2007 Annual Technical Report

Upper Colorado Environmental Plant Center

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Upper Colorado Environmental Plant Center

Established primarily as a means to identify, increase and introduce superior plant materials for identified conservation uses, Upper Colorado Environmental Plant Center (UCEPC) has played a vital role in revegetating disturbances in the inter-mountain west. Owned and operated by the Douglas Creek and White River Conservation Districts, UCEPC has had, since its inception in 1975, the specific charge and primary responsibility for collecting, evaluating, testing, selecting and producing quality plant species for the Upper Colorado River Basin. Superior materials, upon research completion, are then increased, released and made available to the public where they are utilized for a variety of conservation purposes.

UCEPC, at 6,500 feet in elevation, is unique in that it is the highest elevation center within the Plant Materials system. A vital need was identified over 25 years ago within NRCS and among many NRCS customers for plant materials and associated technology for high elevation uses.

The Center was also strategically placed near the world's largest deposit of oil-bearing shales, and within an area rich in other mineral deposits. The area is also home to the world's largest concentration of mule deer and elk, which made for considerable interest in providing quality plant materials for revegetation uses related to energy extraction activities.

Much of the research and development of plant materials from agronomic, arable land is provided primarily by the Agricultural Research Service and University Experiments Stations and Extension Services. As a result, the focus of the UCEPC Plant Materials Program is on plant material development for conservation uses on high elevation disturbances, rangeland, wildlife habitat and riparian corridors. There is, however, a certain degree of overlap in the utility a material may provide. For example, many of the grass species developed in the plant materials program for use in rangeland enhancement have been used on thousands of acres of agricultural ground through federal programs such as the Conservation Reserve Program (CRP). Other programs, such as the Buffer Initiative Program, Environmental Quality Incentives Program and Wildlife Habitat Improvement Program may utilize UCEPC developed materials. These programs have been initiated to reduce soil loss and improve water quality while providing concurrent benefits to livestock, wildlife and humans.

Because of the multitudes of existing problems, which can be alleviated, with the use of properly selected plant materials, the direction of the plant materials program and prioritization of projects and materials undertaken by UCEPC is largely provided by the Technical Advisory Committee. This committee is made up of State

Conservationists, State Resource Conservationists and other representatives of state and federal agencies, universities and private industry. Key, too, to this process and the operation of UCEPC are local conservation districts, and NRCS Field Office and district employees. From individual districts, plant materials, which can aid in solving conservation problems are identified and collected. These materials are then provided to UCEPC for testing and evaluating against the same or comparable materials prior to seed increase or release. It is within this framework that the best materials are made available for the identified conservation use on the area they were developed for and by the users who will benefit from their inclusion in seedings or plantings.

Presently, there are many plant species and projects at UCEPC, which our Technical Advisory committee has identified as providing substantial benefit for resource conservation. These projects fall into one of five identified High Priority Areas listed below:

- Revegetation of high altitude and disturbed land
- Increased productivity of rangeland and pastures
- Improved water quality
- Wildlife habitat enhancement
- Use of native plants in xeriscape and horticulture

These projects include years of evaluations at numerous testing locations, small seed increase fields, and the production of foundation quality seed of materials released for use by the public. The plant materials, which are developed as a result of the projects encompassed by these priority areas, will provide direct and indirect benefit to the resources of Colorado and to those who call Colorado "Home" for many years to come.

Research projects utilizing plant materials developed by UCEPC have ranged in scope from channel restoration and stabilization to roadside revegetation and from enhancement of mule deer winter range to phytoremediation of heavy metal runoff from mine spoils. Range, water and soil resources have been and will continue to be conserved and improved with UCEPC products. Reclamation and revegetation of utility and transmission corridors and natural and man induced surface disturbances are more successful as a result of research and products developed for those purposes, and livestock and wildlife forage and habitat are improved by the plant materials program and the many entities which assist in and cooperate with our mission.

For information about Upper Colorado Environmental Plant Center or any of its products or services, including specific information about plants, please contact us at (970) 878-5003.

Project No. 08A073J
Progress Report – 2007
By: Dr. Gary Noller & Steve Parr

Advanced Evaluation of Antelope Bitterbrush

INTRODUCTION

Antelope bitterbrush *Purshia tridentata* is one of the most widely distributed of all western shrubs. It can be found on arid plains, foothills, and mountain slopes in association with pinyon pine, ponderosa pine, and aspen. Antelope bitterbrush is regarded as an important browse species and is especially critical as winter forage for mule deer, elk, and as the name implies, antelope.

Antelope bitterbrush has a high priority for use in revegetation of surface disturbances related to oil and gas well disturbance, pipelines and service roads, wildlife habitat improvement, and rangeland seeding in the Upper Colorado River Basin. The prostrate layering characteristic of certain accessions of antelope bitterbrush is considered beneficial for these purposes.

Some antelope bitterbrush stands are very susceptible to fire. As a result, large areas of antelope bitterbrush have been burned in the Upper Colorado Region and have not naturally regenerated.

OBJECTIVE

The original purpose of the project was to evaluate the performance of accessions of antelope bitterbrush at the Upper Colorado Environmental Plant Center (UCEPC) in Meeker. In 1992, another objective was added, to determine the relative ability of the accessions to sprout after fire. A third objective was identified after the results from the burning. This objective was to increase a seed source from the identified fire tolerant accession.

METHODS

Tubling plants of 17 accessions were grown in the greenhouse and transplanted to a dry land site on June 6, 1983. See Table 1 for the accessions included. Table 2 lists the growth form for the accessions. Plants were planted in rows with 8-foot centers (Figure 1). Each accession was planted in two replications of 15 plants each, except when not enough plants were available. Only one replication was planted for accession 9038520, 9038526, 9030795, and 9038530.

To determine the ability to sprout after fire, 50% of the plants in each accession were burned on September 2 - 3, 1992. Prior to burning, the shrubs were pruned to a size small enough to fit into the burn barrel. The shrubs were burned at maximum intensity (about 400 F) for 2.5 minutes. A total of 139 shrubs were burned. Soil samples and weather records were taken to determine site conditions at the time of burning.

Information on soil moisture was computed in 1998 to update the project report. The procedure is outlined below.

1992

The plants were burned on September 3 (59 plants) and September 4, 1992, (80 plants). A light to heavy rain occurred on September 3 and amounted to 0.19 inch by the time recorded on September 8. Soil samples for soil moisture were taken on September 11, after the burn and rain (figure 2). Three samples were taken; one from the top five inches of soil, another from the five to ten inch layer, and one sample was taken from under a living plant in the center of the entire plot. Soil samples were placed in an oven at 75 degrees F (23 degrees C) for over 50 days to remove moisture. The percent soil moisture was determined on a dry soil basis (Figure 2).

2005

Seed had been collected for many years from both the re-sprouted fire-tolerant accession from this project as well as from a selected class release of bitterbrush from UCEPC, 'Maybell Select'. However, in 2005, a decision was made to remove the 'Maybell Select' shrubs because of the high potential of cross pollination that was likely occurring with it and the fire-tolerant source. Both plantings were also becoming decadent from old growth and were infested with annual weeds and Canada thistle. Additionally, the source of seed for 'Maybell Select' is less than 50 miles from UCEPC, and collections could be obtained from native stands. The fire-tolerant source has been maintained as a seed source.

2007

Herbicide applications were conducted to reduce the annual weedy competition between plants and to control the infestations of Canada thistle. Applications will be conducted as necessary. Pruning of decadent material was also identified as a management activity to improve seed production potential.

RESULTS

Accession 9038521 (from Soda Springs, Idaho) was identified as having the best ability to sprout after fire. Both replications (Row 12 and 25) were evaluated on August 16, 1996, (Table 3). In row 12, (north) one of the six plants that were burned was dead on August 16. Three burned plants had abundant regrowth, while the other two had only a small amount of regrowth.

In row 25, (south) three of the burned plants had abundant regrowth, while one had only a small amount of regrowth.

Seed was collected from the plants on July 22, 1996, which amounted to 66.0 grams of clean seed.

Notes on the plants taken on August 16, 1996, are presented in Table 3.

> "On July 18, 2000, 153 grams of *Purshia tridentata* fire tolerant antelope bitterbrush was harvested from field twenty-one. There are twenty-three bitterbrush plants alive in the stand from the original planting of 30 transplants (see historic records). The north row has twelve surviving plants and the south row has eleven. Due to a fire ban within the county, the plot was not burned this year."

Table 1. A listing of bitterbrush accessions with location and number planted.

Row	Accession Number	Collection Location	Planted
1	9031619	Colorado, (NPMC)	15
2			0
3	9038525	Six Mile Lake, OR	15
4	9038523	Celilo, OR	15
5	9007977	Rio Blanco County, CO	15
6			0
7	9024076	Eagle, ID	15
8	9038527	Weber County, UT	12
9			0
10			0
11	9024373	Moffat County, CO	15
12	9038521	Soda Springs, ID	15
13	9009355	Inyo County, CA	15
14	9038522	South Pass, WY	15
15	9038531	Moffat County, CO	15
16	9024377	Moffat County, CO	15
17	9038524	Long Valley Jct, UT	15
18	9030795	Colorado (NPMC)	7
19	9038524	Long Valley Jct, UT	15
20	9031619	Colorado (NPMC)	15
21	9038530	College Farm, NM	14
22	9024377	Moffat County, CO	15
23	9024373	Moffat County, CO	15
24	9007977	Rio Blanco County, CO	15
25	9038521	Soda Springs, ID	15

Row	Accession Number	Collection Location	Planted
26	9009355	Inyo County, CA	15
27	9038527	Weber County, UT	12
28	9038520	St. Anthony, ID	9
29	9038523	Celilo, OR	15
30	9038525	Six Mile Lake, OR	15
31	9038526	Caribou County, ID	15
32	9038522	South Pass, WY	15
33	9024076	Eagle, ID	15
34	9038531	Moffat County, CO	15

Table 2. Growth form for all accession of antelope bitterbrush.

Accession Growth Number	Form
9031619	Prostrate
9038520	″
9038523	″
9007977	″
9038530	″
9024076	″
9038527	″
9038526	″
9024373	″
9038521	″
9038522	″
9038531	″
9024377	″
9038524	″
9038525	Upright
9030795	″
9009355	″

Table 3. A listing of the 1996 evaluation information collected on August 16, for 9038521.

	Row	Planted	Survival	Ht cm.	Wd cm.	Vigor
(North)	12	15	13			
			7 (not burned)	145	230	3
			5 (burned)	55	165	4
(South)	25	15	11			
			7 (not burned)	90	195	3
			4 (burned)	50	130	4

2007

Since the evaluation done in 2000, one plant in the northern plot has died. On September 10, 2007, there were 11 plants that were alive in each the northern plot and the southern plot. There were also three smaller plants in the southern plot, but they did not look like original plants and were not noted in the evaluation from year 2000.

CONCLUSION

Year 2008 will represent 25 years of growth for the bitterbrush plants at UCEPC. It is hoped that seed can be collected from the plots this year, and that more intense management will improve plant performance. Seed will be used for further studies, including the determination of fire tolerance of another generation of plants, site adaptability and comparison to other bitterbrush sources that are commercially available.

Project 08A207
Project Report-2007
By: Steve Parr and Manuel Rosales

Advanced Evaluation of *Koeleria macrantha* Prairie Junegrass

OBJECTIVE

To develop and release an accession of *Koeleria macrantha* for conservation use from a composite selection of superior Northwest Colorado ecotypes.

INTRODUCTION

Koeleria macrantha (prairie Junegrass) is a perennial, cool-season bunchgrass that is widely distributed throughout the United States. According to Hitchcock, 1935, its range extends from Ontario to British Columbia, south to Delaware, Missouri, California, and Mexico. The species is also widely distributed in the temperate regions of the old world. In the Central Rocky Mountains, it is commonly found as a component of prairies, open woods, mountain parks, sagebrush, and mountain brush communities. It is found in elevations ranging from below 4000 feet to over 11,000 feet. The species provides good forage for both livestock and grazing wildlife species, and fair forage for browsing species of wildlife. *Koeleria macrantha* is usually sparsely distributed and is generally not found as the dominant range species in a particular stand. Because of this, its importance as forage to both wildlife and livestock may be more related to its abundance than its preference.

Prairie Junegrass also responds well after fire and studies have found positive effects to plant size and seed head abundance following fire. Other studies show it has increased in abundance after prolonged drought conditions and man induced surface disturbances. Although prairie Junegrass has a number of characteristics that make it an attractive product for inclusion in seed mixtures for revegetation, there is only one released variety, **Barkoel**, which is from the Netherlands. There is no release from the United States. This may be a factor in whether the species is recommended in mixtures. Because of the potential benefit to native ranges, prairie Junegrass has been a product under selection at Upper Colorado Environmental Plant Center (UCEPC) since 1984.

MATERIALS

Forty accessions of *Koeleria macrantha* were planted as a fall seeding, Project 08I115, on August 23, 1985. Due to poor establishment of this planting, a **spring planting**, Project 08I152, was established on June 12, 1986. Because of insufficient seed, only 32 accessions of the original 40 were included in Project 08I152. In addition, 19 International collections were included in Project 08I152, bringing its total number of accessions up to 51. In 1988, Projects 08I115 and 08I152 were combined into a single project designated as 08I115.

In 1991, Dr. Jack Carlson, who was at the time the Northwestern Regional Plant Materials Specialist for the SCS, recommended that a composite of the best strains from the Central Highlands of Turkey (PI-204451, PI-206274, PI-383672, PI-383673, and PI-383674), be made.

In addition, Dr. Carlson recommended that a second composite be put together that consisted of the best performing strains from Northwestern Colorado. At that time, Northwest Colorado accessions 9024197, 9024421, and 9039787 were recommended.

In 1993, Dr. Gary Noller, UCEPC Senior Scientist, determined the top three Northwest Colorado and the top three Turkish Central Highlands accessions for the project. Dr. Noller recommended that accessions PI-383672, PI-383673, and PI-204451 be chosen from the Turkish Ecotypes. In addition, Dr. Noller recommended that accessions 9024197, 9039786, and 9039787 be chosen to represent the Northwest Colorado ecotypes. Accession 9024197 is from Rio Blanco County, while accession 9039786 and 9039787 are from Routt County.

During the summer of 1994, UCEPC established separate crossing nurseries for the Northwest Colorado and Central Turkish Highland accessions in UCEPC. The nurseries were established with vegetative culms transplanted from UCEPC Field 21 onto three-foot centers. Each nursery was laid out in a Randomized Complete Block design and included three replications. Each genotype is represented within a given replication seven times. The Northwest Colorado crossing block represents Project 08A207 while the Turkish Central Highlands crossing block represents Project 08A208. Dr. Tom Jones, ARS, Logan, Utah pointed out that *K. macrantha* cross-pollinates and is self-incompatible. Upon cross-pollination, seed borne on each individual representing one of the three accessions will be considered a half-sib family (one parent known, one parent unknown).

METHODS FOR PRODUCT DEVELOPMENT

The original project methodology was to utilize genotypic recurrent selection only for the establishment of an F1 nursery. The original parental plants, 63 in all, were to provide the seed source for 63 F1 type plants, replicated three times, to produce an F1 nursery with 189 plants.

Each of the F1 plants were to be maintained as a separate line and eventually used to create an F2 nursery. The F1 seed, F2 seed, and parental seed would be compared and a subsequent release be initiated based on the results.

In 1996, seed was collected and harvested by individual plant, but was not identified as to which plant or accession. In 1997-2000, seed was harvested and identified for parental determination. In 2001-2003, the seed from the crossing block was bulk harvested. Because a recurrent selection process would take an additional three to five years to establish and compare seed production results, it was determined by UCEPC to go forward with a release of prairie Junegrass based on results of advanced evaluations.

