
TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE STATE OF COLORADO NATURAL RESOURCES CONSERVATION SERVICE

PLANT MATERIALS TECHNICAL NOTE NO. 70

March 31, 2008

To: All Offices

From: Pat Davey, State Plant Materials Specialist

Subject: Land's End Field Evaluation Planting

This technical note transmits the results from an Off-Center Evaluation conducted at Land's End, Colorado. The Off-Center Evaluation report was prepared by Manuel Rosales, Research Agronomist, Natural Resources Conservation Service, Upper Colorado Environmental Plant Center, Meeker, Colorado.

An **Off-Center Evaluation** a planting used by Plant Material Centers to evaluate releases or technology off site from the center. The Land's End Off-Center planting was set up to investigate which plant materials could be used to compete with Russian Knapweed (*Acroptilon repens*)

The information obtained from Land's End site is contained in the following pages.

If a field office is interested in setting up a similar study or other field-based technology studies such as field plantings, demonstration plantings, contact Pat Davey, Colorado Plant Materials Specialist at -720-544-2839 or email patrick.davey@co.usda.gov.

Land's End Field Evaluation Planting-Grass

OBJECTIVE

To determine which plant materials, if any, compete most successfully with Russian knapweed site re-invasion after herbicide treatment.

INTRODUCTION

A 2002 survey conducted by the Colorado Department of Agriculture showed Colorado with more than 118,341 infested acres of Russian knapweed (*Acroptilon repens*). Russian knapweed is a creeping perennial that reproduces from seed and vegetative root buds. Russian knapweed requires an aggressive continual stress with herbicide and mechanical means in order to control it. After the weed is controlled, sowing with desirable plant species is necessary. Re-invasion of the weed has been prevented in some cases with some sod-forming grasses like thickspike wheatgrass or smooth brome. This field evaluation planting was set up to determine the competitive capability of 49 different grasses in preventing re-invasion of Russian knapweed post herbicide and mechanical control

EXPERIMENTAL DESIGN

The statistical design for the study is a randomized complete block with four replications

MATERIALS & METHODS

On October 27-27, 2004, eleven rhizomatous grasses, thirty-one bunch type grasses, and seven Rye grasses were seeded. All plant materials (except small seeded grasses) were planted with a four-row plot cone-seeder. The small seeded grasses such as galleta grass, bluegrass, alkali sacaton, little blue stem, and sheep fescue were planted with a hand pushed belt seeder on October 27, 2005. The rate of seeding was 30 pure live seed per linear foot of row. The plot size is 4 x 20 ft with four rows per plot (1 ft between rows), for the rhizomatous grasses and bunch grasses. Plot size for Rye grasses is 8 x 20 foot with four rows per plot (2 feet between rows). The site is located about 10 miles southeast of Grand Junction, Colorado. The planting location is on Divide Road east of Land's End Road, at the Kannah Creek-Lands End exit off Colorado Highway 50. The elevation of the site is 5,360 feet, the average annual precipitation is approximately 11 inches, and the soil is a stony loam. The site will not be irrigated.

Table1. The following table lists the 49 entries for the study:

