.33
<i>9089208</i>	<i>Uvalde</i>	<i>20.00</i>
9090532	Duval	24.67
9090501	Frio	—*
9090642	Dimmit	—*
9091816	Bee	35.33
9091899	Webb	—*
9091928	Dimmit	—*
9091936	Live Oak	75.33
9091945	Webb	—*
9091947	Webb	—*
9091948	Dimmit	—*
9093165	Dimmit	33.67
9093181	Bexar	22.00

*Not enough plants produced to establish a field plot, existing field plot died, or seed was not produced.

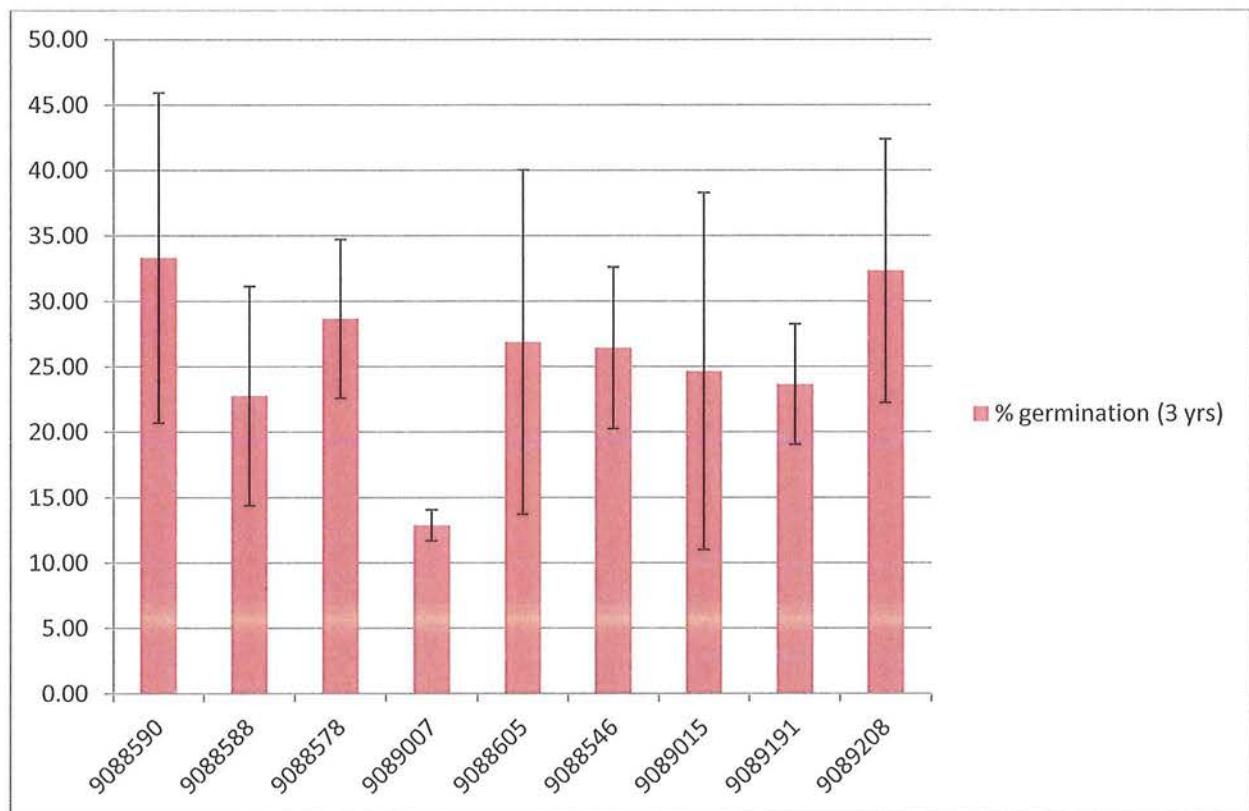
USDA NRCS E. “Kika” de la Garza Plant Materials Center 2006 Evaluation

By 2006, 19 accessions remained in the field plots at the PMC. Field performance was evaluated in April, and indicated very poor survival of the surviving accessions. The plot was removed at the end of 2006, and seed was not collected (PMC 2007). Accession 9088578 exhibited superior performance in terms of survival, resistance to diseases/pests, and seed production in comparison to the other accessions present in April 2006.

USDA NRCS E. "Kika" de la Garza Plant Materials Center Evaluation Summary and Selections

In terms of long-term field performance at the PMC on sandy clay loam soils, accession 9088578 was clearly the best performing accession evaluated. In terms of seed germination performance, just 9 of the 22 accession evaluated at the PMC had consistent viable seed production in each of the 3 evaluation years in which seed was collected. Mean seed germination of these 9 accessions over the 3 yr period was 25%. Percent germination was not statistically significant amongst most accessions that produced seed for each of the 3 years in which germination tests were conducted (Figure 2). However, accessions 9088578 and 9088546 had the highest minimum mean germination (mean-SE) over the 3 year period of evaluation. Based on the field and germination data, soil types of origin, and soil type of the evaluation site, accessions 9088578 and 9088546 were chosen for advanced evaluation.