On July 16, 2002, blended seed from the 2001 harvest was used to seed one acre of prairie Junegrass in Field 11 at UCEPC. Seed density was targeted at 30 seeds per linear foot and the

seeding was completed with a hand pushed Planet Junior. A poor to weak stand was noted until late fall, when a good stand was finally evident.

Since 2004 to present the crossing block has been hand –harvested by accession number.

RESULTS

The following results are summarized by year:

1997-1999

Individual plant harvests were conducted with reference to accession from years 1997-1999. Harvest results from accession 1 (9024197) from Rio Blanco County and accessions 2 (9039786) and accession 3 (9039787) from Routt County are provided below.

Year	Accession 1	Accession 2	Accession 3	Total
1997	209	240	225	674
1998	653	710	581	1944
1999	174	237	255	666
Totals	1036	1187	1061	

Analysis of variance statistics were run for the randomized complete block design of this study. Although there is an apparent accessional difference, the difference is not significant at the 5% level. Of the 63 parental plants, there is mortality in ten. Of the remaining 53 plants, 16 are contributing very little to the seed gene pool simply because of the poor stature of the parental plants. Thirty-seven superior plants will be used for cross-pollination with harvested seed being used to test against the blended seed increase field.

Year- 2001

The Hege combine was used to harvest the entire block on July 11. The clean seed amount resulted in 461 grams.

Year- 2002

On July 18, the Hege combine was again used to harvest the entire block, but only 19 grams were harvested.

Year- 2003

The entire plot was hand harvested on July 15 and 2.5 pounds of clean seed resulted.

Project No. 08A207
Project Report-2007
By: Manuel Rosales & Steve Parr

Year- 2004

Nine inferior plants out of the 44 remaining plants in the crossing block were clipped to prevent crossing with superior desirable parents. Plants were clipped May 17. Plants were monitored throughout the growing season for re-growth but no new heads were formed in the clipped plants. However, about 12 inches of new leaf growth was measured from May 17 to June 15. On July 7, the 35 desirable parent plants in the crossing block were hand harvested and bulked. Three pounds of unclean seed yield 1.7 pounds of cleaned seed.

Year- 2005

On May 13, the nine inferior plants (due to short height and vigor) were clipped to prevent crossing with superior parental plants. All plants were just starting to head out. On June 7, the nine clipped plants were starting to head out again, so they were clipped a second time. The clipped plants were measured for re-growth with an average re-growth of 16 inches. On July 12, the superior plants were hand-harvested by accession. The results are presented in the following table:

Entry No.	Accession No.	No. Plants per Accession	Total Seed Yield per Accession	Collection Site Colorado
1	9024197	10	163 grams	Rio Blanco County
2	9039786	13	181 grams	Routt County
3	9039787	12	187 grams	Routt County

Year- 2006

In 2006, the superior plants of each accession were hand-harvested Inferior plants of each accession were hand clipped on May 18 prior to anthesis to prevent crossing with superior plants. Superior plants were harvested on July 3. Results are presented in the following table:

Entry No.	Accession No.	No. Plants per Accession	Total Seed Yield per Accession	Collection Site Colorado
1	9024197	10	181 grams	Rio Blanco County
2	9039786	13	242 grams	Routt County
3	9039787	12	171 grams	Routt County

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Year-2007

The crossing block was harvested by hand this year as in previous year. The block was harvested by accession number on July 2, 2007. The total seed yield per accession in grams is presented in the following table:

Total Seed Yield per Accession. UCEPC-2007

Accession No.	No. Plants per Accession	Total Seed Yield per Accession	Collection Site Colorado
9024197	10	338 grams	Rio Blanco County
9039786	13	270 grams	Routt County
9039787	12	486 grams	Routt County

Remarks for Growing Season of 2007

A plant materials release from a composite of the three accessions was being planned for the year 2007, however, the release is on hold until a final determination on the species identification is confirmed. The Colorado State Seed Laboratory reported that the *Koeleria macrantha* seed UCEPC submitted for analysis was not *Koeleria* but *Poa* spp. Seed of the accessions has been sent to Steve Larson, with the USDA-Agriculture Research Service, to do a more in-depth investigation to resolve the dilemma of determining if species belongs to the genus *Koeleria* or *Poa*.

Project 08A209
Project Report-2007
By: Steve Parr

Non-Irrigated Production of Three Smooth Brome Grasses

ABSTRACT

Smooth brome grass *Bromus inermis* has been utilized for the conversion of non-irrigated cropland to non-irrigated hayland and improvement of existing non-irrigated hayland throughout the intermountain west. This study was conducted to determine which of three varieties of smooth brome would produce the largest quantity of harvestable biomass for domestic livestock feed in a mountain valley setting of the intermountain west. This study compared the production of 'Manchar', 'Liso', and 'Lincoln' varieties of smooth brome grass under non-irrigated conditions.

INTRODUCTION

During the past several decades many thousands of acres of smooth brome grass have been seeded into non-irrigated situations for hay production in the intermountain west. With the pending release of 'Liso' smooth brome grass, the question arises as to how it will produce in relation to traditional releases of smooth brome grass. The purpose of this study and paper is to review which variety of smooth brome grass will produce the maximum annual harvestable biomass over a realistic stand life of seven to ten years.

MATERIALS AND METHODS

This study was conducted at Upper Colorado Environmental Plant Center (UCEPC), six miles southeast of Meeker, Colorado. Environmental factors at test site are: 16.19″ of annual precipitation, 6500 ft elevation, north facing slope of 3%, growing season of 100 days. This comparison test was conducted on a work loam (fine, montmorillonitic typic argiborolls) which had been fallow for multiple years providing a fine relative weed free seed bed. A total of 18 plots in a random format were developed. Each plot was developed utilizing five 6-ft long rows on 1-ft centers. In return, each plot had border rows consisting of equal parts of each variety on a PLS basis. Planting was conducted utilizing a Planet Junior brand hand planter placing the seed at 1/2″ depth.

The site preparation began on July 1, 1997, and the plots were planted on July 10, 1997. The plots were then irrigated utilizing a “hand” move sprinkle system. The plots were irrigated to field capacity to replicate early spring conditions that are found in the White River Valley. Once field capacity was reached, three weeks later, the sprinkler pipe was removed and no additional irrigation was used during the scope of this study. The results of the 2003 evaluation showed a trend for production by accession to favor those products that spread laterally. Both 'Lincoln' and 'Manchar' had higher plot productivity than the 'Liso' material which was noted to remain more centered along the planted row with much less lateral spread. For evaluations in 2004, ocular assessments were made on the percent spread from the center line of the seeded rows. The three interior rows of each plot were evaluated. A less aggressive, spreading type of smooth

brome may be more productive through time than a vigorous spreading type. In addition, smooth brome has come under some scrutiny as being an aggressive, non-native that has the ability to out-compete native vegetation and spread beyond planted locations. Environmental considerations may strongly favor 'Liso' over more aggressive, spreading selections.

In 2005, productivity was evaluated on a relative scale to help determine the effects of the non-spreading nature of 'Liso' compared to the more aggressively spreading 'Lincoln' and 'Manchar' varieties. Other vegetative characteristics were noted to help identify the unique attributes of each of the selections.

RESULTS

2006 Evaluation

Results are listed in Table 1 for percent cover, number of discernible rows and number of seed heads by plot and product.

Evaluation of
Three Smooth Bromes

Plot #	Percent Cover	Number of Discernible Rows	Number of Seed Heads	Product
1	85	0	0	'Manchar'
2	65	3	4	'Liso'
3	95	0	0	'Lincoln'
4	73	3	2	'Manchar'
5	90	0	0	'Lincoln'
6	80	1	0	'Liso'
7	95	0	0	'Lincoln'
8	70	1 w/parts of 2	1	'Liso'
9	90	0	0	'Manchar'
10	90	0	0	'Manchar'
11	77	3	6	'Liso'
12	95	0	0	'Lincoln'
13	70	3	5	'Liso'
14	80	0	4	'Manchar'
15	95	0	2	'Lincoln'
16	76	3	11	'Liso'
17	85	0	2	'Lincoln'
18	95	0	0	'Manchar'

Table 1

Project 08A209
Project Report-2007
By: Steve Parr

Analysis of variance was conducted for each of the dependent variables; cover, rows, and seed heads. Statistically, there was significant difference in each of these variables by cultivar. However, only the percent cover exhibited normal distribution as 'Liso' displayed the least amount of cover, 'Lincoln', the most cover while 'Manchar' was intermediate. The number of seed heads and the number of rows were also statistically significant among the cultivars, but their distribution is not normal. Rows were either apparent or not visible, so there was not normal distribution. Seed head numbers were a reflection of cover and row visibility. The greater the percent cover, the fewer the number of seed heads.

Listed below are the results of the comparisons of each of the variables with the three cultivars in the study. The analysis of variance for cover is presented after the variable comparisons.

Descriptive Statistics for Cultivar = 'Lincoln'

Variable	N	Mean	SD	Minimum	Maximum
Cover	6	92.5000	4.1833	85.0000	95.0000
Heads	6	0.6667	1.0328	0.0000	2.0000
Rows	6	0.0000	0.0000	0.0000	0.0000

Descriptive Statistics for Cultivar = 'Liso'

Variable	N	Mean	SD	Minimum	Maximum
Cover	**6**	73.00000	5.5857	65.0000	80.0000
Heads	**6**	4.5000	3.9370	0.0000	11.0000
Rows	**6**	2.5000	0.8367	1.0000	3.0000

Descriptive Statistics for Cultivar = 'Manchar'

Variable	N	Mean	SD	Minimum	Maximum
Cover	**6**	85.5000	7.9687	73.0000	95.0000
Heads	**6**	1.0000	1.6733	0.0000	4.0000
Rows	**6**	0.5000	1.2247	0.0000	3.0000

Randomized Complete Block AOV Table for Cover

Source	DF	SS	MS	F	P
Rep	5	99.33	19.867		
Cultivar	2	1171.00	585.500	12.68	0.0018
Error	10	461.67	46.167		
Total	17	1732.00			
Grand Mean	83.667	CV 8.12			

Tukey's 1 Degree of Freedom Test for Non-Additivity

Source	DF	SS	MS	F	P
Non-Additivity	1	0.959	0.9590	0.02	0.8941
Remainder	9	460.708	51.1897		
Relative Efficiency, RCB 0.79					

Means of Cover for Cultivar

Cultivar	**Mean**
'Lincoln'	92.500
'Liso'	73.000
'Manchar'	85.500
Observations per Mean	6
Standard Error of a Mean	2.7739
Std Error (Diff of 2 Means)	3.9229

2007 Evaluation

The smooth brome plots were evaluated on September 10, 2007. From the evaluation, five of six plots of 'Liso' were easily identified by discernible, distinct rows. From field notes,

> "Only plot #4 seems to be 'Liso', but is labeled as Manchar. Head abundance is heavier and more numerous in 'Liso' plots, but forage production by plot is not better for 'Liso' plots, but may be better by row. Because there is more bare ground in the 'Liso' plots, (between rows), the overall production is less. This indicates 'Liso' would be more compatible in a mixed planting than either 'Lincoln' or 'Manchar', both of which are sod bound."

It is recommended at this time that the 'Liso' plots be salvaged for seed production, but after 10 years, the project is complete and should be closed.

CONCLUSIONS

2006

'Lincoln' smooth brome is a very aggressive, rhizomatous sod-forming product. It is suspected that plots were clipped in 2003 at the beginning of lateral movement of 'Lincoln' and 'Manchar' from the planted row. 'Liso', from previous observations, has less lateral spread or movement from its planted row than either 'Manchar' or 'Lincoln'. Because there was "more material to clip" in the 'Manchar' and 'Lincoln' plots from lateral movement of those materials relative to the lack of a spreading tendency exhibited by 'Liso', they produced more forage biomass in 2003 than 'Liso'. Evaluations in 2004 and again in 2005 confirmed the higher biomass production from the lateral spreading products compared to 'Liso'. In 2006, vigor was higher for 'Liso' based on the number of seed heads, 27 compared to six for 'Manchar' and four for 'Lincoln'.

'Lincoln' may still be the most productive smooth brome, in terms of biomass, while 'Liso', since 2003, has become the least productive, although no data was collected for biomass in 2006. Ocular observations in 2005 also identified six out of six plots of 'Liso' by the vegetative characteristic of "very curly leaves". Four of six plots of each 'Manchar' and 'Lincoln' were also identified by leaf shape morphology. Plots 1 and 4 seemed to be a mixture of leaf shapes. No

notations were made for leaf shape for plots 3 and 5. In 2006, 5 of 6 ‘Liso’ plots were identified because of the non-spreading nature, or lateral “row migration” as compared to the other two cultivars. Plot 6 is the most difficult to distinguish as ‘Liso’. The southwest portion of the study is also the most heavily vegetated because prevailing winds deposit more snow in this section of the study than elsewhere. The increased moisture has increased the lateral spread of ‘Liso’, which is not unexpected. This experimental error also shows up as non-additivity in Tukey’s Test for seed head numbers especially. There is one ‘Liso’ plot with 11 seed heads while the next highest number is six. As a result, there is not normal distribution of seed head numbers. There are additional vegetative differences in ‘Manchar’ and ‘Lincoln’. ‘Lincoln’ has more upright leaf growth while ‘Manchar’ exhibits less of that characteristic.

The notion that a less aggressively spreading smooth brome may, in the long term, be more compatible with a mixed planting of other grasses and/or legumes in a hay or pasture planting has merit. However, after nine years of data and observations, 'Liso' has never been more productive than 'Lincoln', and has been less productive than 'Manchar' since 2003. Since the source of seed for 'Liso' has been difficult to obtain, efforts to collect seed from the established project will be done so that further studies can be conducted.

2007

On October 31, the plots of ‘Lincoln’, ‘Manchar’ and the mixed rows of ‘Liso’ were sprayed with glyphosate with an ATV mounted sprayer at the recommended label rate of application. Ample fall moisture had allowed green-up of plants, and the herbicide application should have been effective. If necessary, a reapplication will be conducted in the spring of 2008 to kill all ‘Lincoln’ and ‘Manchar’ plots. ‘Liso’ plots will be maintained for seed production.

According to the 1972 publication by USDA-ARS “Grass Varieties in the United States”, there are two distinct sources of smooth brome, a non-spreading northern type and an aggressive, sod forming southern type. ‘Liso’ is definitely behaving as a non-aggressive northern type and does show promise as a dryland or mixed pasture material in the service area of UCEPC.

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
Maybell Bitterbrush
December – 2007
By: Dr. Gary L. Noller

Maybell Bitterbrush Project with Colorado Division of Wildlife

INTRODUCTION

The project contains three studies: COPMC-T-9801 bitterbrush re-establishment by drilling; COPMC-T-9802 bitterbrush re-establishment, caching vs. live transplants; and COPMC-T-9803 bitterbrush re-establishment with transplants in rows. On October 10, 2007, two of the three bitterbrush studies were evaluated. The evaluation involved examining tubling plants of antelope bitterbrush *Purshia tridentata* in rows and plots. The one caching plot with seedlings (Replication 1, plot 7) has been found each year from 1999 to 2007. Drilled rows (COPMC-T-9801) were **not examined** in 2007, since live plants have not been found. Additional information on methods of planting can be found in progress reports for 1998 and 1999.

