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

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

NOTICE OF RELEASE OF GOLIAD GERMPLASM ORANGE ZEXMENIA SELECTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), United States Department of Agriculture (USDA), and Texas A&M University-Kingsville (South Texas Natives Project) announce the release of a selected ecotype of orange zexmenia [*Wedelia texana* (A. Gray) B.L. Turner] for the south Texas ecoregion. Goliad Germplasm is a composite of 7 collections that were tested under the following accession numbers: 9061276, 9064430, 9064456, 9088799, 9089020, 9091935, and 9091956.

As a selected release, this plant will be referred to as Goliad Germplasm orange zexmenia. It has been assigned the NRCS accession number 9093441. Goliad Germplasm is released as a selected class of certified seed (natural track).

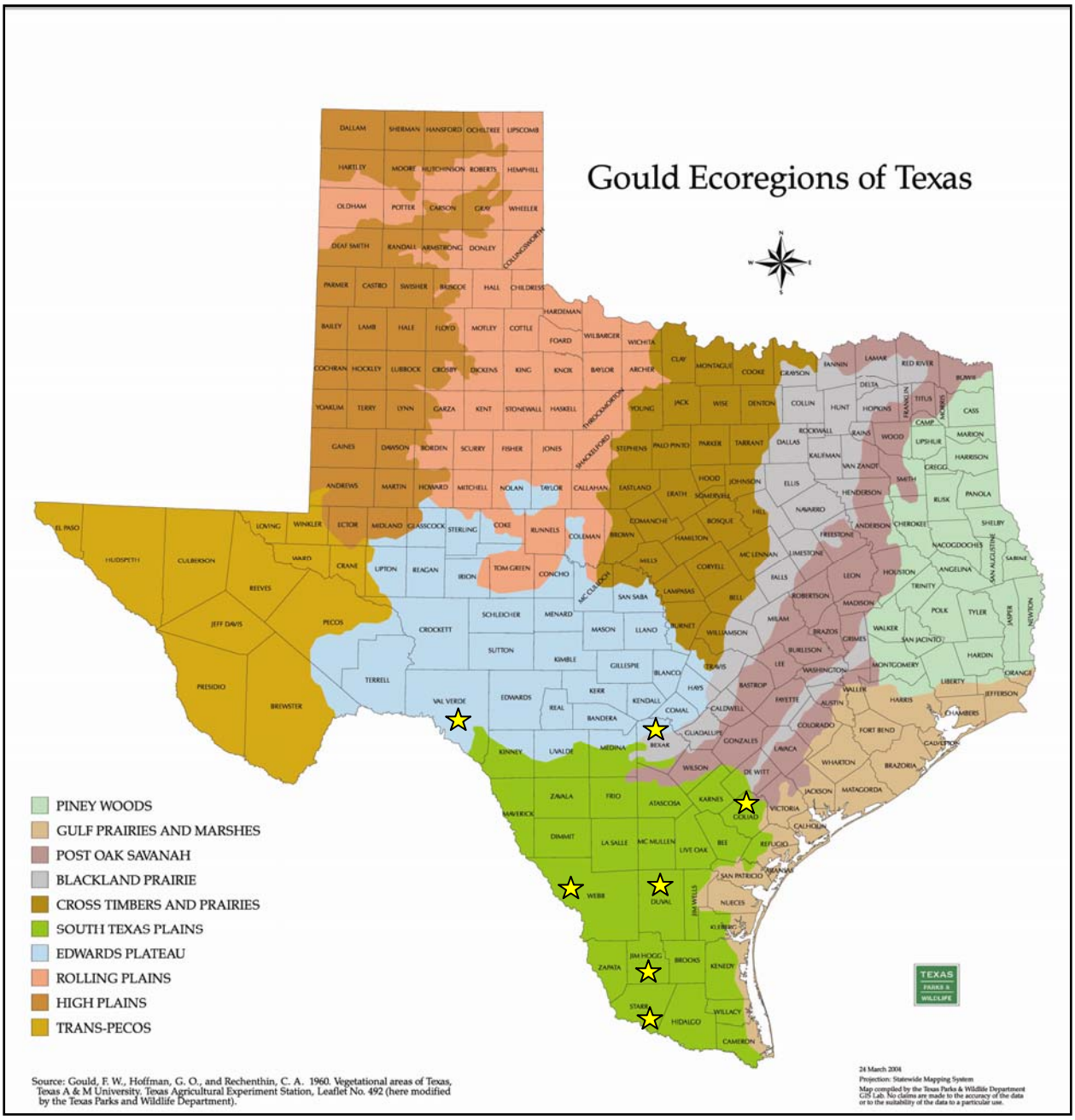
This alternative release procedure is justified because there are no existing Texas commercial sources of tested and adapted orange zexmenia. The potential for immediate use is high especially in range seeding mixes for restoration, diversification, and wildlife habitat.

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

Description: Orange zexmenia is a native Texas sub-shrub 5-10 dm tall. The stems are usually solitary, rather stiff, and woody at the base. The many branches and leaves are covered with rough stiff hairs. The leaves are simple, ovate-lanceolate, sessile or nearly so, mostly opposite, and 5-7.6 cm long. There are a few teeth on either margin of the leaves, the lower pair of which may be more prominent or even lobed. Leaves are generally scabrous or strigose on both sides and turn black after drying.