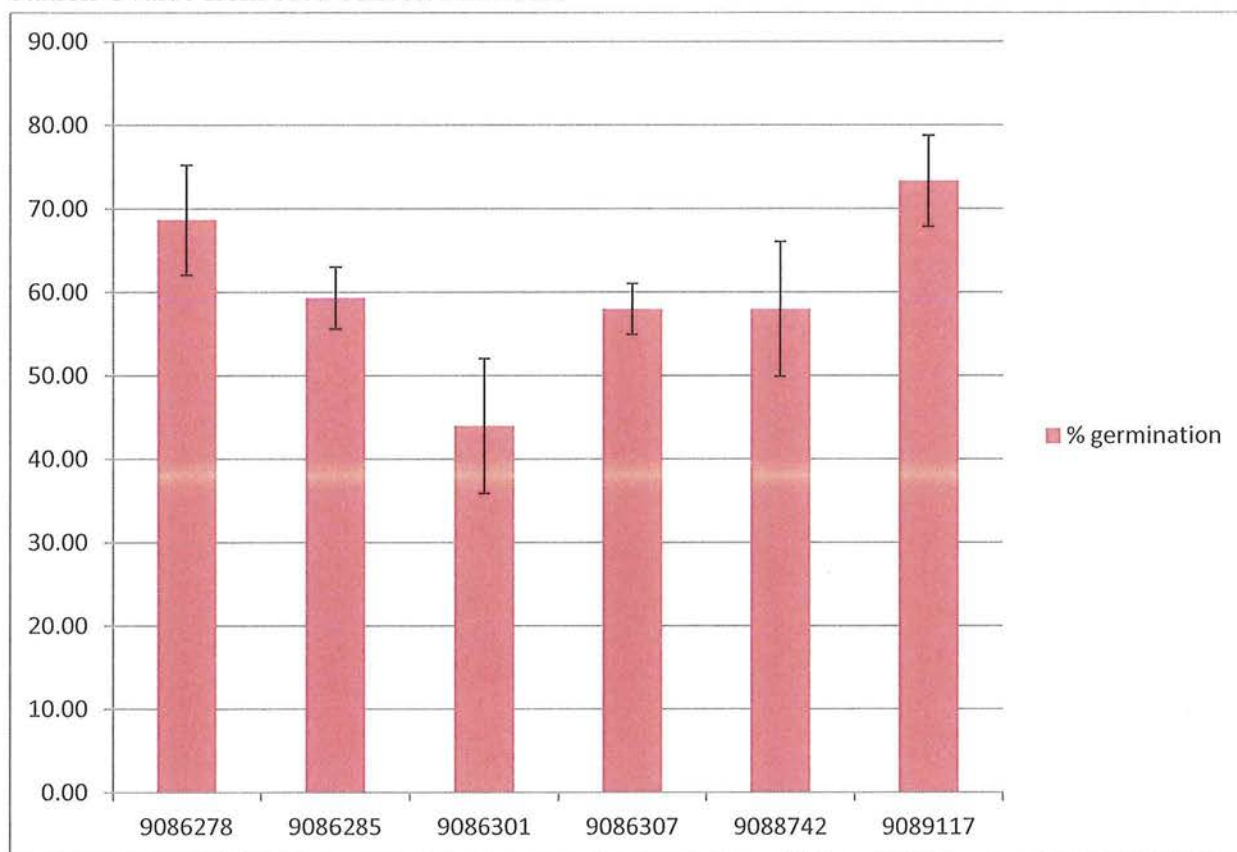
Figure 2. Three year mean germination of 9 accessions of awnless bushsunflower that produced seed in each of 3 consecutive years (2003-2005) at the USDA NRCS E. "Kika" de la Garza Plant Materials Center.



Texas AgriLife Research Station Uvalde Evaluation 2005

South Texas Natives (STN) personnel established a 5 accession initial evaluation plot at the Texas AgriLife Research Station Uvalde (TARU) in spring 2005. Plot design of these plots was a completely randomized block, with 2 replicates of 10 plants started from transplants planted on bedded rows. These plots were irrigated at establishment, and 30 day survival counts were used to determine baseline plant numbers for later survival counts. Plots were evaluated monthly in 2005 for survival, vigor, foliage density, uniformity, development stage, seed production, biomass production, plant height. Seed was collected from each accession when ripe throughout the growing season, and a composite sample of seed of each accession was germination tested in winter 2006. Accessions 9086278 and 9089117 were ranked as superior performers in the field evaluation at Uvalde in 2005, with consistently higher scores given throughout the year in vigor, seed production, and biomass production categories. Seed germination of 9089117 and 9086278 was significantly higher than the other accessions in this evaluation year at this site, averaging 73 and 69% respectively for the two accessions (Figure 3).

Figure 3. Germination of 6 accessions of awnless bush sunflower from Texas AgriLife Research Station Uvalde from seed collected in 2005.



Texas AgriLife Research Station Uvalde 2006 Evaluation

Thirteen new accessions were added to the TARU evaluation plot in 2006, bringing the total number of accessions of awnless bush sunflower evaluated there to 19. The commercially available cultivar 'Plateau' was also added to the plot to be used as a standard for comparison of the south Texas-collected accessions, since this site is near the southern range of adaptation suggested for 'Plateau' (SCS 1988). Accession 9089117 had outstanding performance in plant vigor, seed production, and biomass production categories, while most of the other accessions were uniform in performance. Seed was collected from the 2005 planting when ripe. Accessions planted in 2006 did not produce enough seed for harvest or testing in 2006. Germination of the 6 accessions previously established in 2005 averaged just 5% on account of drought conditions. Highest observed germination amongst these 6 in 2006 was accession 9086285, at 9.33%. 'Plateau' had similar performance to the assembled accessions planted in the same year.

Texas AgriLife Research Station Uvalde 2007 Evaluation

Accession 9089015 was identified as having exceptional seed production potential, exhibiting very dense flowering in visual evaluations in 2007 at Uvalde. This accession performed very well in most all other evaluation categories. 'Plateau' again had similar performance to most of the other accessions in all evaluation categories. Seed production of 9089015 was estimated at twice that of 'Plateau' by evaluators. Seed was not collected in 2007 for testing.

Texas AgriLife Research Station Uvalde Evaluation Summary and Selections

Accession 9089117 exhibited outstanding field performance in 2 of 3 evaluation years at this site, and had very high seed germination in the 2005 harvest test. Since it originated from a fine textured soil in the northern portion of the Rio Grande Plain (Medina County, Valco clay loam), and showed good performance at the Uvalde site, it was selected for advanced evaluation based on the data collected at this location. Finally, accession 9089015 was selected for advanced evaluation based on exceptional seed production potential observed in 2007 in comparison to the other accessions and the standard 'Plateau'.

Rio Farms 2005 Evaluation

Five accessions were planted at Rio Farms for evaluation in 2005. This site was selected for evaluation of awnless bush sunflower to be representative of sandy loam soils in south Texas, as well as the subtropical region of south Texas characterized as the Lower Rio Grande Valley. In the 2005 evaluation, accession 9086285 and 9086301 were noted as having excellent vigor, seed production, and biomass production.

Rio Farms 2006 Evaluation

Seventeen new accessions were established at Rio Farms in 2006. The standards 'Plateau' and a commercial selection from Native American Seed Company (produced near Junction, TX-origin unknown) were included. Monthly evaluations of all plants indicated exceptional vigor in accessions 9086285, 9088578, 9088590, and 9088588. Exceptional seed production was noted in 9086285, 9088588, and 9088770. Accession 9088546 was noted for excellent biomass production. Seed was collected from each accession when ripe throughout 2006, and tested for germination in winter 2007. 'Plateau' awnless bush sunflower had the highest observed seed germination (82%), with accession 9091816 showing similar germination (78%), followed by accession 9089015 (70%), the Native American Seed Company selection (70%), 9088546 (66%), and 9089208 (60%) (Figure 3).