It was a surprise to find that a fire had burned almost the entire area inside the exclosure. Only a small part in the Northeast corner of the exclosure had not burned. In some places the fence posts had burned near the soil leaving the posts hanging on the wire fence. Most bitterbrush plants inside the exclosure had been affected by the fire. The effects on the plants ranged from a plant with no green leaves on October 10, 2007, to plants that had abundant green leaves. The evaluation in 2008 will probably determine what effects the fire has had on the survival of bitterbrush plants.

Other plants were also affected by the fire. Silver sagebrush *Artemisia cana* plants had burned but had new sprouts with green leaves near the base. Prickly-pear cacti *Opuntia polycantha* had pads that looked dry but most had some green and will probably survive. Hairy goldenaster *Heterotheca villosa* also had fresh growth near the base with green leaves. Cheatgrass *(Bromus tectorum)* was abundant with 3-5 inches of green growth. Bunch grasses, mostly needle-and-thread *Stipa comata* had green growth of 4-5 inches.

Mulch was mostly burned leaving abundant bare soil. The sandy soil was moist to a depth of 20 inches. The exclosure fence is still in need of repair and does not prevent animals from entering the exclosure.

RESULTS

Tubling plants in rows and plots were examined on October 10, 2007. In addition, the one cache (Replication 1, plot 7) that was found each year from 1999 to 2007 was also evaluated. The average height and width (in centimeters) for plants in **rows** was determined by measuring all plants in the first four rows. The average height and width (in centimeters) for plants in **plots** was determined by measuring all plants where herbicide or no herbicide was used. The fire effect on bitterbrush plants was categorized as no green leaves (plant may be dead), 1 or 2 green leaves, few green leaves at base, moderate green leaves or many green leaves.

COPMC-T-9801-WL

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
Maybell Bitterbrush
December – 2007
By: Dr. Gary L. Noller

Drilled plots – (4.5 and 9.0 ft. row spacing)**:**
This study was **not evaluated** in 2007.

COPMC-T-9802-WL
Caching:
Plots for caching and tubling (plug) plants had 36 planting sites per plot. Only one cache (Replication 1, plot 7) had plants on October 10, 2007. The one cache results in 0.3% re-establishment for caching. Since the one cache was in the herbicide (glyphosate to reduce competition) plot, this averages 0.7% re-establishment when herbicide is used to reduce competition. The plant in this cache measured only 10.0 cm tall and 20.0 cm wide. Based on this project, caching is **not** a **successfu**l method for re-establishing antelope bitterbrush on this site. Caching plots where plants had not been found in the past were not examined.

Tubling plants in plots:
Height and width measurements from all plots where **herbicide** was used averaged 30.3 cm by 54.2 cm, respectively. The one plant in the plots where **no herbicide** was used measured 20.0 cm in height and 45.0 cm in width. Survival in plots where **herbicide** was used was 34.7% in 1999, 30.6% in 2000, 25.7% in 2001, 25.0 % in 2002, 24.3% in 2003 and 2004, and 23.6% in 2005 and 2006 and 20.8% in 2007 (Table 1). Survival in plots where **no herbicide** was used was 13.9% in 1999, 9.0% in 2000, 4.9% in 2001, 1.4% in 2002, and 0.7% in 2003, 2004, 2005, 2006 and 2007. The change in survival for tubling plants in plots in 2007 was probably caused by the fire. However, planting tubling bitterbrush plants in plots when **herbicide** is used is a **successful** method of re-establishing antelope bitterbrush. In 2007, 44.3% of the plants were found, that were present in 1999. **Herbicide** is important in the initial **establishment** of bitterbrush tublings (50 plants with herbicide and 20 plants with no herbicide in 1999, Table 1), but also in the **persistence** of tublings (30 of 50 plants, 60.0%, were still alive in 2007 when herbicide was used vs. only 1 of the 20 plants, 5.0%, was still alive in 2007 when no herbicide was applied). Survival of bitterbrush tublings in plots appears to be relatively stable three years (2002) after planting (Figure 1). This study indicates that if a bitterbrush tubling can survive for three years, its chances of long term survival are good. It would also suggest, methods that improve the chances of survival for the first three years will be important for long term survival.

COPMC-T-9803-WL
Tubling plants in rows:
Eighteen rows of tubling antelope bitterbrush plants (716 planting sites) were examined for survival on October 10, 2007. Plants in rows averaged a height of 29.1 cm and a width of 42.9 cm. It should be noted that rows were treated with **herbicide** to reduce competition before planting. Survival in rows was 21.1% (151 plants) in 1999, 18.2% (130 plants) in 2000, 17.0% (122 plants) in 2001, 16.5% (118 plants) in 2002, 15.8% (113 plants) in 2003, 16.1% (115 plants) in 2004, and 15.9 % (114 plants) in 2005 and 2006, and 13.0% (93 plants) in 2007 (Table 2). The change in survival from 2006 to 2007 was probably mostly due to the fire. In 2007, 61.6% of the plants were found that were present in 1999. This is a **successful** method of re-establishing antelope bitterbrush on this site.

Survival of bitterbrush tublings in rows also appears to be relatively stable three years (2002) after planting (Figures 2 and 3). This study indicates that if a bitterbrush tubling can survive for the first three years, its chances of long term survival are good. It also suggests that methods that improve the chances for survival for the first three years will be important for long term survival.

OBSERVATIONS AND CONCLUSIONS

1. The project was evaluated on October 10, 2007, for antelope bitterbrush re-establishment.

2. Seeding (both drilling and caching) was done on October 21, 1998.

3. Antelope bitterbrush tublings were planted in plots and rows on May 6, 1999.

4. Seeding (both drilling and caching) were **not successful** methods for re-establishing antelope bitterbrush on this site at this time. Drilled plots were **not examined** in 2007.

5. Survival of antelope bitterbrush tublings on October 10, 2007, in **plots** averaged 10.8% on this site. (20.8% when herbicide was used and 0.7% with no herbicide.) This is a **successfu**l method for re-establishing antelope bitterbrush on this site at this time.

6. In **plots**, 44.3% of the plants that were observed in 1999 were found again in 2007.

7. Planting antelope bitterbrush tublings in **rows** was a **successful** method of re-establishing bitterbrush and resulted in a 13.0% survival recorded on October 10, 2007.

8. In **rows**, 61.6% of the plants that were observed in 1999 were found again in 2007.

9. **Herbicide** was important for the **establishment** of bitterbrush tubling (See Table 1, 1999), and for the **persistence** of the tublings over time (See Table 1, 1999 to 2007).

10. The change in survival of bitterbrush plants from 2006 to 2007 was probably due to the effects of the fire.

11. Survival of bitterbrush tublings in plots and rows did not change substantially after the first three years (2002) of the study.

12. Methods that will improve survival for the first three years will be important for the long term survival of bitterbrush tublings.

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Table 1. A listing of the number of plants found in plots treated with herbicide, no herbicide, and the total of both, from 1999 through 2007. Percent survival is also listed.

TUBLING PLANTS IN PLOTS

Date		**Number of Plants**	**% Survival**
May 9, 1999	(Planted)	288	-
November 10, 1999	(all plants)	70	24.3
	Herbicide	50	34.7
	No herbicide	20	13.9
September 26, 2000	(all plants)	57	19.8
	Herbicide	44	30.6
	No herbicide	13	9.0
November 7, 2001	(all plants)	44	15.3
	Herbicide	37	25.7
	No herbicide	7	4.9
October 4, 2002	(all plants)	38	13.2
	Herbicide	36	25.0
	No herbicide	2	1.4
October 9, 2003	(all plants)	36	12.5
	Herbicide	35	24.3
	No herbicide	1	0.7
October 13, 2004	(all plants)	36	12.5
	Herbicide	35	24.3
	No herbicide	1	0.7
November 2, 2005	(all plants)	35	12.2
	Herbicide	34	23.6
	No Herbicide	1	0.7
November 1, 2006	(all plants)	35	12.2
	Herbicide	34	23.6
	No Herbicide	1	0.7
October 10, 2007	(all plants)	31	10.8
	Herbicide	30	20.8

	No Herbicide	1	0.7

Table 2. A listing of the number of plants found in rows from 1999 to 2007. Percent survival is also listed.

TUBLING PLANTS IN ROWS

Date	**Number of Plants**	**% Survival**
May 6, 1999 (Planted)	716	-
November 10, 1999	151	21.1
September 26, 2000	130	18.2
November 7, 2001	122	17.0
October 4, 2002	118	16.5
October 9, 2003	113	15.8
October 13, 2004	115	16.1
November 2, 2005	114	15.9
November 1, 2006	114	15.9
October 10, 2007	93	13.0

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
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December – 2007
By: Dr. Gary L. Noller

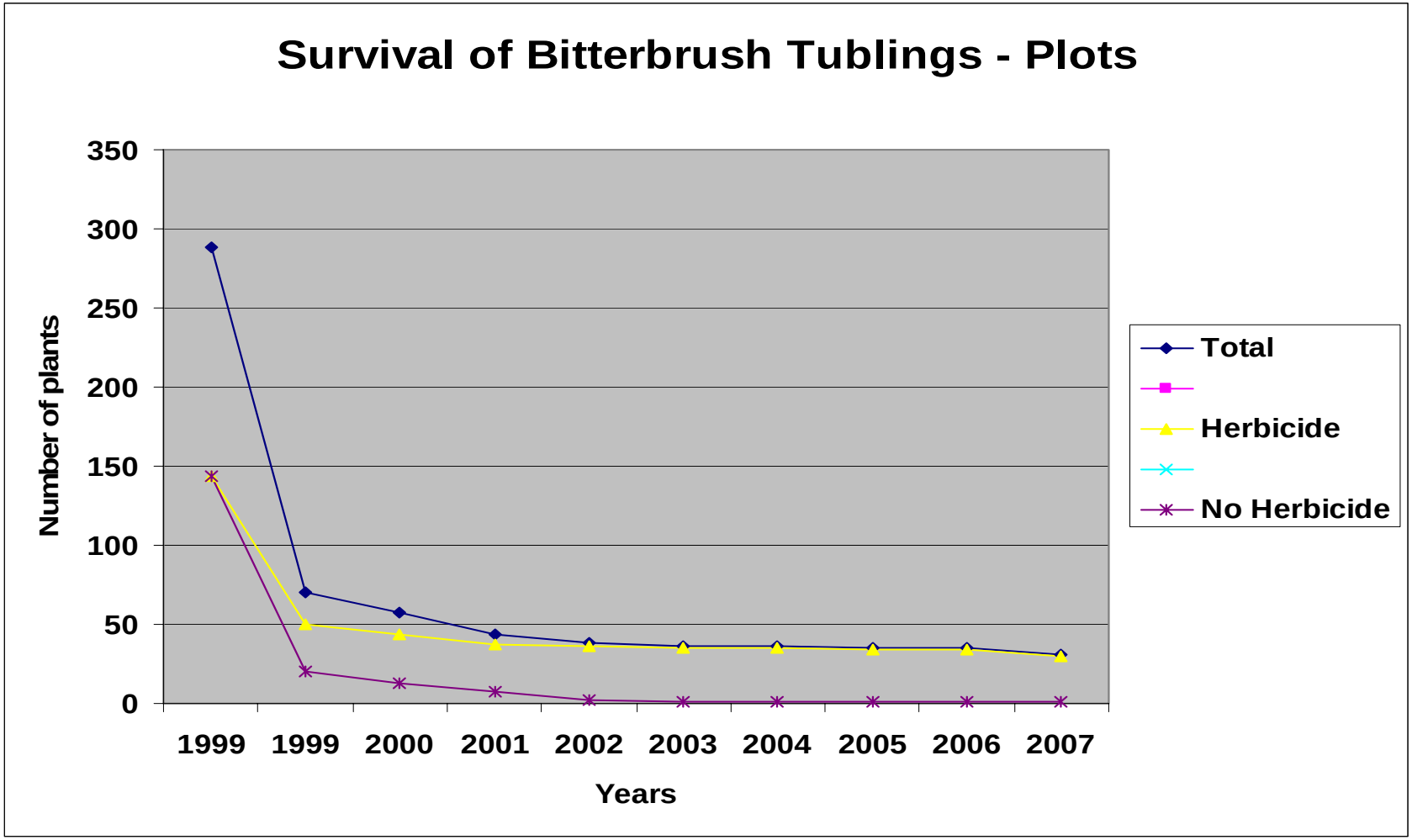

Fig. 1.
Survival of bitterbrush tublings in plots is shown. Bitterbrush tublings are shown as total plants (with and without herbicide), tublings with no herbicide, and tublings that had herbicide (Roundup Ultra at 2 quarts/Ac in a four foot strip prior to planting) to reduce competition. The figure shows that survival, three years after planting (2002), is relatively stable to 2007.

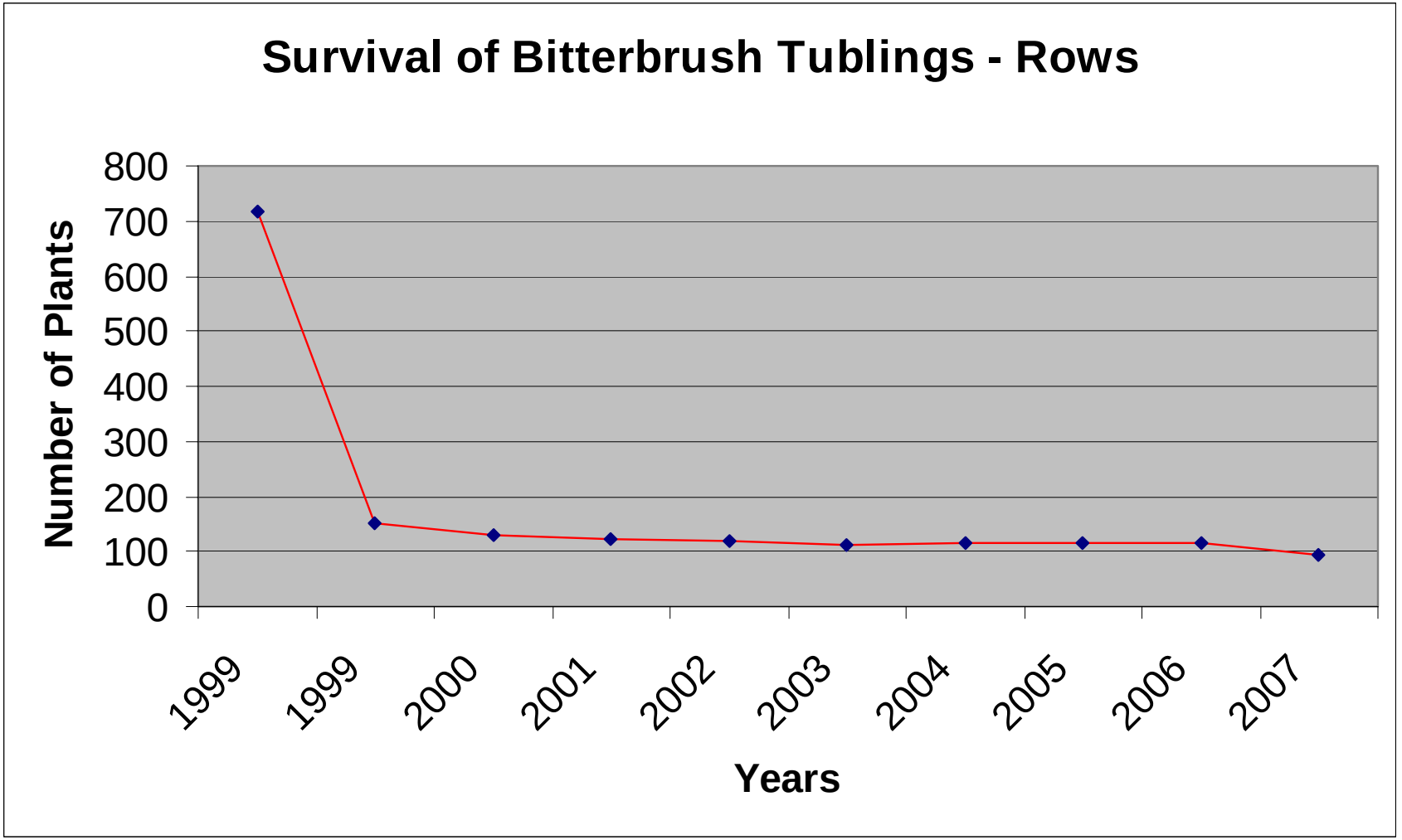

Fig. 2.
Survival of bitterbrush tublings in rows. Herbicide was applied to all rows to reduce competition. Survival three years after planting (2002), has remained relatively stable to present.