The flower stems are terminal and solitary or occasionally in a cyme of three. The flower heads are about 3 cm across. The involucre is in 2 rows generally less than 1 cm broad. The outer phyllaries are strigose and lanceolate. The ray flowers are broad, conspicuous, 7-15 in number, with the corollas being yellow or orange. The pappus is spiny with ciliate on the spine margins.

Figure 1. Source counties of the Goliad Germplasm (not precise location of the collection).



The disk flowers are yellow to yellow-orange with a pappus of 2 spines about 1/2 to 2/3 the length of disk florets. The fruit is a ciliate, pubescent achene. Achenes of the ray flowers are commonly 3 angled, with 2 or occasionally 3 wings. Achenes of the disk flowers are broadly 2-winged or with the wings reduced to 2 upwardly directed auricles. The plants bloom and produce seed from March to December.

It is frequent on various soils in openings and partially shaded brushy sites in the Edwards Plateau and Rio Grande Plains. It is less frequent in the Trans Pecos and southeast and north central Texas. It can also be found in northeastern Mexico, southeast to Veracruz and Hidalgo. It is browsed by white-tailed deer, cattle, sheep, and goats.

Potential Uses: Orange zexmenia occurs throughout southern Texas, but no regionally adapted, commercially available seed stock is available for rangeland restoration in South Texas. Orange zexmenia is recommended for upland wildlife plantings, native landscaping, and in range seeding mixes. It also can be used in many types of conservation plantings, such as stream-side buffers and filter strips.

Method of Breeding and Selection:

Initial evaluation: Initial evaluations of orange zexmenia began in 1994 at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas. A total of 42 accessions of orange zexmenia were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accession 9064456 was one of the top performing accessions of orange zexmenia for survival, vigor, growth form and development, and disease resistance (see Table 2).

In conjunction with the development of the South Texas Natives Project, renewed interest and priority status was revived for orange zexmenia. A new initial evaluation was started in the spring of 2001. Fourteen collections of orange zexmenia were transplanted to field plots at the PMC in May 2001. Seed was collected from these accessions and germination tests were performed for both 2001 and 2002 harvests (Table 3).

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

Accession	Date	County	Soil Type
9061276	10/25/90	Val Verde	Silty clay loam
9064430	05/19/92	Starr	Clay
9064456	07/20/93	Goliad	Sandy clay loam
9088799	07/01/02	Webb	Clay loam
9089020	08/08/02	Duval	Sandy loam
9091935	06/16/04	Jim Hogg	Sand
9091956	11/04/03	Bexar	Loam

The field plot was evaluated for plant performance from 2001 through 2003. Plant characteristics evaluated were survival, density, resistance, uniformity, and seed production (Table 3). Based on plant performance during the initial evaluation of 1994 and the initial evaluation of 2001, 3 accessions were selected for release by the PMC: 9061276, 9064430, and 9064456.

South Texas Natives also planted initial evaluation plots in 2005. Seventeen accessions were planted at Rio Farms (4/8/2005, Delfina fine sandy loam soil type) (Table 4) and 22 accessions at AgriLife Research Uvalde (4/6/2005, Uvalde silty clay loam soil type) (Table 5). Seed was collected three times during the summer of 2005 at AgriLife Research Uvalde, bulked by accession and tested for active germination on 6/27/2006. No germination tests were conducted on seed grown at Rio Farms during the evaluation period. White flies severely attacked most of the plants each year in Uvalde between August and September; however despite being completely defoliated all plants survived. Bordered patch butterfly larvae have defoliated the plants at Rio Farms on two occasions from June to July. No other serious insect problems have been associated with orange zexmenia. Bobwhite quail have frequently been flushed out of the plots at both locations. Quail at Rio Farms have been observed foraging and eating seed off of the weedmat. Deer have occasionally browsed the plots at AgriLife Research Uvalde, especially during the winter months.

Table 2. Orange zexmenia initial evaluation data from the PMC in Kingsville for 1997-1998.

Acc#	Location	Rank Veg. F 97	Rank Seed F 97	Rank Veg. S 98	Rank Seed S 98	Germ % Jan 94	Seed Year Used	Germ % May 98	Seed Year Used
260	Goliad	11	11	6	11	16	90	21	90
281	El Dorado	7	9	15	14	9	90	10	90
342	Gonzales	8	12	3	2	9	91	14	91
351	Sequin	14	15	14	9	13	91	11	91
353	Burnet	16	16	9	15	11	91	33	91
356	Hondo	9	8	4	13	8	91	8	91
357	Austin	13	7	8	10	5	91	9	91
358	Lockhart	4	4	5	5	20	91	27	91
359	Lockhart	10	13	13	8	18	91	17	91
386	Gonzales	15	10	16	4	21	92	7	92
414	Cuero	5	6	1	1	13	92	1	92
421	Sanderson	3	3	10	16	7	92	21	92
423	Goliad	6	5	11	12	23	92	23	92
437	Bandera	2	1	12	6	36	93	35	93
456	Goliad	1	2	2	3	24	93	18	93
784	Comal	12	14	7	7	9	90	15	90

Table 3. Orange zexmenia initial evaluation data from the PMC in Kingsville for 2001-2003.