Rhizomatous Grasses				
Entry #	Cultivar/Release or accession #	Common Name	Scientific Name	Seed Source
1	Rush	Intermediate Wheatgrass	<i>Elytrigia intermedia</i>	Aberdeen , ID
2	Schwendimar	Thickspike Wheatgrass	<i>Elymus lanceolatus</i>	Pullman, WA
3	Critana	Thickspike Wheatgrass	<i>Elymus lanceolatus</i>	Bridger, MT
4	Arriba	Western Wheatgrass	<i>Pascopyrum smithii</i>	Meeker, CO
5	Volga	Mammoth Wildrye	<i>Leymus racemosus</i>	Meeker, CO
6	TH-2 Intermediate	Intermediate Wheatgrass	<i>Elytrigia intermedia</i>	ARS-Logan, UT
7	Rosana	Western Wheatgrass	<i>Pascopyrum smithii</i>	Bridger, MT
8	Sodar	Streambank Wheatgrass	<i>Elymus lanceolatus</i>	Aberdeen , ID
9	Viva**	Galleta Grass	<i>Pleuraphis jamesii</i>	Los Lunas, NM
10	Bannock	Thickspike Wheatgrass	<i>Elymus lanceolatus</i>	Aberdeen , ID
11	Manska	Intermediate Wheatgrass	<i>Elytrigia intermedia</i>	Bismarck, ND
Bunch Grasses				
12	Expedition	Snake River Wheatgrass	<i>E. lanceolatus</i> <i>spp.wawawai</i>	ARS-Logan, UT
13	White River	Indian Ricegrass	<i>Achnaterum hymenoides</i>	ARS-Logan, UT
14	Ephraim	Crested Wheatgrass	<i>Agropyrum cristatum</i>	Aberdeen, ID
15	Nordan	Crested Wheatgrass	<i>Agropyrum cristatum</i>	Bismarck, ND
16	High Plains**	Bluegrass	<i>Poa secunda</i>	Bridger, MT
17	Pryor	Slender Wheatgrass	<i>Elymus trachycaulus</i>	Bridger, MT
18	Paloma	Indian Ricegrass	<i>Achnaterum hymenoides</i>	Los Lunas, NM
19	Salado**	Alkalai Sacaton	<i>Sporobulus airoides</i>	Los Lunas, NM
20	Bad River**	Blue Grama	<i>Bouteloua gracilis</i>	Bismarck, ND
21	9092261-Northwest	Junegrass	<i>Koeleria macrantha</i>	Meeker, CO
22	Anatone	Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	Aberdeen, ID
23	Tusas	Bottlebrush Squirretail	<i>Elymus elimoides</i>	Los Lunas, NM
24	Lodorm	Green Needlegrass	<i>Stipa viridula</i>	Bismark, ND
25	Columbia bunch	Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	ARS-Logan, UT
26	Alma**	Blue Grama	<i>Bouteloua gracilis</i>	Los Lunas, NM
27	Goldar	Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	Aberdeen, ID
28	Whitmar	Beardless Wheatgrass	<i>Pseudoroegneria spicata</i>	Pullman, WA
29	Niner	Sideoats Grama	<i>Bouteloua curtipendula</i>	Los Lunas, NM
30	Wapiti (Buford)	Bottlebrush Squirretail	<i>Elymus elimoides</i>	Meeker, CO
31	Badlands	Blue Gramma	<i>Bouteloa gracilis</i>	Bismark, ND
32	Vaughn	Sideoats Grama	<i>Bouteloa curtipendula</i>	Los Lunas, NM
33	Pueblo	Bottlebrush Squirretail	<i>Elymus elymoides</i>	Meeker, CO

34	Rimrock	Indian Ricegrass	<i>Achnatherum hymenoides</i>	Bridger, MT
35	San Luis	Slender Wheatgrass	<i>Elymus trachycaulus</i>	Meeker, CO
36	Hycrest	Crested Wheatgrass	<i>Agropyrum cristatum</i>	Aberdeen, ID
37	Douglas	Crested Wheatgrass	<i>Agropyrum cristatum</i>	Aberdeen, ID
38	P-7	Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	ARS-Logan, UT
39	Secar	Snake River Wheatgrass	<i>E. lanceolatus</i> <i>spp.wawawai</i>	Pullman, WA
40	Covar**	Sheep Fescue	<i>Festuca ovina</i>	Pullman, WA
41	Newhy	Hybrid Wheatgrass	<i>Elymus hoffmanni</i>	Aberdeen, ID
42	Vavilov	Siberian Wheatgrass	<i>Agropyrum fragila</i>	Aberdeen, ID
Rye Grasses				
43	9043501	Salina Wildrye	<i>Leymus salinus</i>	Meeker, CO
44	L-45	Basin Wildrye Cross	<i>Leymus cinereus</i>	ARS-Logan, UT
45	Bozoisky	Russian Wildrye	<i>Psathyrostachys juncea</i>	Bridger, MT
46	Trailhead	Basin Wildrye	<i>Leymus cinereus</i>	Bridger, MT
47	Magnar	Basin Wildrye	<i>Leymus cinereus</i>	Aberdeen, ID
48	Mankota	Russian Wildrye	<i>Psathyrostachys juncea</i>	Bismark, ND
49	L-46	Basin Wildrye/Creeping Cross	<i>Leymus cinereus</i>	ARS-Logan, UT