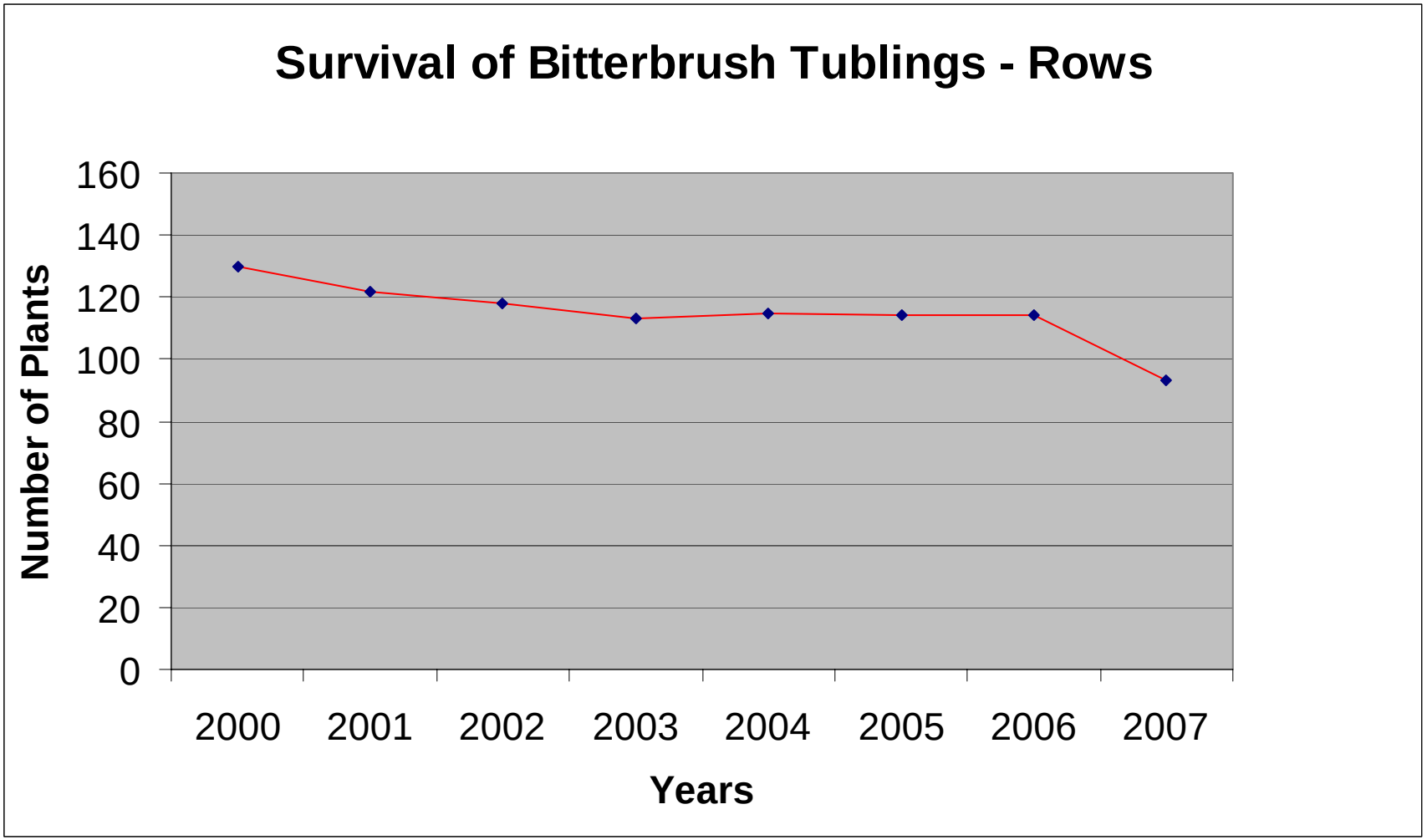

Fig. 3.
This figure is an attempt to emphasize the changes in survival from the fall of 1999 to 2002. And to show that survival was relatively stable from 2002 to 2007.

Project 08S078Z
Report-2007
By: Manuel Rosales and Gary Noller

Seed increase of 9021438 Saskatoon Serviceberry

OBJECTIVE

To produce seed for additional testing and release of the accession 9021438.

INTRODUCTION

Saskatoon serviceberry *Amelanchier alnifolia* is a native shrub found in the Northern Great Plains and Northern Rocky Mountains. It is deciduous with numerous erect stems and gray to brown bark. Twigs are dark gray to reddish brown. Leaves are alternate, ovate with dentate margins. Flowers are a showy white and the fruit is a small, red to dark purple pome. The flowers and fruits are borne in terminal clusters. Each fruit can contain from 4 to 10 seeds, some of which might be infertile. The shrub is relatively slow growing, long lived and can reproduce by seed or root sprouts. Vegetative reproduction by sprouting is most common for *Amelanchier* species. Seeds are dormant and require cold moist stratification to break dormancy. Viability of seeds is good and it has been reported to remain viable for 10 years or more. Accession 9021438 was collected in 1975 from Long's Ridge near Parachute Creek in Garfield County, Colorado, at an elevation of about 8100 ft. It has good vigor, foliage production, survival, with an upright growth form and almost no root sprouts. It has had light use by wildlife at Upper Colorado Environmental Plant Center (UCEPC). The accession has the potential for use in critical area stabilization, mined land reclamation, range and wildlife habitat improvement plantings, as a living snow fence, and in xeriscape plantings.

EXPERIMENTAL DESIGN

This study is a non–replicated test.

MATERIALS & METHODS

Accession 9021438 is a selection from the original nursery planted at UCEPC in August 8, 1977. The accession was selected as a superior performer among 14 different accessions of serviceberry.

On May 19, 1984, the accession was planted in field 3 at UCEPC. Tubling (container-grown) plants were transplanted by hand and spaced 15 ft apart in one row. Two of the tublings died and were replaced in 1986. The planting receives no supplemental water.

RESULTS

The planting was evaluated from 1985 to 1992. Information from these evaluations can be found in the reports for these years. Seed has been collected from the project since 1993. Seed production is listed in the following table.

Serviceberry Seed Collected from Accession 9021438. UCEPC 1993-2007.

Year	Area Harvested-Acres	Harvest Date	Clean Seed lb
1993	0.25		2.88
1994	0.25		0.88
1995	0.25		1.77
1996	0.25	No harvest	
1997	0.25		0.29
1998	0.25	7/30	0.18
1999	0.25	No harvest	
2000	0.25	7/20 – 8/9	0.62
2001	0.25	No harvest	
2002	0.25	No harvest	
2003	0.25	7/10 - 8/13	2.64
2004	0.25	No harvest	
2005	0.25	1/6/06	0.80
2006	0.25	No harvest	
2007	0.25	8/7	1.00

Serviceberry *Amelanchier* spp. intergrades and hybridizes easily, making species identification difficult. Saskatoon serviceberry *Amelanchier alnifolia* has been successfully crossed with many other species of serviceberry in the laboratory.

During 2005, plant samples were sent to Colorado State University for identification of accession 9021438 of serviceberry as a preparation for release. Colorado State University identified the accession as ***Amelanchier utahensis***. In addition, in 2007 plant specimens were sent to the Intermountain Herbarium at Utah State University. The Herbarium at Utah State University confirmed that accession 9021438 was ***Amelanchier utahensis*** and not *Amenlanchier alnifolia* as it has been recorded at the Center. The accession 9021438 is planned to be released as *Amenlanchier utahensis* in 2008.

PROJECT 08S213
Report - 2007
By: Steve Parr

Large-Scale Increase of 9043501 Salina Wildrye *Leymus salinus*

OBJECTIVE

To increase seed (pre-cultivar with seed increase and technology development) for foundation material as well as field plantings, Off-Center trials, and Inter-Center Strain Trials.

INTRODUCTION

Salina wildrye has been identified as one of the most important grasses native to the Upper Colorado Region. It has been rated by the Upper Colorado Environmental Plant Center (UCEPC) Advisory Committee as a high priority for coal mined lands, roadside stabilization, surface disturbed areas, and areas of heavy use.

Harrington, 1954, lists *Leymus ambiguus* (Colorado wildrye) and *Leymus salinus* (Salina wildrye) as occurring 5200 to 8500 feet in elevation primarily in central and northwestern Colorado. Both species are perennial, cool-season bunchgrasses with culms standing between 30 to 50 cm. tall. *Leymus ambiguus* is often found on open slopes, canyons, and rocky hillsides in Colorado, Montana, and Utah. *Leymus salinus* is found on rocky slopes, sagebrush hills, and saline soils in Wyoming, Idaho, Utah, Arizona, and Colorado.

The Soil Conservation Service range site manual lists *Leymus salinus* as a component of shale sites in Utah, often associated with Pinyon-Juniper or mountain brush in 15-inch precipitation zones. Colorado range sites with *Leymus salinus* are described as clayey slopes, clayey salt desert, and semi-desert loams above l2 inches of precipitation.

Leymus salinus was described by Dr. Kay Assay, ARS, Logan, UT, as actively hybridizing with other wildryes. The hybrid from this crossing is sterile. The species is wind pollinated. In general, the species is weak to establish and tends to produce poor quality seed that has some inherent dormancies. However, once established, the species tends to be very persistent and vigorous.

Over a five year period (1987 - 1992), accession 9043501 was consistently evaluated as superior in UCEPC Initial Evaluation 08I114. Project 08I114 consisted of five randomized replications, each of which contained five plants per accession of 31 accessions. 'Prairieland' *Leymus angustus* (altai wildrye) was included in the trial for comparison. In 1994, Project 08I114 was removed from UCEPC.

In addition to the field trial, a germination trial was conducted in 1987 at UCEPC for 38 accessions of *Leymus salinus.* In general, 50% of the seed from filled lots germinated within two days after being removed from a 20 day stratification period and being placed in the germinator.

An Advanced Evaluation for *Leymus salinus,* 08Al58, was installed by UCEPC in 1987. One block of 12 plants per accession was established in Field 25 using 27 accessions. Forage tendencies, as well as general notes concerning vigor, were taken for the planting from 1987 to 1992. Similar to the Initial Evaluation accession 9043501 was judged to be superior. Evaluation 08A158 was removed in 1994 from UCEPC.

As result of its superior performance in the Initial and Advanced Evaluations, a seed and plant increase for accession 9043501 was initiated in 1993 and 1994. In addition, in 1993 vegetative samples for the accession were sent to Utah State University for species confirmation. It was determined that accession 9043501 represents *Leymus salinus.*

PROJECT 08S213
Report - 2007
By: Steve Parr

METHODS

In 1993, a 0.10 acre increase field for accession 9043501 was established by seed in the UCEPC Headquarters Nursery utilizing seed from the original Kaiser Steel of Price, UT, and a Planet Junior. Although establishment has been slow, the planting has filled in quite nicely from residual germination.

In 1994, culms were lifted from the UCEPC Field 25 08I114 and 08A158 plantings and established in Field 4. Survival for the transplanted culms appears to have been 100%. Plants were established on three-foot centers. Either seed, or perhaps, the plants themselves, will be planted/transplanted from the headquarters nursery to Field 4 in 1995.

In 2004, a new planting was conducted on July 29, 2004. Four rows (or 0.13 acre) were planted with a hand pushed Planet Junior. Additional treatments for 2005 included a spring burn and an herbicide treatment to open up spaces between established plants.

RESULTS

No appreciable seed has been harvested to date from either the breeder or foundation fields. Seed production records are provided in Table 1, from the initiation of the seed increase project to present. Since seed production has been poor for this accession, alternative cultural management practices will be investigated over several years to find out if seed production can be increased.

Table 1. Seed Production Records of Two Salina Wildrye Fields at UCEPC. Accession No. 9043501 Project No. 08S213.

Year	Acres	Harvest Date	Field No.	Cleaned Weight	
1996	0.02	7/22	Hqts.	154.00	g
1996	0.10(B)	7/22	4	631.00	g
1996	0.20(F)	Planted	4	No harvest	
1997	0.02	Field plowed	Hqts.	No harvest	
1997	0.10(B)	7/21	4	2.96	lb
1997	0.20(F)	7/21	4	5.32	lb
1998	0.10(B)	8/4	4	4.00	lb
1998	0.20(F)	8/4	4	9.00	lb
1999	0.10(B)	7/15	4	22.00	g
1999	0.20(F)	7/15	4	32.00	g
2000	0.10(B)	No harvest	4	--	
2000	0.20(F)	7/7	4	6.00	g
2001	0.20(F)	7/9	4	174.00	g
2001	0.10(B)	7/9	4	227.00	g
2002	0.10(B)	7/11	4	7.00	g
2002	0.20(F)	7/11	4	23.00	g
2003	0.10(B)	7/9	4	1.69	lb
2003	0.20	7/9	4	0.60	lb
2004	0.10(B)	7/9	4	19.00	g
2004	0.20(F)	7/9	4	146.00	g
2004	0.13	New planting	4	No harvest	
2005	0.13	New planting	4	No harvest	
2005	0.10(B)	7/13	4	1.4	lb
2005	0.20(F)	7/13	4	302	g
2006	0.10 (B)	7/12	4	2	g
2006	0.30 (F)	7/13	4	7	g
2006	0.13(F-2)	7/13	4	76	g
2007	0.10 (B)	7/13	4	296	g
2007	0.30(F-2)	7/11	4	5.5	lb

* B=Breeder field, F = Foundation field, F-2 = Foundation field second planting

PROJECT 08S213
Report - 2007
By: Steve Parr

In spring of 2005, two sections of the foundation field were chosen to conduct some preliminary testing to enhance seed production. A west section block, approximately 20 x 18 ft, was treated with herbicide-Round-Up, and an east block about 120 x 18 ft was burned with a torch. The purpose of the **herbicide treatment was** to thin out some of the old stand and get spaced plants at about 3 x 3 ft in contrast to an existing crowded solid row of plants. The **burning treatment** was to determine if invigorating the plants by burning and getting rid of old plant material (thatch) might also induce better seed production. The herbicide Round-Up was applied May 9, 2005, at the rate of 1-quart /25 gallons of water (1% solution).

Evaluations for 2005: On June 7, 2005, **the herbicide** section was evaluated. Round-up worked very well leaving spaced grass bunches at about 3 x 3 ft as expected, however, no seed set difference was observed between the treated and untreated plants, perhaps because the treatment was done when the plants had already spent a lot of energy in spring growth. The **burned area** showed a more vigorous re-growth after the burning, and also did an excellent job of getting rid of dead plant material. However, no difference in seed set was observed between unburned and burned plants. Burned plants did however, look greener and healthier.