Acc#	9064403	9064366	9064342	9064414	9061276	9064386	9064423	9064361	9064365	9064456	9064362	9064430	9064356	9061261
County	Frio	Karnes	Gonzales	DeWitt	Val Verde	Gonzales	Goliad	Goliad	Medina	Goliad	McMullen	Starr	Goliad	Goliad
Year Collected	1992	1991	1991	1992	1990	1992	1992	1991	1991	1993	1990	1992	1991	1990
Original Seed left	0	20.9	6.2	1.8	5.7	13.8	81.2	44.2	0	36.3	0	0	63.2	0
Greenhouse Germ. 01	32%	15%	29	15	11	38%	19%	18%	15%	15%	12%	9%	5%	2%
2001 Harvest-total	88.9	40.9	37.2	6.9	23.9	42.9	33.1	22.6	65.3	23.1	33.5	24.7	-	-
2001 Harvest-germ	52%	36%	62%	18%	40%	50%	30%	20%	76%	54%	22%	22%	-	-
2002 Harvest-total	167.3	106.3	233.4	72.5	113.8	217.8	46.4	50.4	146.1	51.9	72.6	131.4	13	0.3
2002 Harvest-germ	40%	22%	32%	10%	62%	44%	30%	26%	56%	36%	32%	22%	54%	8%
2003 Harvest-total	93.5	50.5	114	59	57	58	46	62	49	59	47	50	140	18
2003 Harvest-germ	54%	39%	55%	36%	29%	54%	53%	32%	85%	40%	43%	48%	59%	47%
2001-Field Obs.														
survival	92%	100%	100	100	75	96%	88%	100%	92%	100%	100%	100%	-	-
density	6	6.6	6.6	7	6.8	6.5	7	6.8	7	7.1	6.8	6.8	-	-
resistance	5.8	5.4	5.8	5.9	6.1	5.8	5.8	5.8	6.1	6	5.8	5.8	-	-
uniformity	6.1	5.8	4.5	5.9	5.9	5.5	3.9	6.5	5.5	6.3	4	4.8		
seed prod.	4.5	4.5	4.5	5.5	4	3.5	4.5	4.5	4.5	4.5	4	3.5	-	-
2002-Field Obs.														
survival	96%	98%	100	98	100	100%	100%	98%	97%	100%	100%	100%	98%	83%
density	6	5.2	5	5.2	6.7	5.5	5.5	5	6.2	5	5	4.7	5.3	5.8
resistance	5.5	5.5	5.2	5.7	7	5.7	5.5	5	6.2	5.3	5.5	5.5	5.3	5.3
uniformity	5.5	5.8	5.5	5.7	6.5	5.8	6	6	6.2	5.7	5.5	5.3	6	5
seed prod.	5	5	5	5	6	5	5	5.4	6	5	5	5	5	6.3
2003-Field Obs.														
survival	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
regrowth	100%	100%	10	100	100	100%	100%	100%	80%	100%	100%	100%	100%	100%
vigor	5.75	6.75	6	5.25	7	7	5.25	5.5	7	4.5	5.75	6.25	5.75	5.75
density	5.75	6.25	6.25	5	7	7	5.5	5.5	7.25	4.75	5.75	6.5	6	5.75
resistance	5.75	6.25	6	5.25	7	7	5.25	5.5	6.75	4.75	6	6.25	5.75	5.75
uniformity	6.25	6	5.75	5.25	6.25	6.25	5.25	5.75	5.75	5	5.25	7	5.25	5.25
seed prod.	6.5	7.5	6.75	6.5	7	7	6.5	6.5	6.75	5.25	6.5	6.5	6.5	6.5
seed shatter	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Field Observations: 1 = best & 10 = worst rank

Indicates above average performance

Table 4. Orange zexmenia evaluation data from South Texas Natives at Rio Farms for 2005-2006.