Rio Farms Evaluation Summary and Selections

Accession 9086285 exhibited good performance in 2005 and 2006 field evaluations and was selected on this basis. Accession 9089208 was selected based on seed germination potential expressed in the 2007 tests.

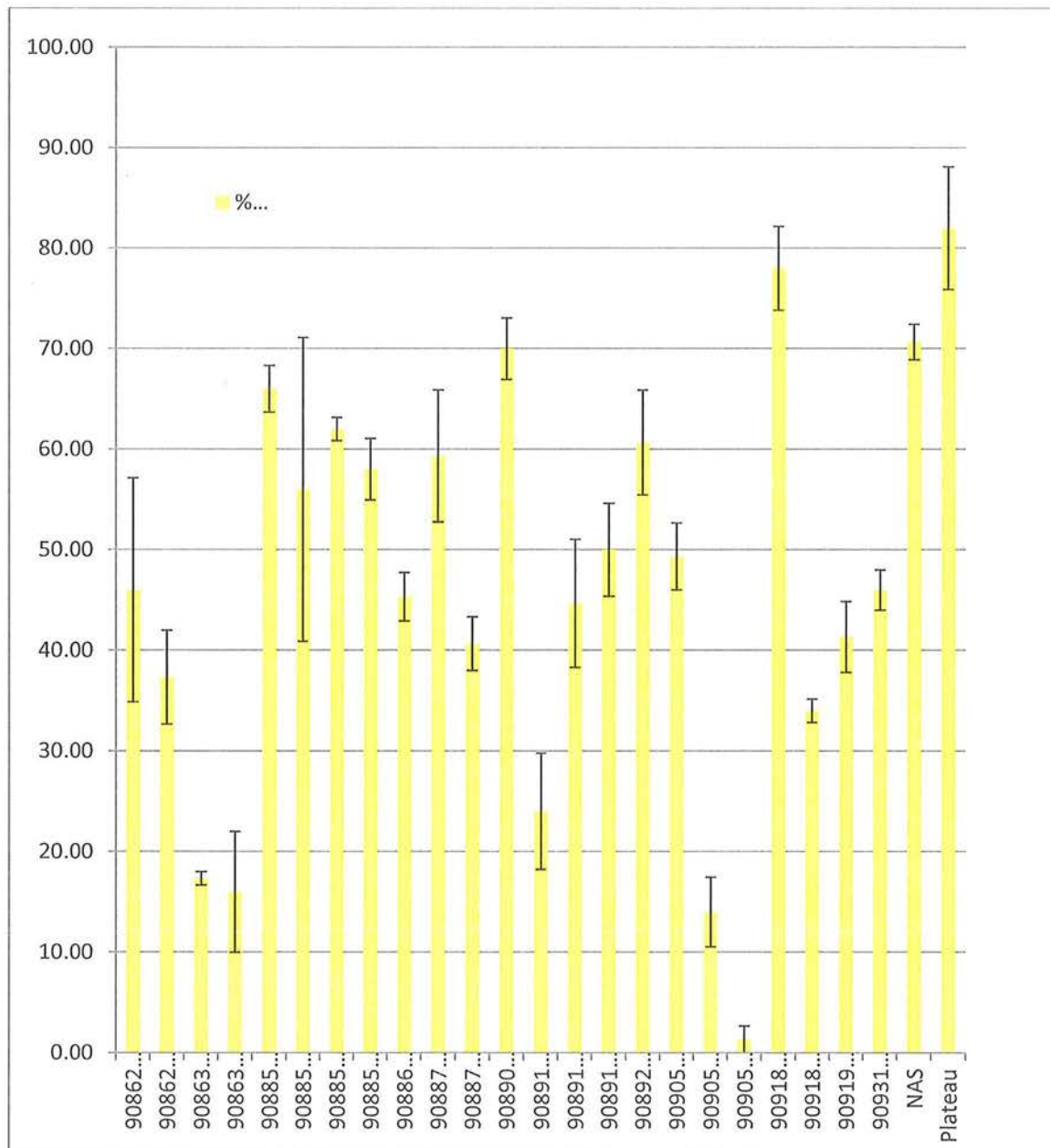
Advanced Evaluation Selection based on performance at all sites

After review of the selections based on site performance we determined that potentially ecotypic plant material from a large portion of the western south Texas was not selected. Based on data collected at all sites and pooled for the remaining accessions, accession 9088713 was selected as a representative accession showing good performance at all site (potentially having broad adaptation). Accession 9088713 had 96% survival in year one at the PMC and 80% survival in year 2; 95% first year survival at Uvalde and 80% in year 2; and 95% survival at Rio Farms in year 1. In terms of cumulative seed germination, 9088713 ranked highest amongst the unselected accessions. In order to include plants from the western portion of south Texas in a potential blend, we elected to include this accession in the advanced evaluation.

Rio Farms 2007 Evaluation

Copious rainfall and standing water at the evaluation site at Rio Farms in 2007 resulted in mortality of all accessions in 2007. No data was collected and the plots were removed.

Figure 3. Germination of 25 accessions of awnless bush sunflower planted at Rio Farms, seed collected in 2006.



Advanced Evaluation:

In winter 2007-2008, we seeded greenhouse flats with half the original seed collection of each of the 7 selected accessions. One seed per greenhouse cell was planted. Because of the small size of the original seed collections, and previous use of a portion of the original seed to produce

plants for initial evaluation, very few plants of some accessions were able to be produced. In March, these plants were planted into isolated paired-row plantings to increase seed and evaluation the selections under production conditions at Rio Farms in Hidalgo County, TX. Table 9 gives the number of plants produced using the original seed that were out-planted in March 2008, and survival by June 2008. Several of the advanced evaluation selections had poor plant numbers with which to increase seed.

Table 9. Number of plants of each selected accession for advanced evaluation and seed increase at Rio Farms 2008. Accessions selected for inclusion in Venado Germplasm are in bold type.

Accession	Greenhouse Plants Produced
9088578	127
9089117	69
9089015	64
9088713	48
9088546	6
9089208	28
9086285	13

Rio Farms Advanced Evaluation

Seed was harvested when ripe from each accession throughout 2008 and 2009 at Rio Farms. Accessions 9088546, 9089208, and 9086285 were collected from and evaluated, however low plant numbers of these accessions made maintenance of the plots difficult, and the low plant numbers of 9088546 and 9086285 resulted in limited seed availability for future increase needs. We also had concerns about adequately representing the diversity of the populations because of low initial plant numbers. These accessions were subsequently dropped from further consideration. Accession 9089208 exhibited a low, sprawling growth habit making inclusion with the other accessions as part of a blended release impractical, so it was also dropped from consideration.