Evaluations for 2006: Breeder and foundation fields were harvested during July 12-13. See Table 1 for amount of seed harvested. The new planting done on July 29, 2004, produced the most seed in 2006, and we hope seed production will be better in 2007, since the planting is new and plants are not crowded yet. The section that was treated with herbicide had more seed heads than the un-sprayed section, however, seed fill was poor. This might indicate that the salina wildrye might need plenty of space to get into the reproductive mode. The same trend was observed in the new planting, plants that had more ground available had more seed heads. The next step is to set up a trial to compare space plants versus solid row planting to determine if lack of space is what has been hindering seed production in this accession of salina wildrye.

Evaluations for 2007: Substantial differences were noted on the “foundation” field plantings. The old planting had very few seed heads, and most of those were again on the most southern row (next to fallow ground). The new planting, however, had abundant seed heads. This year represented the second highest seed production for salina wildrye, and only four rows contributed any appreciable seed. In essence, each row produced approximately 1.25 pounds of clean seed. In addition, the field was swathed and picked up by hand. This harvest method very likely resulted in reduced seed capture compared to direct combining.

CONCLUSIONS

Unquestionably, the younger seed field with less crowded plants, and possibly greater vigor, produce substantially more seed than the older portion of the field. Whether the improved production is a result of a younger field, less crowding among individual plants and roots, or a combination of both, will be investigated with the design of future salina wildrye studies.

Project COPMC-F-0202-OT
Project Report-2007
By: Terri Blanke

Inter-Center Planting of Sweetgrass

OBJECTIVE

To compare and evaluate regionally collected *S*weetgrass, *Hierochloe odorata,* as a culturally significant plant.

INTRODUCTION

Four Northern Plains Region Plant Material Centers compared six sources of Sweetgrass: Accession # 9039770, # 9050243, #9070225, #9063351, #9063128, and South Dakota Radora. The variety 'Radora' was used as the standard variety for comparison. The information obtained was to be used to evaluate genetic variability and recommend potential areas of adaptation for local collections.

EXPERIMENTAL DESIGN

Initial evaluation in rod rows, ten plants per row.

MATERIALS & METHODS

Each PMC exchanged a minimum of ten potted (or cone-tainerized) sweetgrass plants of their local plant material. Bismarck PMC provided ten plants of 'Radora' sweetgrass. Materials were shipped May 15, 2002 (approx.).

Notes on initial establishment at the Colorado PMC are recorded in the 2002 Annual Technical Report.

In June of 2006, five collections of sweetgrass, South Dakota, Montana, North Dakota, Kansas, and Colorado were hand dug, soaked, and separated. The individual collections' roots were covered with moist sphagnum moss to prevent drying out, rolled in damp newspaper, and finally sealed in a plastic bag. They were then shipped to Vicki L. Bradley, Agronomy Curator at the Western Regional Plant Introduction Station in Pullman, Washington. These accessions were supplied for germplasm storage.

RESULTS

Plot design, initial evaluation, follow up evaluation, and discussion are in the 2003 Annual Technical Report. A final evaluation was performed in September of 2007 by Dr. Gary Noller and Terri Blanke. Neither plot has been cultivated for two years. The sweetgrass is competing with several weed varieties, mostly Canada thistle. The sweetgrass receives ditch water that is applied with a sprinkler system about two times a summer. Approximately one gram of seed was harvested and cleaned from the headquarters plot on September 12, 2007. The table below shows the final evaluation and results after five years.

Project COPMC-F-0202-OT
Project Report-2007
By: Terri Blanke

SWEETGRASS EVALUATION

The table represents the five year performance of six regional sources of Sweetgrass, *Hierochloe odorata* at Upper Colorado Environmental Plant Center's headquarters.

E
N + S

September 12, 2007

W

Block #1

Accession	*Survival*†	*Vigor*†	*Seed Culms*†	*Leaf Height*	*Weed Suppression*†	*Overall Rating*†
South Dakota 'Radora'	1	3	3	24"	3	3
Michigan 9070225	3	1	1	26"	3	3
Montana 9063351	5	3	3	22"	5	5
North Dakota 9063128	5	3	5	20"	5	5
Kansas 9050243	1	1	3	25"	1	1
Colorado 9070988	3	3	7	23"	1	3

†Ratings : 1-excellent, 3-good, 5-fair, 7 poor, 9-none.

Block #2

Accession	*Survival*†	*Vigor*†	*Seed Culms*†	*Leaf Height*	*Lack of Weeds*†	*Overall Rating*†
Michigan 9070225	1	1	1	31"	5	1
Montana 9063351	5	5	5	24"	5	5
Kansas 9050243	5	5	5	24"	1	5
North Dakota 9063128	5	5	3	21"	3	5
Colorado 9070988	7	5	5	21"	5	5
South Dakota 'Radora'	1	1	7	26"	3	3

†Ratings : 1-excellent, 3-good, 5-fair, 7 poor, 9-none.

CONCLUSION

Generally, survival was excellent. The plots did not receive much attention. The East and West sides of the plots have edge effect. Phenotypic characteristics are still not evident. Canada thistle is invading the Michigan sweetgrass along the East edge of block #2 but it continues to survive.

Project COPMC-F-0501-CR
Final Report-2007
By: Manuel Rosales

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 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

Eleven rhizomatous grasses, 31 bunch type grasses, and seven Rye grasses were seeded on October 27-28, 2004. 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 ft with four rows per plot (two ft between rows). The site is located about ten miles southeast of the city 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 average precipitation in this area is 5-10 inches annually with an elevation of about 5000 ft. The site will not be irrigated.

Project COPMC-F-0501-CR
Final Report-2007
By: Manuel Rosales

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

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
Rhizomatous Grasses				
1	Rush	Intermediate Wheatgrass	*Elytrigia intermedia*	Aberdeen , ID
2	Schwendimar	Thickspike Wheatgrass	*Elymus lanceolatus*	Pullman, WA
3	Critana	Thickspike Wheatgrass	*Elymus lanceolatus*	Bridger, MT
4	Arriba	Western Wheatgrass	*Pascopyrum smithii*	Meeker, CO
5	Volga	Mammoth Wildrye	*Leymus racemosus*	Meeker, CO
6	TH-2 Intermediate	Intermediate Wheatgrass	*Elytrigia intermedia*	ARS-Logan, UT
7	Rosana	Western Wheatgrass	*Pascopyrum smithii*	Bridger, MT
8	Sodar	Streambank Wheatgrass	*Elymus lanceolatus*	Aberdeen , ID
9	Viva**	Galleta Grass	*Pleuraphis jamesii*	Los Lunas, NM
10	Bannock	Thickspike Wheatgrass	*Elymus lanceolatus*	Aberdeen , ID
11	Manska	Intermediate Wheatgrass	*Elytrigia intermedia*	Bismarck, ND
Bunch Grasses				
12	Expedition	Snake River Wheatgrass	*E. lanceolatus spp.* wawawaiensis	ARS-Logan, UT
13	White River	Indian Ricegrass	*Achnatherum hymenoides*	ARS-Logan, UT
14	Ephraim	Crested Wheatgrass	*Agropyron cristatum*	Aberdeen, ID
15	Nordan	Crested Wheatgrass	*Agropyron cristatum*	Bismarck, ND
16	High Plains**	Bluegrass	*Poa secunda*	Bridger, MT
17	Pryor	Slender Wheatgrass	*Elymus trachycaulus*	Bridger, MT
18	Paloma	Indian Ricegrass	*Achnatherum hymenoides*	Los Lunas, NM
19	Salado**	Alkali Sacaton	*Sporobolus airoides*	Los Lunas, NM
20	Bad River**	Blue Grama	*Bouteloua gracilis*	Bismarck, ND
21	9092261-Northwest	Junegrass	*Koeleria macrantha*	Meeker, CO
22	Anatone	Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Aberdeen, ID
23	Tusas	Bottlebrush Squirreltail	*Elymus elymoides*	Los Lunas, NM
24	Lodorm	Green Needlegrass	*Stipa viridula*	Bismarck, ND
25	Columbia bunch	Bluebunch Wheatgrass	*Pseudoroegneria spicata*	ARS-Logan, UT
26	Alma**	Blue Grama	*Bouteloua gracilis*	Los Lunas, NM
27	Goldar	Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Aberdeen, ID
28	Whitmar	Beardless Wheatgrass	*Pseudoroegneria spicata*	Pullman, WA
29	Niner	Sideoats Grama	*Bouteloua curtipendula*	Los Lunas, NM
30	Wapiti (Buford)	Bottlebrush Squirreltail	*Elymus elymoides*	Meeker, CO
31	Badlands	Blue Gramma	*Bouteloua gracilis*	Bismarck, ND
32	Vaughn	Sideoats Grama	*Bouteloua curtipendula*	Los Lunas, NM
33	Pueblo	Bottlebrush Squirreltail	*Elymus elymoides*	Meeker, CO
34	Rimrock	Indian Ricegrass	*Achnatherum hymenoides*	Bridger, MT
35	San Luis	Slender Wheatgrass	*Elymus trachycaulus*	Meeker, CO
36	Hycrest	Crested Wheatgrass	*Agropyron cristatum*	Aberdeen, ID
37	Douglas	Crested Wheatgrass	*Agropyron cristatum*	Aberdeen, ID
38	P-7	Bluebunch Wheatgrass	*Pseudoroegneria spicata*	ARS-Logan, UT
39	Secar	Snake River Wheatgrass	*E. lanceolatus spp.* wawawaiensis	Pullman, WA
40	Covar**	Sheep Fescue	*Festuca ovina*	Pullman, WA
41	Newhy	Hybrid Wheatgrass	*Elymus hoffmanni*	Aberdeen, ID

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
42	Vavilov	Siberian Wheatgrass	*Agropyron fragile*	Aberdeen, ID
Rye Grasses				
43	9043501	Salina Wildrye	*Leymus salinus*	Meeker, CO
44	L-45	Basin Wildrye Cross	*Leymus cinereus*	ARS-Logan, UT
45	Bozoisky	Russian Wildrye	*Psathyrostachys juncea*	Bridger, MT
46	Trailhead	Basin Wildrye	*Leymus cinereus*	Bridger, MT
47	Magnar	Basin Wildrye	*Leymus cinereus*	Aberdeen, ID
48	Mankota	Russian Wildrye	*Psathyrostachys juncea*	Bismarck, ND
49	L-46	Basin Wildrye/Creeping Cross	*Leymus cinereus*	ARS-Logan, UT

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

RESULTS

Year 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.

Year 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 during the fall of 2006, 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) done in 2006 for percent plant stand and vigor are summarized in Table 2.

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

Cultivar	Common Name	% Plant Stand*	Plant Vigor**
Rhizomatous Grasses			
Critana	Thickspike Wheatgrass	35.0	2.3
Sodar	Streambank Wheatgrass	32.5	1.5
Bannock	Thickspike Wheatgrass	30.5	1.8
Schwendimar	Thickspike Wheatgrass	27.0	2.0
Rosana	Western Wheatgrass	20.2	1.8
Rush	Intermediate Wheatgrass	15.5	1.3
Arriba	Western Wheatgrass	9.0	1.3
TH-2 Intermediate	Intermediate Wheatgrass	6.3	1.0
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	45.0	1.8
Douglas	Crested Wheatgrass	40.0	1.8
Anatone	Bluebunch Wheatgrass	32.5	2.0
Columbia bunch	Bluebunch Wheatgrass	31.5	1.5
P-7	Bluebunch Wheatgrass	29.5	2.0
Whitmar	Beardless Wheatgrass	23.3	2.0
San Luis	Slender Wheatgrass	22.8	1.5
Pryor	Slender Wheatgrass	20.0	1.5
Hycrest	Crested Wheatgrass	18.8	2.0
Newhy	Hybrid Wheatgrass	13.5	1.5
Goldar	Bluebunch Wheatgrass	7.5	1.5
Ephraim	Crested Wheatgrass	7.0	2.3
White River	Indian Ricegrass	1.7	1.3
Tusas	Bottlebrush Squirreltail	1.0	1.3
Niner	Sideoats Grama	0.8	1.3
Wapiti (Buford)	Bottlebrush Squirreltail	0.8	1.0
Pueblo	Bottlebrush Squirreltail	0.8	0.8
Rimrock	Indian Ricegrass	0.8	1.0
High Plains	Bluegrass	0.5	0.8
Salado	Alkali 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	65.0	1.5
Trailhead	Basin Wildrye	60.0	1.5
L-46	Basin Wildrye/Creeping Cr.	51.2	2.0
Bozoisky	Russian Wildrye	38.8	1.8
Magnar	Basin Wildrye	37.5	1.5
Mankota	Russian Wildrye	8.0	1.5
9043501	Salina Wildrye	3.8	1.3

*** Percent plant stand, visual evaluation based on number of plants per plot (four rows/plot)**
Ex: Four complete rows = 100 percent
**** Vigor visual evaluation where 1 = Very vigorous, 2= Moderately vigorous, 3 = weak**

Year 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 by UCEPC.

Cultivar	Common Name	% Plant Stand* Year-2006	% Plant Stand Year-2007
Rhizomatous Grasses			
Critana	Thickspike Wheatgrass	35.0	7.3
Sodar	Streambank Wheatgrass	32.5	2.8
Bannock	Thickspike Wheatgrass	30.5	0.3
Schwendimar	Thickspike Wheatgrass	27.0	0.8
Rosana	Western Wheatgrass	20.2	1.0
Rush	Intermediate Wheatgrass	15.5	2.0
Arriba	Western Wheatgrass	9.0	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
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	45.0	3.8
Douglas	Crested Wheatgrass	40.0	5.6
Anatone	Blue Bunch Wheatgrass	32.5	0.3
Columbia bunch	Blue Bunch Wheatgrass	31.5	4.3

Cultivar	Common Name	% Plant Stand* Year-2006	% Plant Stand Year-2007
P-7	Blue bunch Wheatgrass	30.0	3.0
Whitmar	Beardless Wheatgrass	23.3	1.0
San Luis	Slender Wheatgrass	22.8	0
Pryor	Slender Wheatgrass	20.0	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	0.5
White River	Indian Ricegrass	1.7	0
Tusas	Bottlebrush Squirreltail	1.0	0
Niner	Sideoats Grama	0.8	0
Wapiti	Bottlebrush Squirreltail	0.8	0
Pueblo	Bottlebrush Squirreltail	0.8	0
Rimrock	Indian Ricegrass	0.8	0.5
High Plains	Bluegrass	0.5	0
Salado	Alkali 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 Grama	0	0
Vaughn	Sideoats Grama	0	0
Covar	Sheep Fescue	0	0
Rye Grasses			
L-45	Basin Wildrye Cross	65.0	16.0
Trailhead	Basin Wildrye	60.0	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	0.8
9043501	Salina Wildrye	3.8	0.3

***Percent plant stand, visual evaluation based on number of plants per plot (four rows/plot)**
Ex: Four 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 rye grass species did the best in establishment, followed by the wheatgrasses. Unfortunately, the study could not be continued for a few years more to determine which grasses could out compete Russian Knapweed, however, judging from plant establishment it looks like the rye grasses 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 Squirreltail	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 Squirreltail	Covar - Sheep Fescue
L-45 - Basin Wildrye Cross	Secar – Snake River Wheatgrass	Critana - Thickspike Wheatgrass	Arriba - Western Wheatgrass	Pueblo - Bottlebrush Squirreltail	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	

Project COPMC-F-0504-PA
Report 2007
Report by: Steve Parr

False Quackgrass Performance Trial

INTRODUCTION

Native, perennial, drought adapted, palatable species are high on the list of desirable products for land owners as well as land managers. In 2001, a landowner from Moffat County, Colorado, brought samples of a grass he said his horses particularly preferred when grazing a specific pasture. He also indicated that his father had noted the same behavior in the same pasture on the same ranch many, many years before passing along his observation. So, Lynn Bower wanted to find out what species he had that his horses found so palatable and if the plant center was interested in increasing, observing or otherwise working with this plant. He also told Upper Colorado Environmental Plant Center (UCEPC) that his father called it "false quackgrass". Dr. Gary Noller, UCEPC Senior Scientist at the time, and Steve Parr, UCEPC Manager, identified taxonomically that the specimen that Lynn brought to us was indeed "false quackgrass". Neither Dr. Noller nor Steve Parr had any familiarity with the species whatsoever, so the project was not initially a high priority. Lynn invited us out to his place to collect some plants that we could transplant at UCEPC. Three years later, in the fall of 2004, UCEPC personnel collected sods from Lynn's place and transplanted individual plugs in a spaced planting and a single row in November 2004.