** small seeded grasses planted with Belt Seeder, all other planted with Cone Seeder

RESULTS

2005

This is the second year of evaluations for this field evaluation planting: The study was evaluated in June 28, 2005. Most entries germinated well; however, we had rabbit damage in most plots, especially plots with grasses palatable to rabbits. Some plots were grazed almost to bare soil. The evaluation for stand establishment was done after the rabbit damage. Some of the rye grasses such as L-45, Bozoisky and Trailhead were untouched by the rabbits and had very good plant stands.

2006

The plots were evaluated on May 10. At this time the plots were hand-weeded and a pre-emergence application of Ronstar-G granular was applied to prevent germination of broadleaved weeds and annual grasses. Also an application of Spotrete, a turf fungicide and animal repellent, was applied at the recommended rate to repel the rabbits. Later on in the fall, Charlie Holcomb area agronomist with the Natural Resources Conservation Service visited the plots and reported that all plots had been mowed to the ground by the rabbits.

The evaluations (prior to rabbit damage) in 2006 for percent plant stand and vigor are summarized in the following table;

Table 2. Average percent plant stand and vigor for 49 grasses at Land's End Field Evaluation Planting-2006

Rhizomatous Grasses			
Cultivar	Common Name	% Plant Stand*	Plant Vigor**
Critana	Thickspike Wheatgrass	35	2.3
Sodar	Streambank Wheatgrass	32.5	1.5
Bannock	Thickspike Wheatgrass	30.5	1.8
Schewendimar	Thickspike Wheatgrass	27	2
Rosana	Western Wheatgrass	20.2	1.8
Rush	Intermediate Wheatgrass	15.5	1.3
Arriba	Western Wheatgrass	9	1.3
TH-2 Intermediate	Intermediate Wheatgrass	6.3	1
Manska	Intermediate Wheatgrass	1.8	1.3
Volga	Mammoth Wildrye	0	0
Viva	Galleta Grass	0	0
Bunch Grasses			
Vavilov	Siberian Wheatgrass	53.8	1.8
Expedition	Snake River Wheatgrass	47.5	2.3
Secar	Snake River Wheatgrass	47.5	1.8
Nordan	Crested Wheatgrass	45	1.8
Douglas	Crested Wheatgrass	40	1.8
Anatone	Bluebunch Wheatgrass	32.5	2
Columbia bunch	Bluebunch Wheatgrass	31.5	1.5
P-7	Bluebunch Wheatgrass	29.5	2
Whitmar	Beardless Wheatgrass	23.3	2
San Luis	Slender Wheatgrass	22.8	1.5
Pryor	Slender Wheatgrass	20	1.5
Hycrest	Crested Wheatgrass	18.8	2
Newwhy	Hybrid Wheatgrass	13.5	1.5
Goldar	Bluebunch Wheatgrass	7.5	1.5
Ephraim	Crested Wheatgrass	7	2.3
White River	Indian Ricegrass	1.7	1.3
Tusas	Bottlebrush Squirretail	1	1.3
Niner	Sideoats Grama	0.8	1.3
Wapiti (Buford)	Bottlebrush Squirretail	0.8	1
Pueblo	Bottlebrush Squirretail	0.8	0.8
Rimrock	Indian Ricegrass	0.8	1
High Plains	Bluegrass	0.5	0.8
Salado	Alkalai Sacaton	0.5	0.8
Junegrass	9092261-Northwest	0.5	0.8
Lodorm	Green Needlegrass	0.5	0.8
Paloma	Indian Ricegrass	0.3	0.5
Bad River	Little Bluestem	0	0
Alma	Blue Grama	0	0
Badlands	Blue Grama	0	0
Vaughn	Sideoats Grama	0	0
Covar	Sheep Fescue	0	0