South Texas Natives Farm Advanced Evaluation

Accessions 9088578, 9088117, 9089015, and 9088713 were planted using transplants grown from seed collected at Rio Farms, at the *South Texas Natives Farm* (STNF) in Kingsville in spring 2010. This plot was designated as a G1 field for a potential release, with paired row plantings of up to 600 plants per accession. This increase strategy is based on that devised for Goliad Germplasm orange zexmenia (Lloyd-Reilley et al. 2010), a similar species in many

regards. Accessions were compared for uniformity that would facilitate mechanical harvest in 2010. We found the selected accessions to be similar in seedhead height, and seed maturity dates. In 2011 a single mechanical harvest of this field was made and the bulk seed yield was 76 lbs/acre. In 2012 STN staff produced 47 pounds pure live seed from 0.36 acres of production, or the equivalent to 150 pounds pure live seed per acre. Under ideal conditions and irrigation, we suggest 3 seed harvests of Venado Germplasm are likely per year. Our data indicate the annual seed yields of Venado Germplasm are similar to or are slightly higher than 'Plateau', which is reported to be 119 lbs/acre/yr (SCS 1988).

Common Garden Studies at 6 Texas locations

Transplant established plots of Venado Germplasm and 'Plateau' were evaluated at 6 locations throughout Texas as part of a native seed source variety trial that began in spring 2011. Plot locations were: 1) Texas A&M AgriLife Extension Service Research Station Uvalde (Uvalde, TX); 2) Pecos County Irrigation Control and Water Improvement District #3 Farm (Imperial, TX); 3) USDA NRCS James E. "Bud" Smith Plant Materials Center (Knox City, TX); 4) Texas A&M AgriLife Extension Service Research Station Stephenville (Stephenville, TX); 5) USDA NRCS E. "Kika" de la Garza Plant Materials Center (Kingsville, TX); and 6) Rio Farms (Monte Alto, TX). Three replicates of 10 plants of each accession were planted in a completely randomized block containing a number of other native plants at each location. Data on plant performance were collected monthly throughout 2011 and in every other month during 2012. All plots were irrigated in 2011 as needed to simulate ideal growing conditions and establishment to maturity at each location. Data on percent survival, percent canopy cover, and seed production rankings (1 best, 10 worst) from Rio Farms and the Texas A&M Agrilife Extension Service Research Station Uvalde are presented below. In all trials for all parameters evaluated, Venado Germplasm awnless bushsunflower performed equal with 'Plateau' with the only exception being seed production in which case Venado Germplasm had lower rankings.

Table 10. Percent survival of 'Plateau' and Venado Germplasm awnless bushsunflowers at Rio Farms, Monte Alto, TX 2011 and 2012.

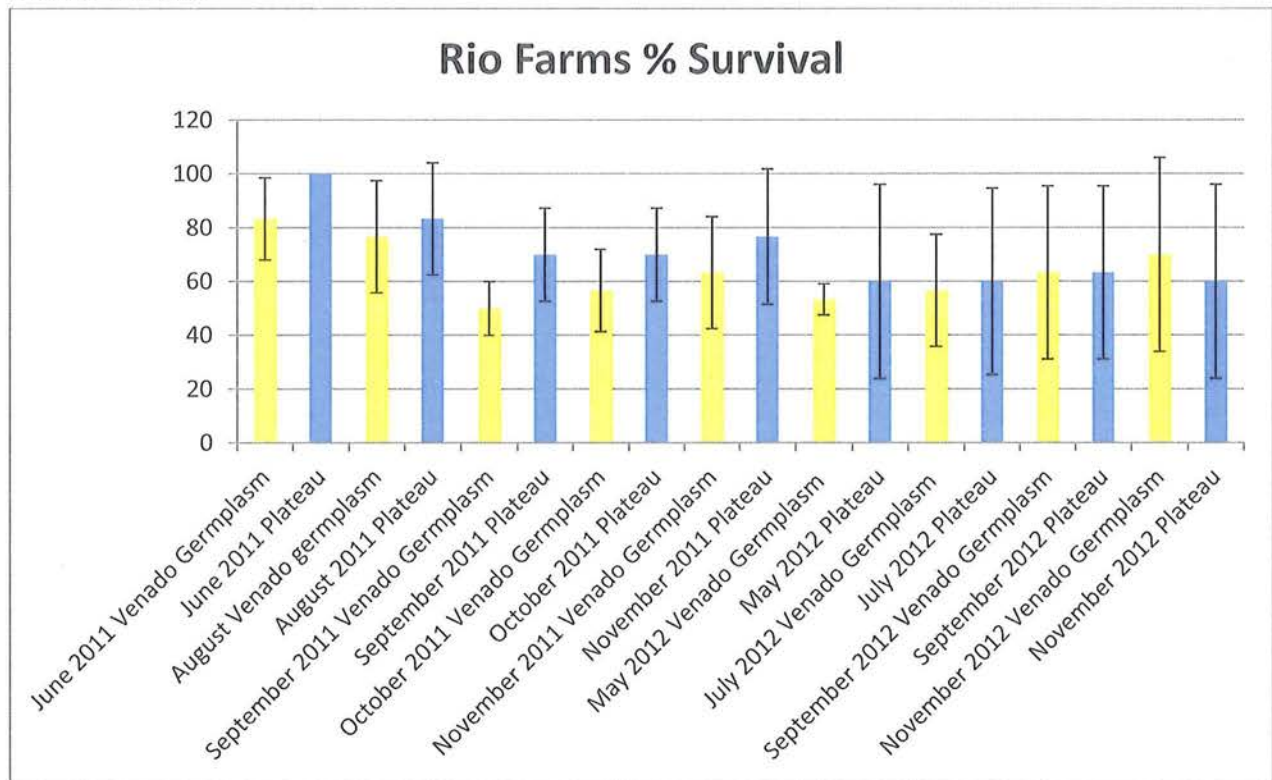


Table 11. Percent canopy cover of 'Plateau' and Venado Germplasm awnless bushsunflowers at Rio Farms, Monte Atlo, TX 2011 and 2012.