OBJECTIVE

The objective of the project is to evaluate the potential for the material to be used in pasture renovation, riparian enhancement, and also livestock and wildlife habitat improvement projects through the use of transplants or seed.

METHODS

Individual plugs were separated from sod collected at Lynn Bower's ranch in Moffat County. Plugs were planted approximately one foot apart in rows approximately 15 feet long. A single row on the south end of the plot was plugged without spacing. No supplemental water has been added to the project and plots have been maintained weed free.

In the fall of 2007, harvested seed was sent to Dr. Richard Wang, ARS Logan, Utah, to identify species from root tip chromosome counts. Earlier, we had Dr. Mary Barkworth, Utah State University Herbarium Curator, identify our specimen. Her taxonomic attempts were inconclusive, and suggested we contact Dr. Wang. Dr. Barkworth felt the specimen was possibly a hybrid because it is rhizomatous which, besides *E. pseudorepens,* places it into one of three possible species for consideration; *Elymus repens, E. lanceolatus,* or *Pascopyrum smithii.* She did not feel it was conclusively any of the four. Because the tribe hybridizes readily, she suggested we have the chromosome number identified. *E. repens* is a hexaploid while *E. albicans* is a tetraploid. She also felt *E. pseudorepens* was very likely a tetraploid, but did not confirm that.

RESULTS

If the material is a hexaploid, we will very likely drop the project. If it is not, we may add some complexity to the project. The material we sent to Dr. Barkworth and to Dr. Wang is not the same material that Dr. Noller and Steve Parr identified. The original diagnosis of a false quackgrass specimen had no awns, and the original specimen remains at the center. The plants growing in our plots are awned. Because there were no seed heads to identify the sod that was used to transplant the material at UCEPC, we very likely transplanted a separate species. Only a site visit to collect headed out specimens would prevent a similar mistake.

CONCLUSION

False quackgrass is a native species in Colorado and has many desirable attributes for plant development. Quackgrass, on the other hand, is an aggressive, non-native weedy grass with undesirable characteristics. Depending on the findings of Dr. Wang, our product can be increased and developed further. We also have the option of recollecting sods from known "false quackgrass" types at Lynn Bower's ranch.

Project COPMC-F-0505-PA
Report-2007
By: Manuel Rosales & Patrick Davey

Boulder County Open Space Demo

OBJECTIVE

To demonstrate to land owners, land managers, and area Field Office employees some of the attributes of various selected plant materials

INTRODUCTION

Boulder County, Colorado, has an area of 753 square miles with 475,000 acres. The terrain in Boulder County is very diverse, including: plains, foothills grasslands, forest montane and alpine zones. This demonstrational planting was set up in cooperation with Boulder County Parks & Open Space, Longmont USDA-NRCS Field Office, Longmont and Boulder County Conservation Districts, Colorado State University Boulder Extension Service, and the Arkansas Valley and Pawnee Buttes Seed companies. The purpose of the planting is to demonstrate the potential of a variety of native grasses and some introduced grasses for Pasture and Hayland purposes as well as for other uses such as Prairie restoration, prevention of noxious weeds, xeriscaping, etc., in Boulder County and nearby counties in Colorado. The Planting will also be used for educational purposes.

EXPERIMENTAL DESIGN

This is a non replicated planting.

MATERIALS & METHODS

A total of 65 entries were seeded on March 7-9, 2005: Fifty-seven single grass species (41 native & 16 non-native), six grass-mixtures, and one legume (planted at two seeding rates). The seeder was a 16-row FLEX-II Truax. Rows were spaced about 7.5 inches apart. The plot size is 20 x 100 ft with 32 rows per plot. The rate of seeding was based on the recommended Pure Live Seed rate/acre per species. Small and fluffy seeded grasses were enhanced with number-1 rice hulls to provide a better flow through the drill. The site is located on Boulder County land north of Denver. The planting will be maintained as dry-land.

A list of all the entries is presented in the following table:

Table 1. List of 65 entries for the demonstrational planting

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
Single Grass Species				
1	Cheyenne	Indiangrass (ws)**	*Sorghastrum nutans*	Arkansas Valley Seed Co
2	9005439	Switchgrass (ws)	*Panicum virgatum*	Bridger, PMC
3	Dacotah	Switchgrass ((ws)	*Panicum virgatum*	Bismarck, PMC

Project COPMC-F-0505-PA
Report-2007
By: Manuel Rosales & Patrick Davey

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
4	Kaw	Big Bluestem (ws)	*Andropagon geradii*	Arkansas Valley Seed Co
5	Bonilla	Big Bluestem(ws)	*Andropagon gerardii*	Bismarck, PMC
6	Pawnee	Big Bluestem(ws)	*Andropagon gerardii*	Arkansas Valley Seed Co?
7	Lodorm	Green needlegrass	*Nasella viridula*	Bismarck, PMC
8	Aldous	Little bluestem (ws)	*Schyzachyrium scoparium*	Arkansas Valley Seed Co
9	Camper	Little bluestem (ws)	*Schyzachyrium scoparium*	Arkansas Valley Seed Co
10	Pastura	Little bluestem (ws)	*Schyzachyrium scoparium*	Arkansas Valley Seed Co
11	Niner	Side oats grama (ws)	*Bouteloua curtipendula*	Los Lunas, PMC
12	BSOG-02B	Side oats grama (ws)	*Bouteloua curtipendula*	
13	El Reno	Side oats grama (ws)	*Bouteloua curtipendula*	Manhattan, PMC
14	Hachita	Side oats grama (ws)	*Bouteloua curtipendula*	Los Lunas, PMC
15	Bad river	Side oats grama (ws)	*Bouteloua curtipendula*	Bismarck, PMC
16	Lovington	Side oats grama(ws)	*Bouteloua curtipendula*	Los Lunas, PMC
17	Texoca	Buffalograss (ws)	*Buchloe dactyloides*	Arkansas Valley Seed Co
18	Viva	Galleta grass(ws)	*Peuraphis jamesii*	Los Lunas, PMC
19	9092261	Prairie Junegrass (cs)	*Koelaria macrantha*	Meeker, PMC
20	Covar	Sheep fescue (cs)	*Festuca ovina*	Arkansas Valley Seed Co
21	Redondo	Arizona fescue (cs)	*Festuca arizonica*	Meeker, PMC
22	Sherman	Big bluegrass (ws)	*Poa secunda*	Arkansas Valley Seed Co
23	Rimrock	Indian ricegrass (cs)	*Achnatherum hymenoides*	Bridger, PMC
24	Paloma	Indian ricegrass (cs)	*Achnatherum hymenoides*	Los Lunas, PMC
25	Tusas	Squirretail (cs)	*Elymus elymoides*	Los Lunas, PMC
26	San Luis	Slender wheatgrass (cs)	*Elymus trachycaulus*	Meeker, PMC
27	Pryor	Slender wheatgrass (cs)	*Elymus trachycaulus*	Bridger, PMC
28	Volga	Mammoth wildrye (cs)	*Leymus racemosus*	Meeker, PMC
29	UNIDENTIFIED	Needle & thread (cs)	*Hesperostipa comata*	Arkansas Valley Seed Co
30	Climax	Timothy (cs)	*Phleum pratense*	Arkansas Valley Seed Co
31	Paiute	Orchard grass(cs)	*Dactylis glomerata*	Aberdeen, PMC
32	Renegade	Orchard grass (cs)	*Dactylis glomerata*	Arkansas Valley Seed Co.
33	Salado	Alkali sacaton (ws)	*Sporobolus airoides*	Los Lunas, PMC
34	Fawn	Tall fescue (cs)	*Festuca arundinacea*	Arkansas Valley Seed Co.
35	Trailhead	Basin wildrye (cs)	*Leymus cinerus*	Bridger, PMC
36	Magnar	Basin wildrye (cs)	*Leymus cinerus*	Aberdeen, PMC

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
37	Garnet	Mountain brome (cs)	*Bromus marginatus*	Meeker, PMC
38	UNIDENTIFIED	Nodding brome (cs)	*Bromus anomalus*	Arkansas Valley Seed Co.
39	Regar	Meadow brome cs)	*Bromus erectus*	Aberdeen, PMC
40	Manchar	Smooth brome (cs)	*Bromus inermis*	Arkansas Valley Seed Co.
41	Critana	Streambank wheatgrass (cs)	*Elymus lanceolatus*	Bridger, PMC
42	Bannock	Streambank wheatgrass cs)	*Elymus lanceolatus*	Aberdeen, PMC
43	Goldar	Bluebunch wheatgrass (cs)	*Pseudorogneria spicata*	Aberdeen, PMC
44	Anatone	Bluebunch wheatgrass (cs)	*Pseudorogneria spicata*	Aberdeen, PMC
45	Luna	Pubescent wheatgrass cs)	*Thinopyrum intermedium*	Meeker, PMC
46	Rush	Intermediate wheatgrass(cs)	*Thinopyrum intermedium*	Aberdeen, PMC
47	Arriba	Western wheatgrass(cs)	*Pascopyrum smithii*	Meeker, PMC
48	Rosana	Western wheatgrass(cs)	*Pascopyrum smithii*	Bridger, PMC
49	Sodar	Streambank wheatgras(cs)s	*Elymus lanceolatus*	Aberdeen, PMC
50	UNIDENTIFIED?	Tufted hairgrass (cs)	*Deschampia caespitosa*	Arkansas Valley Seed Co.
51	Jose	Tall wheatgrass cs)	*Thinopyrum ponticum*	Los Lunas, PMC
52	Mandan	Canada wildrye (cs)	*Elymus canadensis*	Bismarck, PMC
53	Bozoisky-select	Russian wildrye cs)	*Psathyrostachys juncea*	Bridger, PMC
54	Newhy	Hybrid wheatgrass cs)	*Elymus hoffmanii*	Aberdeen, PMC
55	Douglas	Crested wheatgrass (cs)	*Agropyron cristatum*	Aberdeen, PMC
56	Hycrest	Crested wheatgrass (cs)	*Agropyron cristatum X desorturum*	Aberdeen, PMC
57	Ephraim	Crested wheatgrass (cs)	*Agropyron cristatum*	Aberdeen, PMC
	Grass-Mixtures			
58	Rocky Mountain. Native mix	Mix-1* See entries below		Arkansas Valley Seed Co.
59	Aggressive dryland mix	Mix-2* See entries below		Pawnee Butte Seed Co.
60	Low grow mix	Mix-3* See entries below		Arkansas Valley Seed Co.
61	Dryland mix	Mix-4*-See entries below		Arkansas Valley Seed Co.
62	Boulder NRCS-mix-Regular	Mix-5*-See entries below		
63	Boulder NRCS-mix-heavy	Mix-6*-See entries below		
	Legume			
64	Medic-@ 14.2 lb/ac	Medic	*Medicago spp.*	CSU Ext. Service
65	Medic @ 29.1 lb/ac	Medic	*Medicago spp*	CSU Ext. Service

Entries for Grass-Mixtures				
Mix-1*	**Mix-2***	**Mix -3***	**Mix-4***	**Mix-5/6***
Slender wheatgrass	Green needle grass	Crested wheatgrass	Crested Wheatgrass-Hycrest	Pubescent wheatgrass
Slender wheatgrass	Slender wheatgrass	Perennial rye grass	Smooth brome-Lincoln	Smooth brome
Thickspike wheatgrass	Slender wheatgrass	Blue fescue	Wild rye-Bozoisky	
Buffalograss	Pubescent wheatgrass	Canada bluegrass	Tetraploid PER	
Blue gramma	Intermediate wheatgrass	Chewing fescue	Orchard grass-Renegade	
Big bluestem			Intermediate wheatgrass-Oahe	
Arizona fescue-Sherman-				

** (ws) = warm season grass; (cs) = cool season grass

RESULTS, ACCOMPLISHMENTS & OBSERVATIONS

Growing Season of 2005

During the summer of 2005, most of the plots were sprayed with herbicide Round-up to control emerging weeds. All plots were mowed to control Kochia weed *Kochia scoparia*. Plant establishment was evaluated during summer-2005. Results are presented in Table-2.

Table 2. Plant stand for 65 entries four month after planting.
Boulder County Open Space Demo-Summer-2005

Entry #	Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
Single Grass Species				
1	UNIDENTIFIED?	Nodding brome	*Bromus anomalus*	5
2	Regar	Meadow brome	*Bromus erectus*	5
3	Garnet	Mountain brome	*Bromus marginatus*	5
4	Paiute	Orchard grass	*Dactylis glomerata*	5
5	Renegade	Orchard grass	*Dactylis glomerata*	5
6	Fawn	Tall fescue	*Festuca arundinacea*	5
7	Paloma	Indian ricegrass	*Achnatherum hymenoides*	4
8	Douglas	Crested wheatgrass	*Agropyron cristatum*	4
9	Hycrest	Crested wheatgrass	*Agropyron cristatum X desorturum*	4
10	Manchar	Smooth brome	*Bromus inermis*	4

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Entry #	Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
11	Mandan	Canada wildrye	*Elymus canadensis*	4
12	Newhy	Hybrid wheatgrass	*Elymus hoffmanii*	4
13	Critana	Streambank wheatgrass	*Elymus lanceolatus*	4
14	Bannock	Streambank wheatgrass	*Elymus lanceolatus*	4
15	San Luis	Slender wheatgrass	*Elymus trachycaulus*	4
16	Pryor	Slender wheatgrass	*Elymus trachycaulus*	4
17	Lodorm	Green needlegrass	*Nasella viridula*	4
18	Arriba	Western wheatgrass	*Pascopyrum smithii*	4
19	Rosana	Western wheatgrass	*Pascopyrum smithii*	4
20	Goldar	Bluebunch wheatgrass	*Pseudoroegneria spicata*	4
21	Anatone	Bluebunch wheatgrass	*Pseudoroegneria spicata*	4
22	Rush	Intermediate wheatgrass	*Thinopyrum intermedium*	4
23	Luna	Pubescent wheatgrass	*Thinopyrum intermedium*	4
24	Jose	Tall wheatgrass	*Thinopyrum ponticum*	4
25	Ephraim	Crested wheatgrass	*Agropyron cristatum*	3
26	Kaw	Big Bluestem	*Andropagon gerardii*	3
27	Texoca	Buffalograss	*Buchloe dactyloides*	3
28	Tusas	Squirretail	*Elymus elymoides*	3
29	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	3
30	Magnar	Basin wildrye	*Leymus cinereus*	3
31	Dacotah	Switchgrass	*Panicum virgatum*	3
32	Rimrock	Indian ricegrass	*Achnatherum hymenoides*	2
33	Bonilla	Big Bluestem	*Andropogon gerardii*	2
34	Pawnee	Big Bluestem	*Andropogon gerardii*	2
35	Bad river	Side oats grama	*Bouteloua curtipendula*	2
36	Lovington	Side oats grama	*Bouteloua curtipendula*	2
37	Redondo	Arizona fescue	*Festuca arizonica*	2
38	UNIDENTIFIED	Needle & thread	*Hesperostipa comata*	2
39	Trailhead	Basin wildrye	*Leymus cinereus*	2
40	9005439	Switchgrass	*Panicum virgatum*	2
41	Niner	Side oats grama	*Bouteloua curtipendula*	1
42	BSOG-02B	Side oats grama	*Bouteloua curtipendula*	1
43	El Reno	Side oats grama	*Bouteloua curtipendula*	1