Rye Grasses			
L-45	Basin Wildrye Cross	72.5	1.5
Trailhead	Basin Wildrye	60	1.5
L-46	Basin Wildrye/Creeping Cr.	51.2	2
Bozoisky	Russian Wildrye	38.8	1.8
Magnar	Basin Wildrye	37.5	1.5
Mankota	Russian Wildrye	8	1.5
9043501	Salina Wildrye	3.8	1.3

*Percent plant stand, visual evaluation based on number of plants per plot (4 rows/plot) i.e.: 4 complete rows = 100 percent

**Vigor visual evaluation where 1 = Very vigorous

2= Moderately vigorous

3 = weak

2007

During the winter of 2006 the cooperator of the site sold the property and moved to Montana. On May 17, 2007, The Grand Junction NRCS field office made arrangements for a site visit. To our surprise, when we got to the site, we found the plots partially destroyed by vehicular intrusion, and all plot labels had been removed. In addition, the plots had also been damaged by rabbits and were full of weeds. A decision was made by Steve Parr, UCEPC manager to try to evaluate what was left and discontinue the field evaluation planting. The results of the evaluation for plant stand for 2007, and plant stand for 2006 for comparison are presented in Table 3.

Table 3. Average percent plant stand for 49 grasses at Land's End Field Evaluation Planting-2006 and 2007. UCEPC

Rhizomatous Grasses			
		Year-2006	Year-2007
Cultivar	Common Name	% Plant Stand*	% Plant Stand
Critana	Thickspike Wheatgrass	35	7.3
Sodar	Streambank Wheatgrass	32.5	2.8
Bamock	Thickspike Wheatgrass	30.5	0.3
Schewendimar	Thickspike Wheatgrass	27	0.8
Rosana	Western Wheatgrass	20.2	1.0
Rush	Intermediate Wheatgrass	15.5	2.0
Arriba	Western Wheatgrass	9	2.5
TH-2 Intermediate	Intermediate Wheatgrass	6.3	0
Manska	Intermediate Wheatgrass	1.8	0
Volga	Mammoth Wildrye	0	0
Viva	Galleta grass	0	0

Table3. Continued

Bunch Grasses			
Vavilov	Siberian Wheatgrass	53.8	3.8
Expedition	Snake River Wheatgrass	47.5	7.5
Secar	Snake River Wheatgrass	47.5	8.3
Nordan	Crested Wheatgrass	45	3.8
Douglas	Crested Wheatgrass	40	5.6
Anatone	Blue Bunch Wheatgrass	32.5	0.3
Columbia bunch	Blue Bunch Wheatgrass	31.5	4.3
P-7	Blue bunch Wheatgrass	30.0	3.0
Whitmar	Beardless Wheatgrass	23.3	1
San Luis	Slender Wheatgrass	22.8	0
Pryor	Slender Wheatgrass	20	0
Hycrest	Crested Wheatgrass	18.8	0.8
Newhy	Hybrid Wheatgrass	13.5	3.0
Goldar	Bluebunch Wheatgrass	7.5	1.5
Ephraim	Crested Wheatgrass	7	0.5
White River	Indian Ricegrass	1.7	0
Tusas	Bottlebrush Squirretail	1	0
Niner	Sideoats Grama	0.8	0
Wapiti	Bottlebrush Squirretail	0.8	0
Pueblo	Bottlebrush Squirretail	0.8	0
Rimrock	Indian Ricegrass	0.8	0.5
High Plains	Bluegrass	0.5	0
Salado	Alkalai Sacaton	0.5	0
9092261-Northwest	Junegrass	0.5	0
Lodorm	Green Needlegrass	0.5	0
Paloma	Indian Ricegrass	0.3	0
Bad River	Little Bluestem	0	0
Alma	Blue Grama	0	0
Badlands	Blue Gramma	0	0
Vaughn	Sideoats Grama	0	0
Covar	Sheep Fescue	0	0
Rye Grasses			
L-45	Basin Wildrye Cross	72.5	16.0
Trailhead	Basin Wildrye	60	17.0
L-46	Basin Wildrye/Creeping Cr.	51.2	4.0
Bozoisky	Russian Wildrye	38.8	2.5
Magnar	Basin Wildrye	37.5	3.5
Mankota	Russian Wildrye	8	0.8
9043501	Salina Wildrye	3.8	0.3