Accession	9061276	9064430	9064456	9086293	9088580	9088799	9088936	9088939	9088944	9089020	9090526	9090531	9090626	9090640	9090711	9090718	9091886	9091906	9091913	9091922	9091935	9091943	9093178	9091956	9091929	NAS	Mean
County	Val Verde	Starr	Goliad	Starr	Live Oak	Webb	Frio	Atascosa	Atascosa	Duval	Duval	Duval	Kinney	Kinney	Frio	Bexar	Starr	Jim Hogg	Webb	Dimmit	Jim Hogg	Webb	Bexar	Bexar	Zavala	Kimble	
Soil type	silty clay loam	clay	sandy clay loam	sandy loam	clay	clay loam	sandy loam	clay loam	caliche loam	sandy loam	loam (gravelly hill)	loamy sand	loam	gravel	gravel	loam	loam	sand	loam	gravel	sand	sandy loam	loam	loam	sand	?	
2005-2006 Survival	x	100	100	12	66	83	33	89	66	93	x	30	x	31	40	61	x	57	0	x	66	x	42	43	26	77	55.75
2005 Vigor	x	x	x	2.14	2.25	1.86	2.43	2.29	2.29	2.00	x	2.71	x	2.43	2.50	2.14	x	2.14	2.00	x	1.43	x	2.57	2.29	2.57	x	2.24
2006 Vigor	x	2.33	2.17	3.20	4.00	3.50	4.17	2.33	3.33	2.17	x	3.80	x	4.17	2.67	4.50	x	3.17	5.50	x	2.00	x	3.67	4.00	4.33	3.20	3.41
2005 Foliage density	x	x	x	2.57	3.25	2.14	3.00	2.14	2.43	2.14	x	3.14	x	2.57	3.25	2.43	x	2.57	3.00	x	1.86	x	3.43	3.14	2.86	x	2.70
2006 Foliage density	x	2.17	2.17	3.80	4.67	3.33	4.67	1.67	3.33	2.33	x	3.20	x	3.83	2.67	5.17	x	3.33	5.00	x	2.83	x	4.00	4.33	3.83	3.40	3.49
2005 Uniformity	x	x	x	2.43	1.75	1.86	2.57	2.71	2.00	2.43	x	2.29	x	2.43	2.50	2.14	x	2.14	2.25	x	1.57	x	2.57	2.71	2.57	x	2.29
2006 Uniformity	x	1.67	1.33	2.00	4.00	1.50	1.83	2.00	2.00	1.67	x	2.60	x	2.00	2.00	2.83	x	2.00	2.00	x	1.83	x	2.00	2.17	2.00	1.40	2.04
2005 Developement sta	x	x	x	1.29	1.25	1.29	1.29	1.29	1.29	1.29	x	1.29	x	1.17	1.25	1.29	x	1.29	1.25	x	1.29	x	1.29	1.29	1.29	x	1.27
2006 Developement sta	x	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	x	1.00	x	1.00	1.00	1.00	x	1.00	1.00	x	1.00	x	1.00	1.00	1.00	1.20	1.04
05 Seed production	x	x	x	2.71	2.75	3.00	3.00	2.00	3.00	2.14	x	2.43	x	3.14	3.25	1.86	x	2.00	2.50	x	1.14	x	3.14	2.71	3.43	x	2.60
06 Seed production	x	2.00	2.17	3.40	5.00	3.83	5.17	1.83	3.33	2.33	x	3.80	x	3.67	2.67	4.33	x	2.83	6.50	x	2.00	x	3.67	4.17	4.33	4.20	3.56
05 Forage production	x	x	x	2.29	3.00	2.29	2.86	2.29	2.43	1.86	x	3.14	x	3.14	3.50	2.29	x	2.14	2.75	x	1.43	x	3.57	3.14	3.14	x	2.66
06 Forage production	x	1.67	2.17	3.00	4.67	3.67	4.50	2.50	3.67	2.33	x	3.60	x	4.00	2.33	5.17	x	3.00	6.00	x	2.00	x	4.33	3.67	4.50	4.80	3.58
2005 Plant height	x	x	x	2.43	2.25	1.43	2.57	2.14	2.29	2.14	x	2.57	x	3.14	3.25	1.86	x	1.71	2.00	x	1.14	x	3.14	2.71	3.00	x	2.34
2006 Plant height	x	1.67	2.00	2.00	4.00	2.80	3.00	2.20	2.60	2.00	x	2.80	x	3.40	2.00	4.00	x	2.40	4.50	x	1.60	x	3.67	3.40	4.00	4.20	2.91
05 Mean evaluation sco	x	x	x	2.27	2.36	1.98	2.53	2.12	2.24	2.00	x	2.51	x	2.57	2.79	2.00	x	2.00	2.25	x	1.41	x	2.82	2.57	2.69	x	2.30
06 Mean evaluation sco	x	1.73	1.79	3.43	3.92	2.70	3.92	1.94	2.91	1.85	x	3.48	x	3.63	2.67	3.88	x	2.84	4.94	x	2.16	x	3.54	3.59	4.00	3.18	3.10

Indicates > mean performance at Rio Farms

Selected accessions

1 good - 9 poor

Table 5. Orange zexmenia evaluation data from South Texas Natives at AgriLife Research Uvalde for 2005-2006.