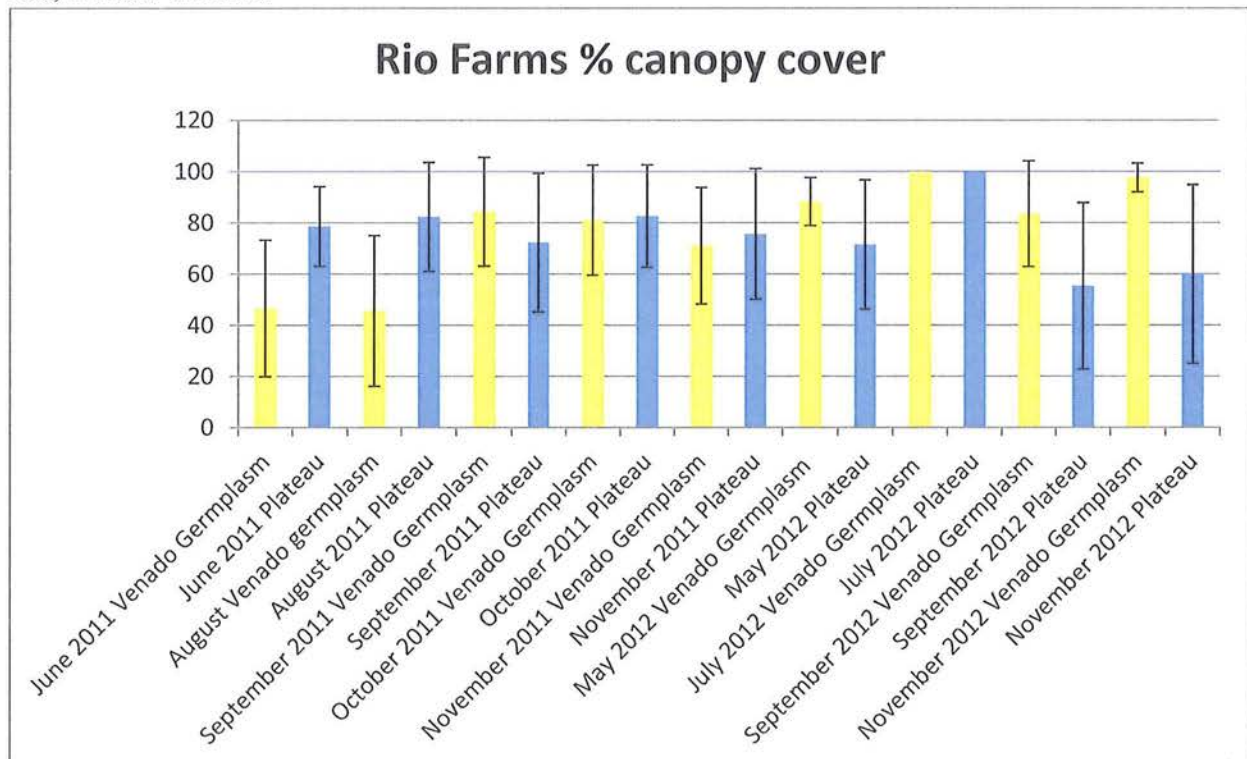


Table 12. Seed production ranking of 'Plateau' and Venado Germplasm awnless bushsunflowers at Rio Farms, Monte Atlo, TX 2011 and 2012.

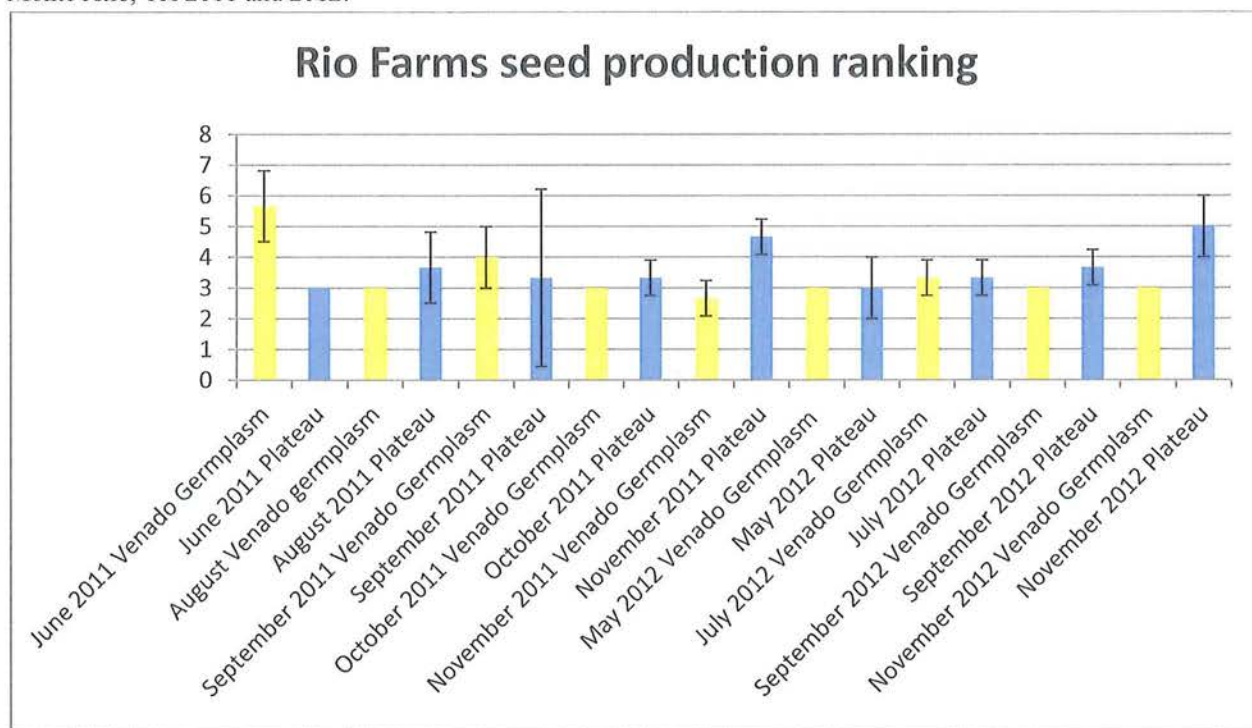


Table 13. Percent survival of 'Plateau' and Venado Germplasm awnless bushsunflowers at Texas A&M AgriLife Extension Service Research Station Uvalde, TX 2011 and 2012.

