Kika de la Garza Plant Materials Center

Kingsville, TX

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NATIVE MIX SMALL FIELD PLANTING SUMMARY

INTRODUCTION

Texas range seed mixes commonly include a mix of grasses and forbs. However, many of the commercial grass varieties included in these planting mixes are not native to Texas, and may inhibit establishment and growth of native forbs and other grass species that are planted nearby. Two-flower (*Chloris crinita)* and four-flower trichloris (*Chloris pluriflora)* are two warm-season perennial grasses native to Texas (Hitchcock, 1971). They are of particular interest because USDA-NRCS soil surveys have reported that two-flower and four-flower trichloris are co-dominant, climax species on numerous range sites in South Texas. Plains bristlegrass (*Setaria leucopila*) is an important warm-season, perennial forage species, which is native to Texas (Gould, 1975). It has moderate to high palatability for all species of livestock (Gay, Dwyer, Allison, Hatch, and Schickendanz, 1980). Buffelgrass (*Cenchrus ciliaris*) is an exotic commercial grass variety that has been widely used in Texas range planting mixes (Everitt and Gausman, 1984). However, a study by Nurdin and Timothy E. Fulbright (1990) found that buffelgrass "may produce phytotoxic chemicals that inhibit germination and growth of legumes planted in seeding mixtures" (p.466). Kleingrass (*Panicum coloratum)* is a native of Africa, which has been introduced to South and Central Texas (Gould, 1975). Two commercial varieties, 'Selection 75' and 'Verde', are commonly used in range and pasture mixes in Texas (Alderson & Sharp, 1994).

Native, perennial forbs are commonly used in Texas range plantings. Illinois bundleflower (*Desmanthus illinoensis*) 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 (*Simsia calva*) 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). Orange zexmenia (*Zexmenia hispida*),

also known as hairy wedelia (*Wedelia hispida)*, is a common, native, warm-season, perennial forb. It is easily cultivated, and is often browsed by deer, sheep, and goats (Ajilvsgi, 1984). *Aphanostephus riddellii*, commonly known as perennial lazy daisy, has been found to be one of the most highly preferred food sources for white-tailed deer (Arnold & Drawe, 1979; Everitt & Drawe, 1974). In fact, Everitt and Drawe's 1974 study found perennial lazy daisy to be the most preferred spring food source of white-tailed deer, making up more than 12% of their early spring diet. Arnold and Drawe's study in 1979 found perennial lazy daisy to be "the second most heavily preferred species" of white-tailed deer over the course of a year. The objective of this small field planting was to evaluate a warm-season, native grass alternative (for South Texas) to available commercial varieties, which will allow for a diverse mix of grass and forbs in rangeland plantings.

MATERIALS AND METHODS

Planting the Plots

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 .18 pounds of pure live seed per acre of perennial lazy daisy (Aphanostephus riddellii), .93 pounds of pure live seed per acre of prairie bundleflower (Desmanthus illinoensis, var. 'Sabine'), 1 pound of pure live seed per acre of awnless bushsunflower (Simsia calva, var. 'Plateau'), and 2 pounds of pure live seed per acre of orange zexmenia (Zexmenia hispida). In addition, Mix #1 used 2 pounds of pure live seed per acre of buffelgrass (Cenchrus ciliaris); Mix #2 consisted of 1 pound of pure live seed per acre each of plains bristlegrass (Setaria machrostáchya), accession # 434462 of two-flower trichloris (Chloris crinita), and four-flower trichloris (Chloris 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') (Table #1).

The plantings were made on March 5, 1998, in blocks C and D at the Kika de la Garza Plant Materials Center in Kingsville, Texas. All plots were on 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.

Spring Evaluation

On June 15, 1998, 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 1 foot x 1 foot square locations within each plot. A metal frame was used to mark each location. Locations were selected randomly, using a random numbers table and numbers drawn from a hat to represent the x-axis and y-axis locations on a grid of the plot. Ocular estimation was used to evaluate percent of cover provided.

Fall Evaluation

On December 1, 1998, 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 1 foot by 1 foot square locations within each plot. A metal frame was used to mark each randomly selected location. Ocular estimation was used to evaluate percent of cover. The number of plants of each species was counted.

RESULTS AND DISCUSSION

Spring Evaluation

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 .5 percent. The failure of the grasses to emerge may be due to especially droughty conditions in Kingsville throughout the entire evaluation period (Table #2). 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 as well. The bushsunflower provided 13.8 % of total plot cover, and seemed especially drought tolerant. The lazy daisy provided 3.4% of actual cover. This plant was particularly impressive in that many small plants became established, despite a seeding rate of only .18 lbs. of pure live seed per acre. If there had been adequate seed available, we would have used a seeding rate of 1 lb. of pure live seed per acre. The prairie bundleflower, which provided 2.82 % of actual cover, was also planted at a reduced seeding rate due to a lack of available seed. It was planted at only .93 lbs. of pure live seed per acre. 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 #3).

Fall Evaluation

There was an increase in the emergence of kleingrass in the plots containing Mix #4. It made up approximately 5 percent of the total plot cover, and averaged 0.18 plants per square foot. Most of the other species of planted grass never emerged, although one specimen of buffelgrass and one species of four-flower trichloris were noted. As noted in the previous paragraph, the failure of the grasses to emerge may be due to especially droughty conditions following planting, and capping of the heavy clay soil at the planting site.

Of the forbs, bushsunflower showed the highest percent of cover (25%), with an average of 2.14 plants per square foot. This was followed by orange zexmenia, with 11.47 percent of plot cover and an average of 1.1 plants per square foot. Lazy
daisy made up 4.5 percent of total cover and averaged .57 plants per square foot.