*Percent plant stand, visual evaluation based on number of plants per plot (4 rows/plot) i.e.: 4 complete rows = 100 percent

SUMMARY

Based on data collected on 2006, out of the 49 grasses planted, October 27-28 of 2004, seven species had no germination at all, four species had plant stands greater than 50 percent, four species had plant stands between 40-50 percent, eight species had plant stands between 30-39 percent, and 26 species had plant stands less than 30 percent (see Table 4). Overall the best in establishment was the rye grass species, followed by the wheatgrasses. Unfortunately, the study could not be continued for a few more years to determine which grasses could out-compete Russian Knapweed; however, judging from plant establishment it looks like the rye grasses, Siberian wheatgrass and crested wheatgrass could have the most potential to prevent re-invasion of Russian Knapweed.

Table 4. Plant Establishment for 49 Perennial Grass Species Seeded at Land's End, Colorado.

>50 % Plant stand	40-50% Plant stand	30-39 % Plant stand	>0-29 Plant stand		No Establishment
L-46 – Basin Wildrye	Douglas - Crested Wheatgrass	Columbia bunch - Blue bunch Wheatgrass	Manska - Intermediate Wheatgrass	Tusas - Bottlebrush Squirretail	Alma - Blue Grama
Trailhead – Basin Wildrye	Nordan – Crested Wheatgrass	Magnar - Basin Wildrye	Rosana - Western Wheatgrass	Niner - Sideoats Grama	Bad River - Little Bluestem
Vavilov - Siberian wheatgrass	Expedition - Snake River Wheatgrass	P-7 - Blue bunch Wheatgrass	TH-2 - Intermediate Wheatgrass	Wapiti - Bottlebrush Squirretail	Covar - Sheep Fescue
L-45 - Basin Wildrye Cross	Secar – Snake River Wheatgrass	Critana - Thickspike Wheatgrass	Arriba - Western Wheatgrass	Pueblo - Bottlebrush Squirretail	Badlands - Blue Gramma
		Bannock - Thickspike Wheatgrass	Whitmar - Beardless Wheatgrass	Rimrock - Indian Ricegrass	Volga - Mammoth Wildrye
		Anatone - Bluebunch Wheatgrass	San Luis - Slender Wheatgrass	High Plains - Bluegrass	Vaughn - Sideoats Grama
		Sodar - Streambank Wheatgrass	Pryor - Slender Wheatgrass	Salado - Alkalai Sacaton	Viva - Galleta Grass
		Bozoisky - Russian Wildrye	Hycrest- Crested Wheatgrass	9092261- Northwest Junegrass	
			Newhy - Hybrid Wheatgrass	Lodorm - Green Needlegrass	
			Goldar - Bluebunch Wheatgrass	Paloma - Indian Ricegrass	
			Ephraim - Crested Wheatgrass	Mankota - Russian Wildrye	
			White River - Indian Ricegrass	Salina - Wildrye	
				Schwendimar - Thickspike Wheatgrass	
				Rush- Intermediate Wheatgrass	