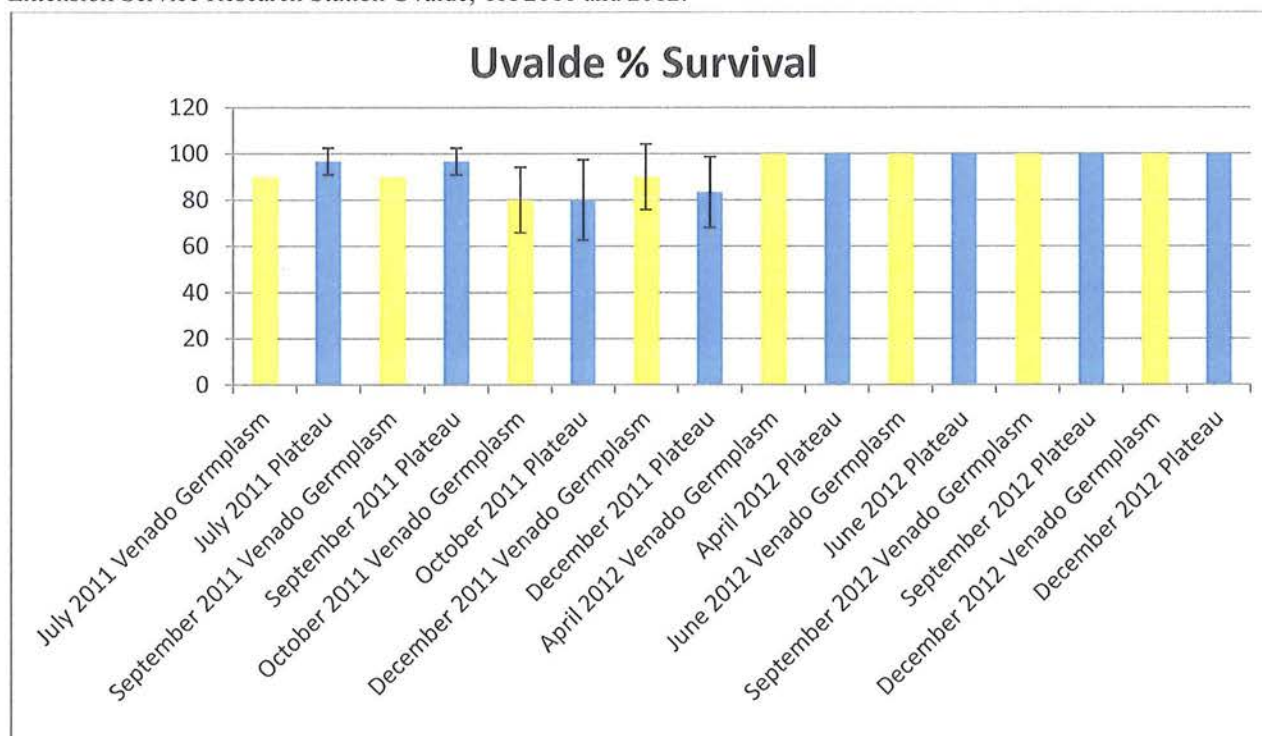


Table 14. Percent canopy cover of ‘Plateau’ and Venado Germplasm awnless bushsunflowers at Texas A&M AgriLife Extension Service Research Station Uvalde, TX 2011 and 2012.

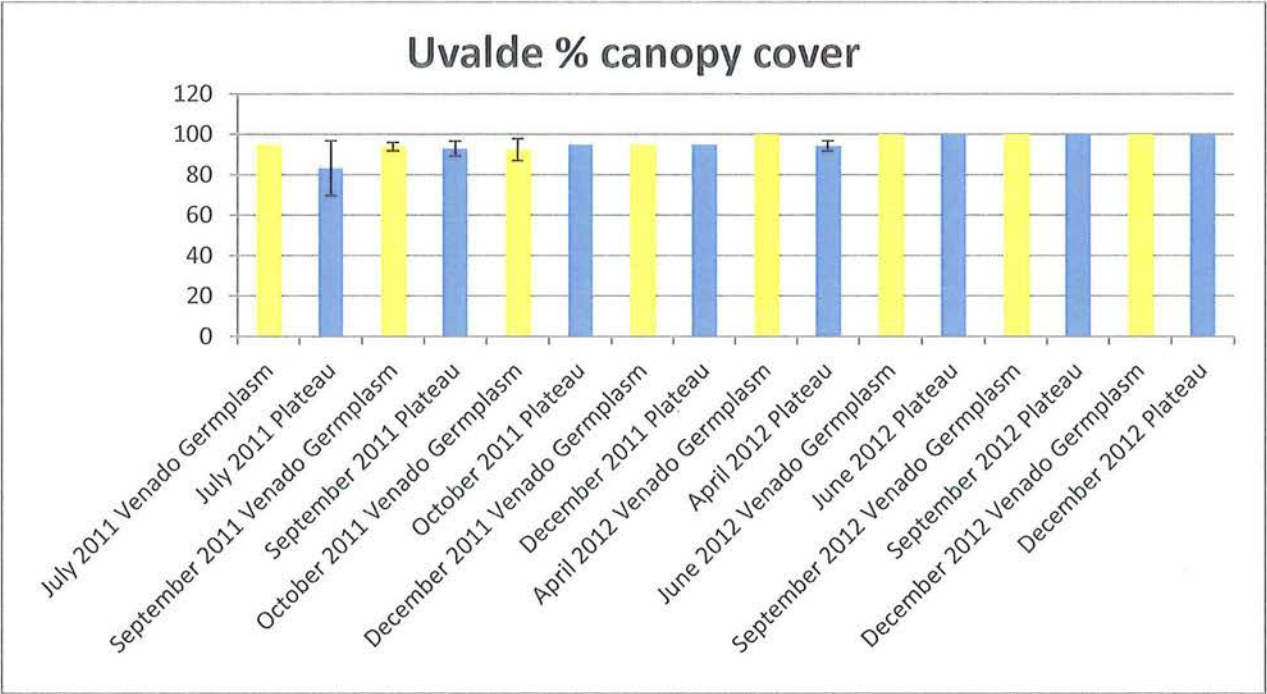
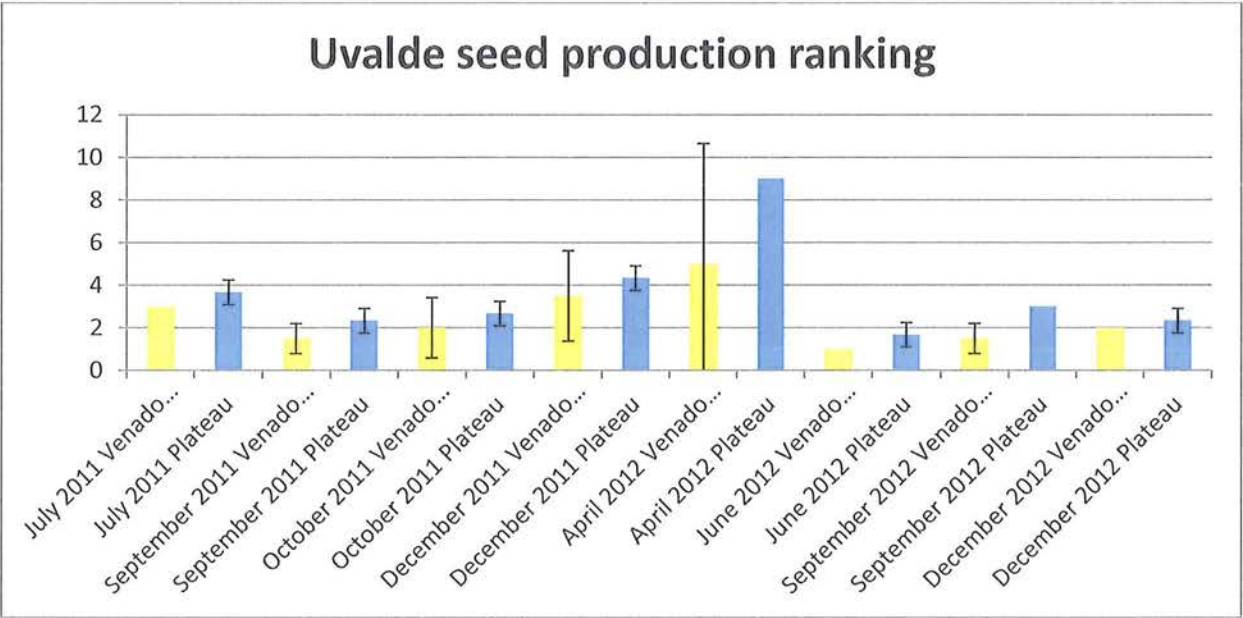