Entry #	Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
44	Hachita	Side oats grama	*Bouteloua curtipendula*	1
45	Covar	Sheep fescue	*Festuca ovina*	1
46	9092261	Prairie Junegrass	*Koeleria macrantha*	1
47	Volga	Mammoth wildrye	*Leymus racemosus*	1
48	Climax	Timothy	*Phleum pratense*	1
49	Sherman	Big bluegrass	*Poa secunda*	1
50	Bozoisky-select	Russian wildrye	*Psathyrostachys juncea*	1
51	Aldous	Little bluestem	*Schyzachyrium scoparium*	1
52	Camper	Little bluestem	*Schyzachyrium scoparium*	1
53	Pastura	Little bluestem	*Schyzachyrium scoparium*	1
54	Cheyenne	Indian grass	*Sorghastrum nutans*	1
55	Salado	Alkali sacaton	*Sporobolus airoides*	1
56	UNIDENTIFIED?	Tufted hairgrass	*Deschampsia caespitosa*	0
57	Viva	Galleta grass	*Pleuraphis jamesii*	0
Grass-Mixtures				
58	Dry-land mix.	Mix-4* See entries inTable-1		5
59	Aggressive dry-land mix	Mix-2* See entries inTable-1		4
60	Rocky Mountain Native mix	Mix-1* See entries inTable-1		4
61	Low grow mix	Mix-3*- See entries inTable-1		4
62	Boulder NRCS-mix-Regular	Mix-5*- See entries inTable-1		4
63	Boulder NRCS-mix-heavy	Mix-6*- See entries inTable-1		4
Legume				
64	Medic @ 29.1 lb/ac	Medic	*Medicago* spp.	3
65	Medic-@ 14.2 lb/ac	Medic	*Medicago* spp.	2

* Plant stand: 0 = Poor or no establishment; and 5 = Excellent establishment

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By: Manuel Rosales & Patrick Davey

Growing Season of 2006

In March of 2006, the plots and surrounding area have caught lots of plastic trash (mainly grocery store type plastic bags) in the weed stems that were mowed last summer. Trash had blown from adjacent businesses west of the plots. The demonstrational plots were located in an accessible and visible area from the road for demonstrational purposes. However, in this occasion the view was not very pleasant and a complaint was placed to the Longmont Conservation District to remove the trash. On April 11, 2006, Patrick Davey, Plant Materials Specialist for Colorado Natural Resources Conservation Service, used an All-Terrain-Vehicle with a chain to pull a gravel pit crusher screen over the 9-acre field to nock down the standing weed stems and release the attached trash. The operation worked and the trash was collected and removed. After removal of the trash the cool-season grass plots were visible. All wheatgrassess and both the Paiute Orchard and Renegade Orchard grasses had about 100 percent stands. No written evaluation was done at this time.

Patrick Davey visited the plots again on April 18, 2007, to check for weed growth and do a visual evaluation of the plots. He found newly kochia rosettes about ½ inch tall and Russian thistle seedlings growing mainly on the warm season grass plots. He also reported that the wheatgrasses (cool season) were growing very well, especially 'Rosana' and 'Arriba' which were spreading out of the planted rows. Both entries of orchard grass showed decline in plant stand, 100 to 25 percent from last summer. 'Texoca' buffalograss was the only visible warm season grass at this time.

On July 26, 2006, Patrick Davey, visited the plots to perform a summer evaluation. He reported that all cool season species were completely dried up and in a dormant stage, perhaps due to lack of precipitation and summer heat. Leaves were brown and crispy, and crumbling when touched. Again, 'Texoca' buffalograss was the only grass showing signs of growth. No formal evaluation of all the plots was done for this summer.

Growing Season of 2007

On April 27, Pat Davey visited the site and sprayed the warm season grass plots that did not establish last year. Plots were sprayed with a 3% Glyphosate (Round-up) to kill cheatgrass and Kochia seedlings.

On June 29, Pat Davey, spot sprayed 2-4 D to control Canada thistle and to prevent it from blooming. The perimeter and all plots were spot sprayed at the rate of 1.5 lbs/acre. In addition, about 20 large spotted knapweeds plants were removed by hand.

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Report-2007
By: Manuel Rosales & Patrick Davey

General observations for growing season of 2007

- Paiute and Renegade orchard grasses have almost died out
- Buffalograss is doing better than last year
- Tufted hairgrass did not establish yet
- Timothy died out
- All varieties of crested wheatgrasses are doing well

The warm season grasses will be replanted during summer of 2008. Also, a tour of the plots is being planned for summer of 2008.

Project COPMC-F-0506-RA
Project Report – 2007
By: Dr. Joe Brummer and Steve Parr

63 Ranch Conservation Field Trial

INTRODUCTION

The South Park area of Colorado is characterized as a high, cold desert. The harsh growing conditions associated with this environment coupled with drought, historic overgrazing, and the transfer/removal of irrigation water have led to many degraded range sites in the Park. Some of the more productive native grasses, such as Arizona fescue *Festuca arizonica* and prairie Junegrass *Koeleria macrantha* have been displaced. Low growing species, such as blue grama *Bouteloua gracilis* and fringed sage *Artemisia frigida,* have taken the place of these more productive species. With the recent drought conditions, even blue grama has given way to fringed sage. Although fringed sage is a native plant, it has come to dominate many sites throughout the Park. It is particularly troublesome because it is low producing, is unpalatable to livestock, and is very competitive and persistent once established. Upper Colorado Environmental Plant Center, Colorado State University, Natural Resources Conservation Service, Teller and Park County Conservation Districts, and the Colorado Division of Wildlife cooperated to establish two conservation field trials south of Fairplay, Colorado. The study will evaluate various herbicides for controlling or reducing the density of fringed sage; reseeding at three different times – an early summer planting, a mid-summer planting and a dormant fall planting - with both a native grass mixture and an introduced grass mixture on two different sites in South Park.

The two sites differ primarily in the amount of organic matter in the soil profile, but are representative of several thousand acres within South Park (MLRA 48B) with similar site characteristics.

Site Description

63 Ranch east of Highway 285 (Owned by the Colorado Division of Wildlife)

The study area was formerly irrigated. When the water was transferred for municipal uses, most of the irrigated forage species eventually died and were replaced by fringed sage with minor amounts of dryland grasses such as bottlebrush squirreltail. There are many areas within the Park that went through this same successional process and are now dominated by fringed sage. This site has a layer of organic matter on the soil surface that accumulated when it was irrigated. This layer of organic matter does not have good water holding capacity and tends to dry out quickly. The area receives only 12"-14" of annual precipitation and is characterized by high winds, all of which makes establishing new plantings difficult.

OBJECTIVE

The objective of the planting is to compare the most effective methods and products for re-establishing desirable vegetation on altered or degraded range sites in South Park.

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Project Report – 2007
By: Dr. Joe Brummer and Steve Parr

METHODS

The methods used in the study include the use of four different herbicides, three seeding dates and two seed mixes. Herbicides were applied at the rates identified below the first week in June 2005.

Treatments:

Herbicide Main Plots: (30 x 112 ft)	**Rate: (per acre)**
Unsprayed control	------
2,4-D ester (4 lb a.i./gal)	4 pt
Curtail	6 pt
Tordon + 2,4-D ester	1 pt + 2 pt
Cimarron Max (2 part herbicide)	1 oz + 4 pt

Seeding Date Split Plot: (32 x 150 ft)
Unseeded control (16ft x 150 ft)
Mid summer (Between July 1 and 15)
Fall (Dormant - Early November)

Seed Mix Split-Split Plot: (16 x 150 ft)
Native (See Table 1)
Introduced (See Table 1)

The plantings were conducted on July 6, 2005, November 2-3, 2005, and July 2006 with the seed mixtures identified in Table 1. Different planting times were selected to attempt to optimize the use of precipitation patterns. In mid to late July, South Park receives monsoonal flows from the southwest. This precipitation pattern generally lasts through early September. In order to capitalize on this monsoonal pattern, the first planting was done before the onset of the monsoon season. The dormant, fall seeding was done in early November 2005 to make use of early spring moisture for establishment prior to the very dry period of mid-May through June and to ensure that seed germination would not occur until spring 2006.

Table 1
Grass Species Planted for Fringed Sage Renovation Project
At 63 Ranch and Ranch of the Rockies in Park County Colorado

Grasses	**Variety**	**% in Mix**	**Seeding Rate lb/acre**	**Grams Per Rep**	**PLS lb/acre**
Native Mixture	**Average PLS of Native Mixture is 74%**				
Arizona fescue	Redondo	20	2.5	20	0.5
Bottlebrush squirreltail	Tusas	10	7.0	22	0.7
Indian ricegrass	Paloma	10	6.0	16	0.6
Mountain bromegrass	Garnet	15	12.5	104	2.0

Prairie Junegrass	Northwest CO	10	0.5	5	0.1
Sandberg's bluegrass	High Plains	10	1.0	3	1.0
Western wheatgrass	Rosanna	25	8.0	57	2.0
Total:				**227**	**6.9**
Introduced Mixture	**Average PLS of Introduced Mixture is 86%**				
Crested wheatgrass	Douglas	15	5.0	22	0.8
Crested wheatgrass	Hycrest	15	5.0	24	0.8
Hybrid wheatgrass	Newhy	15	7.0	36	1.1
Intermediate wheatgrass	Rush	15	9.0	38	1.4
Meadow bromegrass	Regar	15	6.5	26	1.0
Pubescent wheatgrass	Luna	15	9.0	52	1.4
Siberian wheatgrass	Vavilov	10	5.5	16	0.6
Total:				**214**	**7.1**

The two grass mixes were compiled in part from results of an earlier trial in South Park. However, a number of new, untested products were also used in each mix.

Experimental Design:

Split-split plot within a randomized complete block with four replications
Total plot area needed per site = 1.68 acres (with a 20 ft alley)

Data Collection:

Evaluations will be initiated in 2006 at both planting sites. Data will be collected on the effects of the treatments for the following:

Density and productivity of fringed sage
Grass establishment as measured by seedling density
Grass productivity by species
Density and productivity of the more abundant forb and shrub species
Economic analysis of treatment costs/benefits

RESULTS

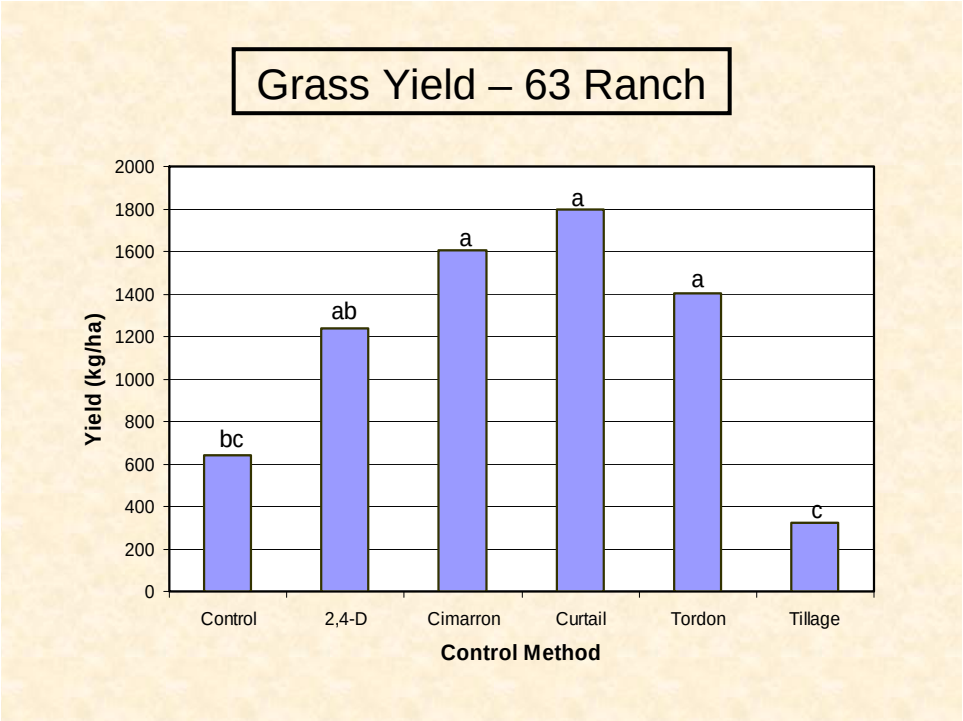
General observations were made on November 2, 2005, about the effectiveness of the treatments conducted in July. The herbicides did not seem to have any significant or glaring differences, but establishment appeared better in the sprayed plots than in the unsprayed control plots. In addition, the introduced seed mixture was more vigorous and had better average stands than the native mixture. Complete evaluations will be conducted in 2006. However, both seed mixtures from the July planting are performing well based on preliminary observations.

Evaluations conducted in 2006 provided additional insight into fringed sage control and desirable forage enhancement or establishment. Initial results from 2005 were based on density counts of fringed sage and indicated that Cimarron Xtra and 2,4-D alone worked well at the 63 Ranch while Tordon and 2,4-D alone were the treatments of choice at the ROR. Additional data was collected in 2006 which altered these initial conclusions. Fringed sage biomass averaged 1735

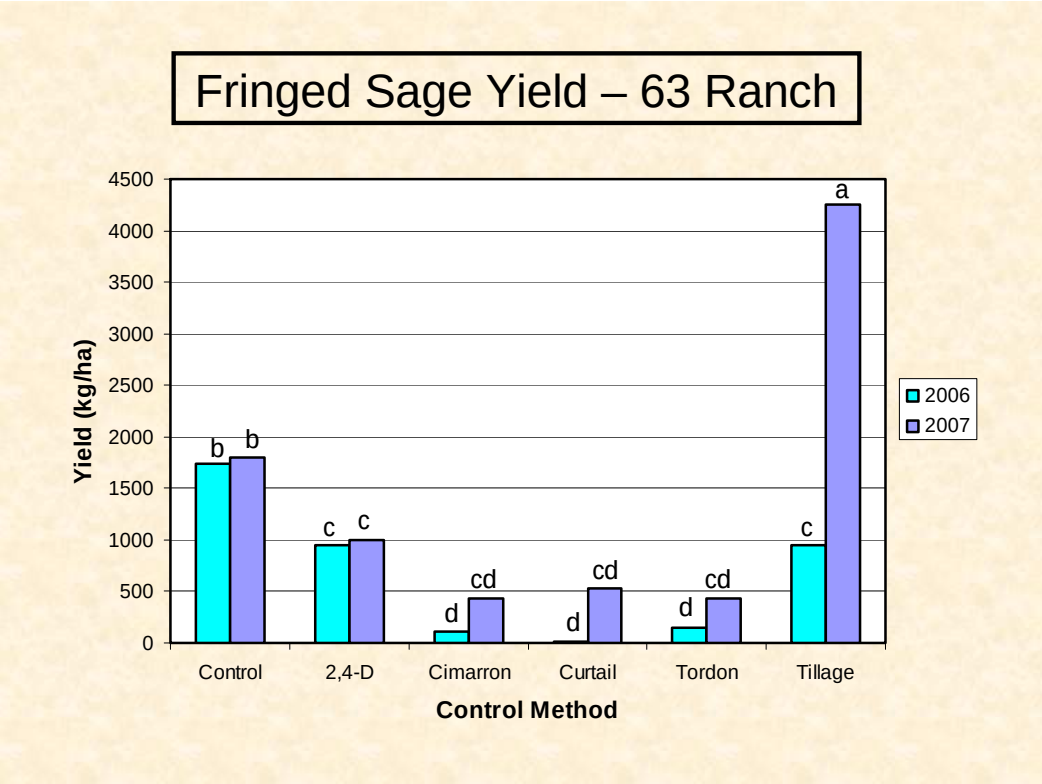
and 895 kg/ha in the untreated control plots at the 63 Ranch and ROR, respectively. Although 2,4-D appeared to reduce density of fringed sage in 2005, a number of plants had recovered sufficiently by the 2006 growing season to the point where biomass was reduced by only 45% at both sites. This compares to biomass reductions of 93%, 99%, and 92% for Cimarron, Curtail, and Tordon, respectively, at the 63 Ranch. Tillage was no better than 2,4-D at the 63 Ranch site with only a 45% reduction in fringed sage biomass. The disturbance and lack of competition created by the tillage treatment allowed fringed sage to quickly reestablish from the seed bank. Control was not as good at the ROR with reductions in fringed sage biomass of 70%, 73%, and 81% for Cimarron, Curtail, and Tordon, respectively. Grass biomass averaged 392 kg/ha and 246 kg/ha in the controls at the 63 Ranch and ROR, respectively. Except for the tillage treatment at the 63 Ranch, grass biomass responded positively in all treatments. At the 63 Ranch, grass biomass averaged 1235 kg/ha and 1472 kg/ha for Cimarron and Curtail, respectively, but only 734 kg/ha for Tordon. Baltic rush (included in grass category) was present at the 63 Ranch and Tordon appeared to have detrimental effects on this plant which accounted for most of the reduced grass response in this treatment. At the ROR, grass response was highest for Tordon with an average of 1082 kg/ha. Grass response for 2,4-D, Cimarron, and Curtail averaged 594 kg/ha, 820 kg/ha, and 742 kg/ha, respectively, at this site.