Accession	9061276	9064430	9064456	9086293	9088580	9088799	9088936	9088939	9088944	9089020	9090526	9090531	9090626	9090640	9090711	9090718	9091886	9091906	9091913	9091922	9091935	9091943	9093178	9091956	9091929	NAS	Mean
County	Val Verde	Starr	Goliad	Starr	Live Oak	Webb	Frio	Atascosa	Atascosa	Duval	Duval	Duval	Kinney	Kinney	Frio	Bexar	Starr	Jim Hogg	Webb	Dimmit	Jim Hogg	Webb	Bexar	Bexar	Zavala	Kimble	
Soil type	silty clay loam	clay	sandy clay loam	sandy loam	clay	clay loam	sandy loam	clay loam	caliche loam	sandy loam	(gravelly hill)	loamy sand	loam	gravel	gravel	loam	loam	sand	loam	gravel	sand	sandy loam	loam	loam	sand	?	
2005-2006 Survival	100	100	x	100	85	100	88	90	83	100	100	94	85	100	100	100	66	89	87	100	83	100	94	94	84	x	92.58
2005 Vigor	2.40	x	x	2.80	2.20	2.70	2.90	3.10	2.90	2.70	2.00	2.50	2.60	2.70	3.30	2.90	4.00	2.70	2.30	3.40	2.50	2.20	2.60	2.40	2.90	x	2.67
2006 Vigor	2.40	2.00	x	3.00	1.80	2.40	2.50	3.40	2.89	2.90	3.40	1.80	2.40	2.20	2.60	3.00	4.57	2.50	2.10	3.60	1.90	2.00	3.20	2.60	2.10	x	2.64
2005 Foliage density	3.00	x	x	2.80	2.10	2.60	3.10	2.70	2.70	2.30	2.40	2.40	2.60	2.60	2.90	2.90	4.29	2.40	2.30	2.80	2.40	2.60	2.60	2.50	2.40	x	2.55
2006 Foliage density	2.50	3.00	x	2.88	2.13	2.63	2.75	2.63	2.29	2.25	3.75	2.13	2.38	2.00	2.63	3.00	4.86	2.25	2.38	3.00	1.88	3.00	3.13	3.13	2.38	x	2.70
2005 Uniformity	3.20	x	x	2.70	2.50	2.20	2.70	2.90	3.30	2.80	2.80	2.50	2.80	2.80	3.10	3.00	3.29	2.30	2.20	3.00	2.50	2.40	2.40	2.60	2.50	x	2.57
2006 Uniformity	2.20	1.00	x	3.10	2.50	2.70	2.50	2.70	3.11	2.10	2.20	2.60	2.60	2.00	3.20	2.80	2.29	3.10	1.90	3.40	2.40	2.20	3.40	3.00	2.30	x	2.55
2005 Developement sta	1.20	x	x	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.50	2.29	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	x	1.20
2006 Developement sta	2.00	4.00	x	1.88	1.88	1.63	1.75	2.50	2.29	2.38	1.75	1.75	1.88	1.75	1.75	1.88	3.71	1.88	1.88	2.75	1.75	1.75	2.00	1.75	1.75	x	2.09
05 Seed production	3.20	x	x	3.10	2.60	2.50	3.20	3.10	3.20	3.50	2.60	2.60	3.10	3.70	3.40	2.90	5.00	2.70	2.10	2.80	2.60	1.60	2.40	2.40	2.70	x	2.42
06 Seed production	3.40	4.00	x	3.10	2.00	2.50	2.80	3.67	3.67	3.50	3.80	1.90	2.78	1.70	3.00	3.20	5.75	3.22	2.00	2.67	1.90	3.00	2.67	2.40	2.20	x	2.95
05 Forage production	2.80	x	x	2.60	2.40	2.70	3.20	3.40	3.20	2.70	2.40	2.80	2.60	2.70	3.60	3.00	6.14	2.50	2.30	3.00	2.60	2.60	2.40	2.40	3.10	x	2.68
06 Forage production	3.00	4.00	x	2.90	2.00	2.60	3.00	3.80	2.89	3.30	3.80	2.00	2.60	1.90	2.80	3.10	6.57	2.50	2.20	3.80	1.90	2.80	2.70	2.50	2.20	x	2.95
2005 Plant height	2.40	x	x	2.60	2.40	2.50	3.10	3.40	3.00	2.90	2.20	2.50	2.60	2.50	3.60	2.90	5.43	2.60	2.00	3.20	2.40	2.40	2.40	2.20	3.00	x	2.60
2006 Plant height	2.25	2.00	x	2.13	1.50	1.88	2.25	3.38	2.86	3.00	2.50	1.75	2.13	1.25	2.25	2.38	6.43	2.38	2.25	3.75	1.25	1.50	2.38	2.00	1.38	x	2.37
05 Mean evaluation sc	2.60	x	x	2.54	2.20	2.34	2.77	2.83	2.79	2.59	2.23	2.36	2.50	2.60	3.01	2.73	4.35	2.34	2.06	2.77	2.31	2.14	2.29	2.24	2.54	x	2.38
06 Mean evaluation sc	2.34	2.63	x	2.50	1.98	2.17	2.44	2.88	2.75	2.55	2.78	1.87	2.34	1.73	2.40	2.54	4.77	2.48	2.09	3.00	1.87	2.16	2.56	2.30	2.04	x	2.46
05 harvest germ.	45.33	x	x	55.3	22.0	62.0	51.3	48.7	62.7	64.7	55.3	72.0	32.7	64.0	60.0	84.7	x	71.3	60.0	73.3	74.0	x	66.0	64.0	58.7	x	58.36

Indicates>mean performance at TAES Uvalde

Selected accessions

1 good - 9 poor

Table 6. South Texas Natives evaluation of selected accessions 2005-2006.