Table 15. Seed production ranking of ‘Plateau’ and Venado Germplasm awnless bushsunflowers at Texas A&M AgriLife Extension Service Research Station Uvalde, TX 2011 and 2012.



Field Plantings

Venado Germplasm was included in seed mixes in 4 range seedings from 2008-2011. Results of those plantings are highlighted below.

Texas Parks and Wildlife Department Taormina Wildlife Management Area Planting

Venado Germplasm was included as part of a 29 species native seed mix planted on a Harlingen clay soil in an attempt to restore retired cropland that had been taken over by Old World Bluestems. Venado Germplasm was planted as 0.3% of the mix which equaled a planting rate of 100 grams/hectare. Even at such a low seeding rate Venado Germplasm accounted for an average of 0.6% canopy cover in seeded plots.

Hixon Ranch Plantings

Venado Germplasm was included in a seeding technique study on Cochina clay in LaSalle County, Tx. In this project Venado Germplasm was 1% of a 17 species mix that was drill seeded in one plot and seeded with a hydroseeder in a second plot. Venado germplasm performed very well accounting for 5% of the overall basal cover of plants 1 year after seeding.

In a separate seeding trial conducted on the Hixon Ranch Venado germplasm was included in 2 separate seed mixes planted in 2 different locations on a Bookout clay soil. In the first mix a forb only planting Venado Germplasm accounted for 1.53% of the mix and in the second seed mix of forbs and legumes it was 1.07% of the mix. These two seed mix were planted in the fall of 2009. Venado Germplasm was only sparsely observed ($\leq 0.01\%$ of the vegetation canopy cover) for the first 2 years after planting in both seed mixes. In June 2012 Venado Germplasm accounted for 1.64% of the vegetation canopy cover in areas planted with the forb and legume seed mix, and 7.8% of the vegetation canopy cover in areas seed with the forb only seed mix.

King Ranch ExxonMobil Plantings

On the Santa Gertrudis division of the King Ranch, Venado Germplasm was planted in a 20 species mix in an attempt to revegetate plugged and abandoned oil wells. Three of the restored pads were on a fine sandy loam soils and the fourth was a loam. All four pads were seeded using a Truax Flex two seed drill in the fall of 2011. Averaging across all four pads and four sample dates, Venado Germplasm has only been recorded in trace amounts (0.01 plants per square foot). It has been recorded at higher amounts (0.2 plants per square foot) within grazing exclosures indicating that grazing pressure may limit plant establishment.

Dobie Ranch planting

Venado Germplasm was included at 1% in a 21 species mix planted on 3 different soil types in Live Oak county. The three soil types in this project were Choke silty clay loam, Pavelek clay loam, and Rosenbrock clay. In all 3 soil types 3 different seeding methods were used, including drill seeding, hydroseeding, and broadcast seeding. There were no differences in plant establishment between the 3 soil types or between the 3 seeding techniques. Venado Germplasm averaged 0.01 plants per square foot in each soil type and seeding technique.

The low rates of establishment found on all sites are possible due to the palatability of awnless bushsunflower. Researchers at the Caesar Kleberg Wildlife Research Institute have shown that awnless bushsunflower is a highly palatable and a sought after half-shrub by white tailed deer.

Seed increase

Each of the individual accessions that make up the Venado Germplasm was increased in isolation at Rio Farms Inc. (Monte Alto) in the lower Rio Grande Valley of Texas starting in 2009. These isolated plots were established by transplants using seed from the original wild collections. Seed harvested from these isolated plots was used to grow transplants that were used to establish a breeder block of Venado Germplasm awnless bushsunflower in the spring of 2011 in Kingsville, TX. Due to weed issues, the plots were removed during the winter of 2011, and replanted in the spring of 2012, again using transplants from seed produced in isolation. The 2012 breeder block was made up of 4 rows all containing an equal number of plants of each of the 4 accessions. Seed harvested from this field will be provided to commercial growers as G0 seed of Venado Germplasm awnless bushsunflower. From this 0.33 acres of production we were able to produce 47 lbs/pure live seed (PLS) of seed which is equivalent to 150 PLS pounds of seed per acre. The percent PLS of seed produced from the breeder block grown in Kingsville, TX ranged from 35% to 50%.

Seed Production and cleaning

Seed production of Venado Germplasm awnless bushsunflower can be started from seed, however weed competition can create a problem. Once established awnless bushsunflower has shown to be tolerable to grass specific herbicides (Select), and pre-emergent herbicides (Prowl). White flies have proven to be a pest and cause significant plant damage at certain times of the year. Seed can be harvested using a combine with a grain style header when 75% of the seed heads have reached maturity, typically as early as mid June. Following harvest, seed should be dried, as a significant amount of plant material will also be harvested in the process. After

drying, seed can be cleaned using a Clipper seed cleaner and further cleaned using a gravity table.