Prairie bundleflower averaged only .1150 plants per square foot and made up only .8 percent of the cover. Weeds made up 17.625 percent of total cover, and 35 percent of cover was bare ground (Table 3).

The condition of the plants at the time of evaluation is also an important factor to consider. When we evaluated the plots in the spring, plants from all four forb species used in this study were green, fresh, and lush. However, at the time of the fall evaluation, nearly all of the bushsunflower was at the end of its seasonal growth cycle, providing mostly older, less palatable vegetation for wildlife forage. The lazy daisy showed much new, green, tender growth, making it a more palatable wildlife food source at this time of year. The orange zexmenia and prairie bundleflower were only moderately fresh, showing mostly mature vegetative growth.

Changes in Plot Composition

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. Prairie bundleflower went from having 2.82 percent of total plot cover in the spring to a mere .8 percent of plot cover in the fall. This seems to indicate a poor survival rate for the prairie bundleflower. The only other decline in cover from spring to fall was that of bare ground, which decreased from 69.6 percent to 35.0 percent.

The other planted forbs all showed a fall increase in the percent of total plot cover. Bushsunflower led had an 11.2 percent increase in percent of plot cover. Orange zexmenia had a 9.445 percent increase in plot cover, while lazy daisy showed a 1.1 percent increase in plot cover. The percent of cover provided by kleingrass also increased from .5 percent in the spring to 5.6 percent in the fall, an increase of 5.1 percent.

Recommendations for Future Research

We were unable to evaluate the different grass-forb mixtures. Extremely droughty conditions and a heavy clay soil appeared to inhibit the emergence of the grasses. However, much useful information was gained on the forbs used in this study, all of which emerged, matured, and produced seed under extremely adverse conditions. With the exception of the prairie bundleflower, all the planted forbs showed an increase in percent of cover from spring to fall. It is our plan to replant this study in the spring of 1999.

TABLE 1.

SEED PURITY, GERMINATION RATE, AND PLANTING RATE FOR NATIVE MIX STUDY

Plant Type	Purity (%)	Germination (%)	Seed Adjustment Factor	Seed Rate /Acre(lbs) Mix #1	Seed Rate /Acre (lbs) Mix #2	Seed Rate /Acre (lbs) Mix #3	Seed Rate /Acre (lbs) Mix #4
2-flower Trichloris	96	90	.86	0	1	1.5	0
4-flower Trichloris	87	12	.10	0	1	1.5	0
Plains Bristlegrass	28	14	.04	0	1	0	0
Buffel Grass	92	87	.80	2	0	0	0
Orange Zexmenia	68	28	.19	2	2	2	2
Lazy Daisy*	87	03	.03	.18	.18	.18	.18
Bush Sunflower	81	75	.61	1	1	1	1
Prairie Bundleflower+	95	10	.10	.93	.93	.93	.93
Klein grass	-	-	.80	0	0	0	1.7

Plot size = 20' x 10' (200 sq.ft.) or .005 acres

There are five plots of each mix. Four reps for separate mix plot and one for the combined plot

* Seeding rate was reduced from 1 lb. of pure live seed per acre due to limited seed availability

\+ Seeding rate was reduced from 3 lbs. of pure live seed per acre due to limited seed availability

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TABLE 2.

TEMPERATURE AND RAINFALL AVERAGES FOR KINGSVILLE, TEXAS* FOR THE SPRING OF 1998

Week of	Average Low Temperature (ºF)	Average High Temperature (ºF)	Average Weekly Temperature (ºF)	Amount of Precipitation (in.)
February 15,1998	51	74	63	1.2
February 22, 1998	53	78	66	< .01
March 1,1998	55	76	66	< .01
March 8, 1998	49	64	57	.68
March 15, 1998**	56	77	67	.60
March 22, 1998	61	82	72	0
March 29, 1998	58	84	71	0
April 5, 1998	56	83	70	0
April 12, 1998	66	82	75	0
April 19, 1998	54	84	69	0
April 26, 1998	62	89	75	.45
May 3, 1998	72	92	82	0
May 10, 1998	71	89	80	0
May 17, 1998	70	92	81	0
May 24, 1998	75	94	85	0
May 31, 1998	76	95	86	< .01
June 7, 1998	79	97	88	< .01
June 14, 1998	81	102	92	.15

* Data from NAS Kingsville

** Week that plots were planted

TABLE 3.

RELATIONSHIP OF PURE LIVE SEED TO PERCENT COVER

Species	Pounds/Acre of Pure Live Seed	Percent of Cover Spring 1998	Percent of Cover Fall 1998	Change in Percent of Cover 6/98-12/98	Avg. # of Plants Per Sq. Ft. Fall 1998
Bushsunflower	1	13.800	25.000	+ 11.200	2.140
Lazy Daisy	.18	3.400	4.500	+ 1.100	.570
Orange Zexmenia	2	2.030	11.475	+ 9.445	1.100
Prairie Bundleflower	.93	2.820	.800	- 2.020	.115
Buffelgrass (mix 1)	2	0.000	.005	+ .005	.001
Kleingrass (mix 4)	1.7	.500	5.600	+ 5.100	.180
Plains Bristlegrass (mix 2)	1	0.000	0.000	0.000	0.000
Four-Flower Trichloris (mix 2)	1	0.000	.005	+ .005	.001
Two-Flower Trichloris (mix 2)	1	0.000	.00	0.000	0.000
Four-Flower Trichloris (mix 3)	1.5	0.000	.00	0.000	0.000
Two-Flower Trichloris (mix 3)	1.5	0.000	.00	0.000	0.000
Weeds	-	8.060	17.625	+ 9.565	7.540
Bare Ground	-	69.650	35.000	- 34.650	-

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