Accession	9061276	9064430	9064456	9088799	9089020	9091935	9091956	Mean
County	Val Verde	Starr	Goliad	Webb	Duval	Jim Hogg	Bexar	
Soil type	silty clay loam	clay	sandy clay loam	clay loam	sandy loam	sand	loam	
2005-2006 AgriLife Research Uvalde Survival	100	100	x	100	100	83	94	92.58
2005-2006 Rio Farms Survival	x	100	100	83	93	66	43	55.75
2005 Rio Farms Vigor	x	x	x	1.86	2.00	1.43	2.29	2.24
2006 Rio Farms Vigor	x	2.33	2.17	3.50	2.17	2.00	4.00	3.41
2005 AgriLife Research Uvalde Vigor	2.40	x	x	2.70	2.70	2.50	2.40	2.67
2006 AgriLife Research Uvalde Vigor	2.40	2.00	x	2.40	2.90	1.90	2.60	2.64
2005 Rio Farms Foliage density	x	x	x	2.14	2.14	1.86	3.14	2.70
2006 Rio Farms Foliage density	x	2.17	2.17	3.33	2.33	2.83	4.33	3.49
2005 AgriLife Research Uvalde Foliage density	3.00	x	x	2.60	2.30	2.40	2.50	2.55
2006 AgriLife Research Uvalde Foliage density	2.50	3.00	x	2.63	2.25	1.88	3.13	2.70
2005 Rio Farms Uniformity	x	x	x	1.86	2.43	1.57	2.71	2.29
2006 Rio Farms Uniformity	x	1.67	1.33	1.50	1.67	1.83	2.17	2.04
2005 AgriLife Research Uvalde Uniformity	3.20	x	x	2.20	2.80	2.50	2.60	2.57
2006 AgriLife Research Uvalde Uniformity	2.20	1.00	x	2.70	2.10	2.40	3.00	2.55
2005 Rio Farms Developement stage	x	x	x	1.29	1.29	1.29	1.29	1.27
2006 Rio Farms Developement stage	x	1.33	1.33	1.00	1.00	1.00	1.00	1.04
2005 AgriLife Research Uvalde Developement stage	1.20	x	x	1.20	1.20	1.20	1.20	1.20
2006 AgriLife Research Uvalde Developement stage	2.00	4.00	x	1.63	2.38	1.75	1.75	2.09
2005 Rio Farms Seed production	x	x	x	3.00	2.14	1.14	2.71	2.60
2006 Rio Farms Seed production	x	2.00	2.17	3.83	2.33	2.00	4.17	3.56
2005 AgriLife Research Uvalde Seed production	3.20	x	x	2.50	3.50	2.60	2.40	2.42
2006 AgriLife Research Uvalde Seed production	3.40	4.00	x	2.50	3.50	1.90	2.40	2.95
2005 Rio Farms Forage production	x	x	x	2.29	1.86	1.43	3.14	2.66
2006 Rio Farms Forage production	x	1.67	2.17	3.67	2.33	2.00	3.67	3.58
2005 AgriLife Research Uvalde Forage production	2.80	x	x	2.70	2.70	2.60	2.40	2.68
2006 AgriLife Research Uvalde Forage production	3.00	4.00	x	2.60	3.30	1.90	2.50	2.95
2005 Rio Farms Plant height	x	x	x	1.43	2.14	1.14	2.71	2.34
2006 Rio Farms Plant height	x	1.67	2.00	2.80	2.00	1.60	3.40	2.91
2005 AgriLife Research Uvalde Plant height	2.40	x	x	2.50	2.90	2.40	2.20	2.60
2006 AgriLife Research Uvalde Plant height	2.25	2.00	x	1.88	3.00	1.25	2.00	2.37
2005 Rio Farms Mean evaluation score	x	x	x	1.98	2.00	1.41	2.57	2.30
2006 Rio Farms Mean evaluation score	x	1.73	1.79	2.70	1.85	2.16	3.59	3.10
2005 AgriLife Research Uvalde Mean evaluation score	2.60	x	x	2.34	2.59	2.31	2.24	2.38
2006 AgriLife Research Uvalde Mean evaluation score	2.34	2.63	x	2.17	2.55	1.87	2.30	2.46
2005 AgriLife Research Uvalde harvest (active germ.)	45.33	x	x	62.00	64.67	74.00	64.00	58.36

	Indicates >mean performance at Rio Farms
	Indicates>mean performance at AgriLife Research Uvalde

For selection, data was sorted by evaluation site, year and evaluation type, and averaged by accession. Accessions that showed above average performance in the greatest number of categories at each location, and above average performance at each location were selected. Accession 9088799-Webb and 9091935-Jim Hogg were selected because they showed excellent performance in most categories at both evaluation sites (Tables 4-6). Accession 9089020-Duval was selected because of its excellent performance at Rio Farms (Table 4 and 6) and accession 9091956-Bexar was selected for excellent performance at AgriLife Research Uvalde (Table 5 and 6).

Seed production: Orange zexmenia can be harvested with a combine. When harvesting orange zexmenia, run the combine's cylinder speed at 900 RPM, the convave at 6 mm, the sieve open at ¼", and the fan off. Orange zexmenia can also be harvested using a weed eater with a stripper attachment. Evaluation plots at the PMC have been harvested for several years with a combine. Seed yield of these plots has averaged 60 pounds of seed/ acre. There are approximately 140,520 seeds in a pound of orange zexmenia.

Orange zexmenia seed is cleaned initially using a "Westrup" brush machine to dislodge the seeds from the seedheads. Once the seed is dislodged, it is processed through a clipper style seed cleaner. The seed of orange zexmenia is an achene and appears similar to a sunflower seed but smaller. The seed comes in two basic shapes, depending on if it was formed by a ray or a disk flower. One shape is triangular and the other is triangular with wings along the sides of the seed coat. The seeds with wings are more difficult to separate out, as the wings cause the seeds to blow away with the chaff during separation with air. A germination test was performed in August 2002 to determine if the seeds with wings had good enough germination to warrant the added effort to keep them during cleaning. Two accessions that had previously exhibited good germination (accessions 9064403 and 9064423) were selected for observation. One hundred seeds (50 regular and 50 winged) were tested for each accession (Table 7). It was determined that seeds of both types should be kept during cleaning, since the germination results were so close. It is recommended that after cleaning, the seed should be stored at 45^{o}F and less than 50% humidity.