Area of Adaptation

Based on our trial plantings and evaluations, Venado Germplasm is recommended for use in the Rio Grande Plains, Gulf Coast Prairies and Marshes, and Coastal Sand Plains Ecoregions of Texas. Good performance is possible in adjacent areas of northern Mexico, the southern Edwards Plateau, and eastern Trans Pecos Ecoregions of Texas; however this use has not been extensively tested. Acceptable performance has also been documented in north central Texas in the Cross Timbers and Prairies and Rolling Plains ecoregions.

Procedure for maintaining stock classes of seed

The parent populations of Venado Germplasm will be maintained by *South Texas Natives* in conjunction with the Kingsville PMC. G0 seed is the seed that has been harvested from isolated plantings of the parent line. G1 seed is that which is harvested from plantings made using the G0 seed. G1 seed can be replanted for production of G2 seed. Increase of the variety using G2 seed is prohibited.

Additional restrictions, etc.

All commercial seed fields of Venado Germplasm must be located in Texas and isolated from other cultivated varieties and wild populations of the *Simsia calva* by a minimum of 1,320 feet. Release of this variety will be limited to a single grower, with preference given to those who can provide production locations meeting isolation requirements.

G0 and G1 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 of 2% of net sales of Certified Pure Live Seed sold will be collected by the TAMU Office of Technology and Commercialization, and placed in a project account with discretionary spending authority requiring approval for expenditures by the *South Texas Natives* Project Director; Manager of the USDA NRCS E. "Kika" de la Garza Plant

Materials Center, and Resident Director of the Texas AgriLife Research Center Corpus Christi for the benefit of native seed development research 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 Venado Germplasm awnless bushsunflower was suitable for release based on the criterion contained in this document. This conclusion is mainly because awnless bushsunflower 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 source of forage for deer, a seed source to upland avian wildlife species and provide ecological benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

Conservation Use: Venado Germplasm awnless bushsunflower is recommended for upland wildlife plantings, critical site revegetation and for inclusion in range seeding mixes in south Texas.

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Figure 1. Collection, evaluation, and experimental planting sites used in development of awnless bushsunflower.

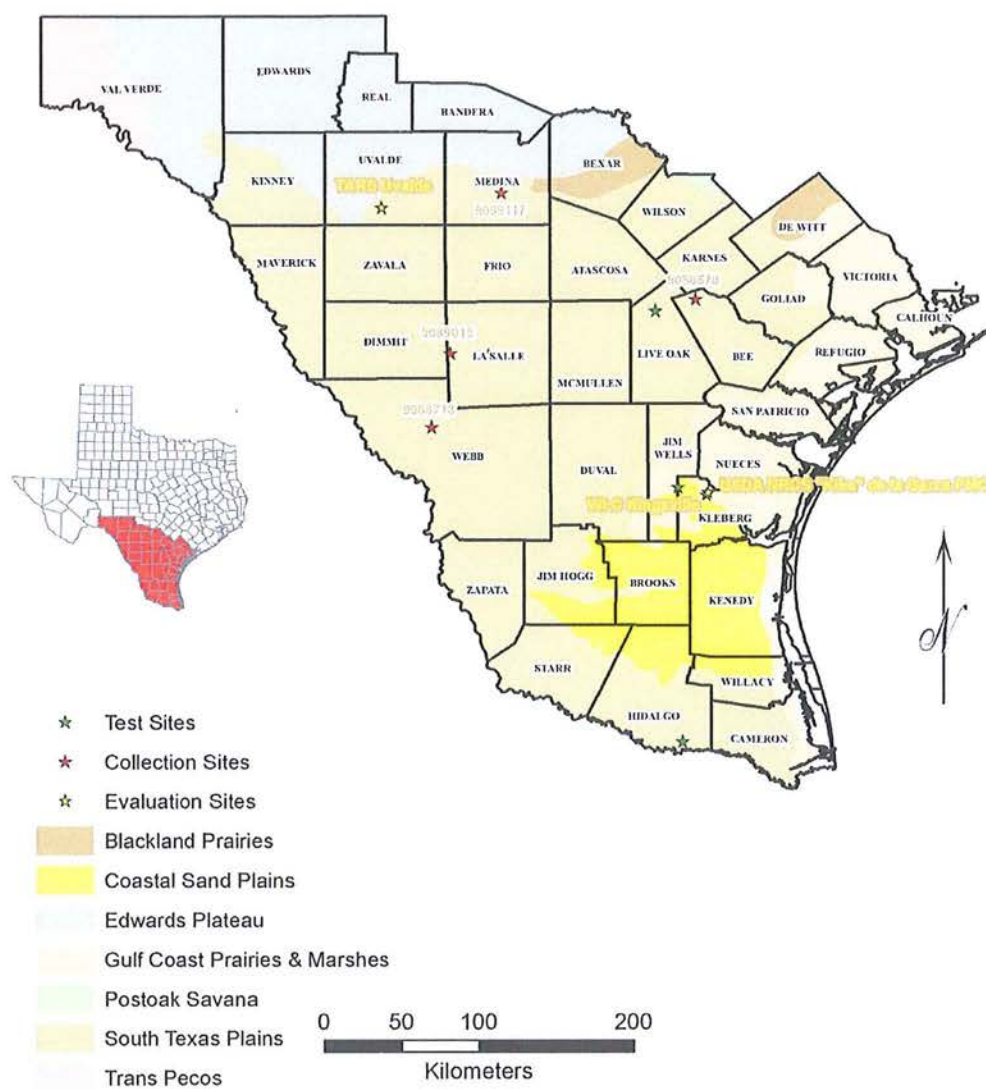


Figure 2. Seed increase field Venado Germplasm awnless bushsunflower.



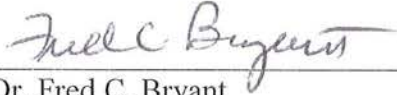
Figure 3. Representative plant of Venado Germplasm awnless bushsunflower.



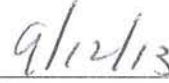
Figure 4. Cleaned seed harvested from Venado Germplasm awnless bushsunflower.



Signatures for release of:
VENADO GERMPLASM AWNLESS BUSHSUNFLOWER
(*Simsia calva* (Engelm. & A. Gray) A. Gray)



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



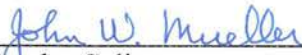
Date



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



Date



Salvador Salinas
Texas State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

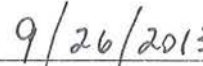
Acting

SEP 20 2013

Date



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



Date