Table 7. Orange zexmenia winged seed study from 2001 harvest.

Accession	Wings on Seed	8 days (%)	20 days (%)	28 days (%)
9064403	not present	12	50	60
	present	22	60	68
9064423	not present	8	32	36
	present	16	32	36

Comparative forb trial: An evaluation of four forbs for inclusion in range seeding mixes and wildlife food plots was performed at the PMC in 1998. The four forbs evaluated were: Illinois bundleflower (*Desmanthus illinoensis*), awnless bushsunflower (*Simsa calva*), orange zexmenia, and perennial lazy daisy (*Aphanostephus riddellii*). Native, perennial forbs are commonly used in Texas range plantings. Illinois bundleflower is one of the most important native, perennial

legumes currently used in Texas range planting mixes. It is high in protein, readily eaten by both livestock and wildlife, and is often used as an indicator of range condition (Ajilvsgi, 1984). Awnless bushsunflower is another forb native to Texas. In addition, awnless bushsunflower has been found to be a good source of protein for deer (Schweitzer, Bryant, & Wester, 1993). Other native, warm-season forbs have also been shown to provide a palatable food source for livestock and wildlife in Texas (Nelle, 1994). Perennial lazy daisy is also a native, warm-season forb.

Each species was evaluated for survival, plant hardiness, vegetative production, seed production, and other desirable characteristics. The purpose of this study was to evaluate each forb for potential inclusion in range seeding mixes and wildlife food plots for South Texas.

The Four Forb Plot consisted of four replications of four 15-foot sections of bedded rows, each containing 15 plants of a different forb species. Locations of each species within a replication were randomly selected. There was a five-foot wide alley between each replication, and a border row of orange zexmenia transplants on either side of the plot to control for an edge effect. Plants for this plot were grown individually in the greenhouse in seeded cones. They were transplanted by hand into their randomly assigned locations at one-foot intervals in April of 1998. They were irrigated immediately following planting, and as needed throughout the growing season. Plants were observed several times a month, and survival, hardiness, vegetative production, and seed production were all recorded. On December 1, 1998, all rows were evaluated for plant survival.

Table 8. Four forb plant survival by species and replication.

Species	Replication	# Surviving	% Surviving
Awnless Bushsunflower	1	0	0
	2	0	0
	3	0	0
	4	2	13
	Total Plot	**2**	**3**
Illinois Bundleflower	1	0	0
	2	0	0
	3	0	0
	4	0	0
	Total Plot	**0**	**0**
Orange Zexmenia	1	15	100
	2	15	100
	3	15	100
	4	15	100
	Total Plot	**60**	**100**
Perennial Lazy Daisy	1	15	100
	2	13	86
	3	14	93
	4	15	100
	Total Plot	**57**	**94**

In addition, height and width measurements were taken from five randomly selected sample plants from each row. The condition of the plants was also recorded at that time.

Orange zexmenia had the highest survival rate of the four forbs included in the plot, with 100 percent survival for all four replications. Perennial lazy daisy had the second best survival rate at 94% (Table 8). Much of the death loss in the awnless bushsunflower occurred in August of 1998. Most of the plants died suddenly, and upon examination it was noted that roots were spongy-textured. Kleberg County Agricultural Extension Agent, John Ford, confirmed the cause of death of the bush sunflower to be cotton root rot, a soil borne virus. By the beginning of September, 1998, only two awnless bushsunflower survived. The other forbs in the plot appeared to be fairly resistant to the disease. Of the four forbs, orange zexmenia appeared to be the hardiest of the species and also produced the most vegetation. It had 100% survival rate, appeared highly drought and wet tolerant and produced multiple new seedlings near the existing plants.

Seeding Trials: A seeding trial that included orange zexmenia was initiated in 1998. The objective of this field trial was to evaluate a warm-season, native seed mix, which would allow for a diverse combination of grass and forbs in rangeland plantings. Four mixes consisting of a grass and forb mix were compared in 20' by 10' plots. Each mix had four replications planted together in a block in order to guarantee some non-contaminated plots as time progresses. In addition, a fifth repetition of each mix was planted in random order in a four-plot combination block. All four mixes used the same forb combination, which consisted of 0.18 pounds of pure live seed per acre of perennial lazy daisy, 0.93 pounds of pure live seed per acre of Illinois bundleflower (var.'Sabine'), 1 pound of pure live seed per acre of awnless bushsunflower (var. 'Plateau'), and 2 pounds of pure live seed per acre of orange zexmenia. In addition, Mix #1 used 2 pounds of pure live seed per acre of buffelgrass (*Pennisetum ciliare*); Mix #2 consisted of 1 pound of pure live seed per acre each of plains bristlegrass (*Setaria machrostáchya*), two-flower trichloris (*Trichloris crinita*), and four-flower trichloris (*Trichloris pluriflora*); Mix #3 contained 1.5 pounds of pure live seed per acre of the two trichlorises; and Mix #4 had 1.7 pounds of pure live seed per acre of Kleingrass (*Panicum coloratum*, var. 'Verde').

The plantings were made on March 5, 1998, at the PMC in Kingsville, Texas. All plots were on a Victoria Clay soil, and were cultivated prior to planting. Seeds were hand-broadcast, and then pressed into the soil, using a 5-foot cultipacker. Emergence was observed on a daily basis for 60 days after planting. Then observations were made weekly.

At three months, the plots were evaluated for the percent of cover provided by each of the planted species, and the percent of weed cover and bare ground. Data was collected by evaluating ten random 1 foot x 1 foot square locations within each plot. A metal frame was used to mark each location. Ocular estimation was used to evaluate percent of cover provided.

At nine months, the plots were re-evaluated for the percent of cover of each of the planted species and the percent of weed cover and bare ground. The plots were also evaluated for the number of each planted species and weeds per square foot. Data was again collected by evaluating ten random 1 foot by 1 foot square locations within each plot. Ocular estimation was used to evaluate percent of cover. The number of plants of each species was counted.

No grass emerged in any of the plots with the exception of minimal kleingrass in plots containing Mix #4. The kleingrass was found to provide mean cover of only 0.5 percent. The failure of the grasses to emerge may be due to droughty conditions in Kingsville throughout the entire evaluation period. The six month period from March 1998 through August 1998 received only 7.34 inches of rainfall. In addition, the Victoria clay soil tends to form a heavy cap under dry conditions, further inhibiting emergence. With that in mind, the four forbs showed impressive establishment. All four forbs planted emerged and thrived despite droughty conditions and soil capping. All showed some reproductive growth in the spring of 1998. The bushsunflower provided 13.8% of total plot cover, and seemed especially drought tolerant. The lazy daisy provided 3.4% of actual cover and the Illinois bundleflower provided 2.82%. Orange zexmenia, the fourth forb species provided 2.03% of total plot cover, while weeds provided 8.06 percent. The remaining 69.65% was bare ground (Table 9).

By the fall of 1998, bushsunflower had 25% cover, with an average of 2.14 plants per square foot. This was followed by orange zexmenia, with 11.47% of plot cover and an average of 1.1 plants per square foot. Lazy daisy made up 4.5% of total cover and averaged 0.57 plants per square foot. Illinois bundleflower averaged only 0.1150 plants per square foot and made up only 0.8% of the cover. Weeds made up 17.625% of total cover, and 35% of cover was bare ground (Table 9).

There were several notable changes in plot composition from spring of 1998 to fall of 1998. First, only one of the planted species showed a decrease in percent of cover in the fall evaluation. Illinois bundleflower went from having 2.82% of total plot cover in the spring to a mere 0.8% of plot cover in the fall. This seems to indicate a poor survival rate for the Illinois bundleflower in South Texas. The only other decline in cover from spring to fall was that of bare ground, which

Table 9. Relationship of pure live seed to percent cover.

Species	#/Acre of Pure Live Seed	% Cover Spring 1998	% Cover Fall 1998	Change in % of Cover 6/98 – 12/98	Avg. # of Plants / Ft^2 Fall 1998
Awnless Bushsunflower	1	13.80	25.000	+ 11.200	2.140
Perennial Lazy Daisy	0.18	3.40	4.500	+ 1.100	0.570
Orange Zexmenia	2	2.03	11.475	+ 9.445	1.100
Prairie Bundleflower	0.93	2.82	0.800	- 2.020	0.115
Buffelgrass (mix1)	2	0.00	0.005	+ 0.005	0.001
Kleingrass (mix 4)	1.7	0.50	5.600	+ 5.100	0.180
Plains Bristlegrass (mix 2)	1	0.00	0.000	0.000	0.000
Four-Flower Trichloris (mix 2)	1	0.00	0.005	+ 0.005	0.001
Two-Flower Trichloris (mix 2)	1	0.00	0.000	0.000	0.000
Four-Flower Trichloris (mix 3)	1.5	0.00	0.000	0.000	0.000
Two-Flower Trichloris (mix 3)	1.5	0.00	0.000	0.000	0.000
Weeds	-	8.06	17.625	+ 9.565	7.540
Bare Ground	-	69.65	35.000	- 34.650	-

decreased from 69.6% to 35.0%. The other planted forbs all showed a fall increase in the percent of total plot cover. Awnless bushsunflower had an 11.2% increase in percent of plot cover. Orange zexmenia had a 9.445% increase in plot cover, while lazy daisy showed a 1.1% increase in plot cover.

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

Conservation Use: Goliad Germplasm orange zexmenia will provide a native species for rangeland planting, wildlife habitat, and landscaping. It is an attractive plant for landscaping use because of its all around hardiness, small shrub growth form, and brightly colored flowers. Orange zexmenia is also a good plant for inclusion in native seed mixes for range use. It is eaten by sheep, goats, and cattle. Additionally, orange zexmenia is useful for native site restoration. It is often browsed by white-tailed deer and bobwhite quail have been observed eating the seeds. Orange zexmenia is also an adult nectar source for butterflies.

Area of Adaptation: Orange zexmenia is hardy in both dry and moist conditions. It grows on varied soil types, brushy sites, and in open spaces. It is found in parts of Texas and Mexico. Goliad Germplasm orange zexmenia is well adapted for use in MLRA 81 (Edwards Plateau), MLRA 83 (Rio Grande Plains), and in MLRA 42 (Trans Pecos). Current testing has not completely substantiated the northern and western limits of its range of adaptation.

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

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Goliad Germplasm orange zexmenia
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