2007

The Curtail and Cimarron herbicide applications reduced the fringed sage component substantially while increasing the grass component by more than two times over the control. In fact, all herbicide applications increased the grass yield by nearly two times, including 2,4-D. Only tillage provided for an increase in forb (fringed sage) production when compared to the other treatment methods. In addition, the Tordon plots produced the lowest total biomass in 2006, but the highest in 2007 for all treatments except tillage, which suggests that the grass component may have been affected negatively by the application one year later, but that there was a positive response two years later.



Cover values mimicked those for biomass. Seeding success was evaluated by ranking each plot from 0 (no seeded plants) to 5 (all drill rows well defined by seeded plants). Establishment was generally minimal at the 63 Ranch, regardless of seed mix or time of seeding. The best establishment at this site was in the tillage treatment (2.4) due to reduced competition and seeding into a prepared seedbed. Establishment was better in both summer plantings (average of 1.4) compared to the fall (1.0) with the native seed mix doing slightly better (1.6) compared to the introduced mix (1.3) at this site.. The fall and summer 2006 plantings ranked less than 1.0 for both native and introduced seed mixes while the summer 2005 planting ranked at 3.7 and 2.9 for the introduced and native mixes, respectively.



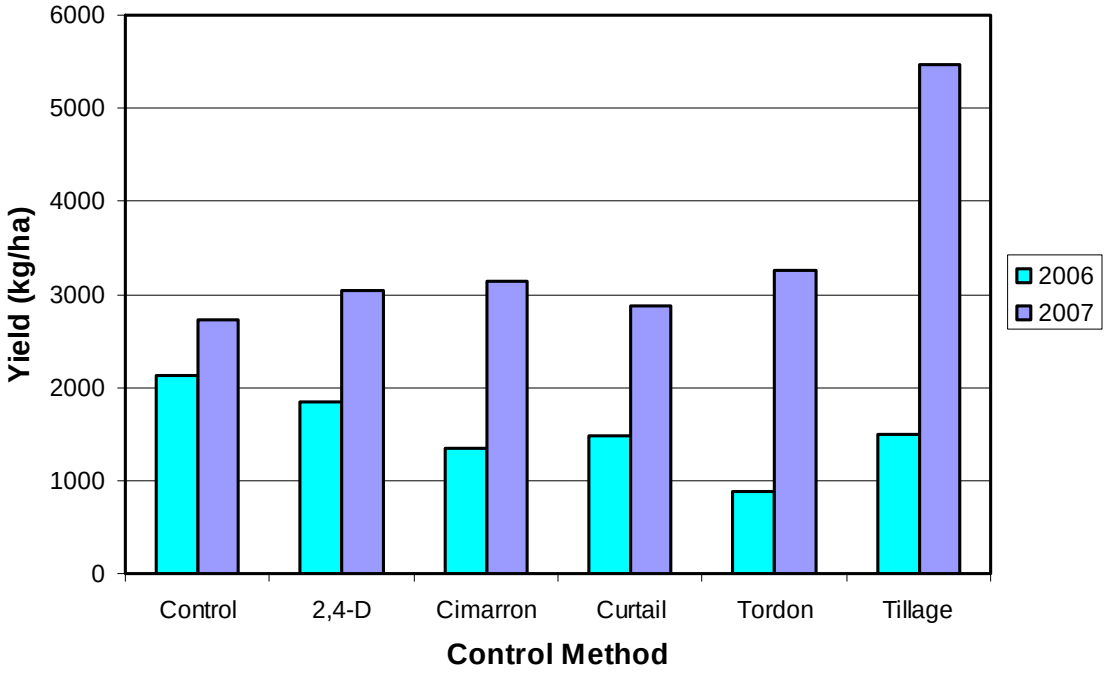
CONCLUSION

Fringed sage can be effectively controlled with several types of herbicides (Cimarron Xtra, Curtail, and Tordon) thereby allowing established grasses to increase productivity. Although Curtail performed well, it was higher priced at $35.63/acre compared to $17.11 and $19.98/acre for Tordon and Cimarron, respectively. Seeding success is often minimal in high-elevation, harsh environments such as the South Park area of Colorado. Mid-summer plantings appear to be the best approach for improving establishment of seeded grasses in areas that typically receive monsoonal (July and August) precipitation. Performance of the introduced grass mix was not consistently better than the native mix. Although native grasses are slower to establish, they may be the better choice for long-term productivity. There are thousands of acres in the South Park area alone that could benefit from control of fringed sage including over 40,000 acres that have experienced increases in sage due to the sale of irrigation water.

Overall, tillage as a disturbance produced the greatest biomass response of the treatments compared to the control. However, almost 80% of the total biomass yield of the tilled plots is attributed to fringed sage, while less than 17% of the total biomass for the Tordon treated plots is comprised of fringed sage. Curtail and Cimarron had similar results.

The application of one of three herbicides at this site appears to be the most effective treatment at reducing fringed sage biomass and increasing native, perennial grasses when compared to a control. In addition, tilling and planting desired grasses at this site without controlling the fringed

sage with herbicides prior to planting, does not result in desirable grass establishment. Therefore, if tillage is used to convert these historic irrigated hay meadows to desirable dryland grasses, competition must be substantially reduced and off-type products must be controlled prior to planting desired materials.



Project COPMC-F-0507-RA
Project Report – 2007
By: Dr. Joe Brummer and Steve Parr

Ranch of the Rockies Conservation Field Trial

INTRODUCTION

The South Park area of Colorado is characterized as a high, cold desert. The harsh growing conditions associated with this environment coupled with drought, historic overgrazing, and the transfer/removal of irrigation water have led to many degraded range sites in the Park. Some of the more productive native grasses, such as Arizona fescue *Festuca arizonica* and prairie Junegrass *Koeleria macrantha* have been displaced. Low growing species, such as blue grama *Bouteloua gracilis*, and fringed sage *Artemisia frigida*, have taken the place of these more productive species. With the recent drought conditions, even blue grama has given way to fringed sage. Although fringed sage is a native plant, it has come to dominate many sites throughout the Park. It is particularly troublesome because it is low producing, is unpalatable to livestock, and is very competitive and persistent once established. Upper Colorado Environmental Plant Center, Colorado State University, Natural Resources Conservation Service, Teller and Park County Conservation Districts, and the Colorado Division of Wildlife cooperated to establish two conservation field trials south of Fairplay, Colorado. The study will evaluate various herbicides for controlling or reducing the density of fringed sage; reseeding at three different times – an early summer planting, a mid summer planting and a dormant fall planting - with both a native grass mixture and an introduced grass mixture on two different sites in South Park.

The two sites differ primarily in the amount of organic matter in the soil profile, but are representative of several thousand acres within South Park (MLRA 48B) with similar site characteristics.

Site Description

Ranch of the Rockies south of Highway 24

This is an upland site that has experienced an increase in fringed sage due to the drought and past grazing practices. Although many of the native grasses are present at the site, their density and vigor have been significantly reduced which has allowed fringed sage to increase to the point where it dominates large areas.

OBJECTIVE

The objective of the planting is to compare the most effective methods and products for re-establishing desirable vegetation on altered or degraded range sites in South Park.

METHODS

The methods used in the study include the use of four different herbicides, three seeding dates and two seed mixes. Herbicides were applied at the rates identified below the first week in June 2005.

Project COPMC-F-0507-RA
Project Report – 2007
By: Dr. Joe Brummer and Steve Parr

Treatments:

Herbicide Main Plots: (30 x 112 ft)	**Rate: (per acre)**
Unsprayed control	------
2,4-D ester (4 lb a.i./gal)	4 pt
Curtail	6 pt
Tordon + 2,4-D ester	1 pt + 2 pt
Cimarron Max (2 part herbicide)	1 oz + 4 pt

Seeding Date Split Plot: (32 x 150 ft)
Unseeded control (16 ft x 150 ft)
Mid summer (Between July 1 and 15)
Fall (Dormant - Early November)

Seed Mix Split-Split Plot: (16 x 150 ft)
Native (See Table 1)
Introduced (See Table 1)

The plantings were conducted on July 6, 2005, November 2-3, 2005, and again in July 2006, with the seed mixtures identified in Table 1. Two planting times were selected to attempt to optimize the use of precipitation patterns. In mid to late July, South Park receives monsoonal flows from the southwest. This precipitation pattern generally lasts through early September. In order to capitalize on this monsoonal pattern, the first planting was done before the onset of the monsoon season. The dormant, fall seeding was done in early November 2005 to make use of early spring moisture for establishment prior to the very dry period of mid-May through June and to ensure that seed germination would not occur until spring 2006.

Table 1
Grass Species Planted for Fringed Sage Renovation Project
At 63 Ranch and Ranch of the Rockies in Park County, Colorado

Grasses	**Variety**	**% in Mix**	**Seeding Rate lb/acre**	**Grams Per Rep**	**PLS lb/acre**
Native Mixture	**Average PLS of Native Mixture is 74%**				
Arizona fescue	Redondo	20	2.5	20	0.5
Bottlebrush squirreltail	Tusas	10	7.0	22	0.7
Indian ricegrass	Paloma	10	6.0	16	0.6
Mountain bromegrass	Garnet	15	12.5	104	2.0
Prairie Junegrass	Northwest CO	10	0.5	5	0.1
Sandberg's bluegrass	High Plains	10	1.0	3	1.0
Western wheatgrass	Rosanna	25	8.0	57	2.0
Total:				**227**	**6.9**

Grasses	Variety	% in Mix	Seeding Rate lb/acre	Grams Per Rep	PLS lb/acre
Introduced Mixture	**Average PLS of Introduced Mixture is 86%**				
Crested wheatgrass	Douglas	15	5.0	22	0.8
Crested wheatgrass	Hycrest	15	5.0	24	0.8
Hybrid wheatgrass	Newhy	15	7.0	36	1.1
Intermediate wheatgrass	Rush	15	9.0	38	1.4
Meadow bromegrass	Regar	15	6.5	26	1.0
Pubescent wheatgrass	Luna	15	9.0	52	1.4
Siberian wheatgrass	Vavilov	10	5.5	16	0.6
Total:				**214**	**7.1**

Table 2

The two grass mixes were compiled in part from results of an earlier trial in South Park. However, a number of new, untested products were also used in each mix.

Experimental Design:

Split-split plot within a randomized complete block with four replications
Total plot area needed per site = 1.68 acres (with a 20 ft alley)

Data Collection:

Evaluations will be initiated in 2006 at both planting sites. Data will be collected on the effects of the treatments for the following:

Density and productivity of fringed sage
Grass establishment as measured by seedling density
Grass productivity by species
Density and productivity of the more abundant forb and shrub species
Economic analysis of treatment costs/benefits

RESULTS

General observations were made on November 2, 2005, about the effectiveness of the treatments conducted in July. The herbicides did not seem to have any significant or glaring differences, but establishment appeared better in the sprayed plots than in the unsprayed control plots. In addition, the introduced seed mixture was more vigorous and had better average stands than the native mixture. However, both seed mixtures from the July planting are performing well based on preliminary observations.

Evaluations conducted in 2006 provided additional insight into fringed sage control and desirable forage enhancement or establishment. Initial results from 2005 were based on density counts of fringed sage and indicated that Tordon and 2,4-D alone were the treatments of choice at the Ranch of the Rockies. Additional data was collected in 2006 which altered these initial conclusions. Fringed sage biomass averaged 895 kg/ha in the untreated control plots at ROR. Although 2,4-D appeared to reduce density of fringed sage in 2005, a number of plants had recovered sufficiently by the 2006 growing season to the point where biomass was reduced by

only 45% at both sites. Control was not as good at the ROR with reductions in fringed sage biomass of 70%, 73%, and 81% for Cimarron, Curtail, and Tordon, respectively. Grass biomass averaged 246 kg/ha in the controls at ROR. Grass biomass responded positively in all treatments. At the ROR, grass response was highest for Tordon with an average of 1082 kg/ha. Grass response for 2,4-D, Cimarron, and Curtail averaged 594 kg/ha, 820 kg/ha, and 742 kg/ha, respectively, at this site.

2007

All treatments were significantly different for controlling fringed sage than the control treatment in 2007. Tordon treated plots had over four times less fringed sage than the control plots and four times more grass yield than the control plots.

Yield – ROR

Control Trt	Sage	Grass	Forbs	Shrubs	Total
	----------(kg/ha)----------				
Control	800 a	320 d	60 a	40 a	1220 a
2,4-D	520 b	650 c	40 a	80 a	1290 a
Cimarron	250 c	940 b	20 a	100 a	1310 a
Curtail	320 bc	880 b	50 a	70 a	1320 a
Tordon	190 c	1280 a	40 a	10 a	1520 a

It is interesting to note that the use of Curtail, while not the most effective at controlling fringed sage, released the most forb production. Curtail also ended up producing the least amount of plot biomass overall in 2006, but responded to have the second highest total production in 2007. Tordon was the most effective herbicide for controlling fringed sage on this site and was also the best choice for improving grass production and overall plot biomass production.

Cover values mimicked those for biomass. Seeding success was evaluated by ranking each plot from 0 (no seeded plants) to 5 (all drill rows well defined by seeded plants). At the ROR,

establishment was generally low with rankings of 1.9, 1.7, 1.5, and 1.2 for Tordon, Curtail, Cimarron, and 2,4-D, respectively. The fall and summer 2006 plantings ranked less than 1.0 for

both native and introduced seed mixes while the summer 2005 planting ranked at 3.7 and 2.9 for the introduced and native mixes, respectively.

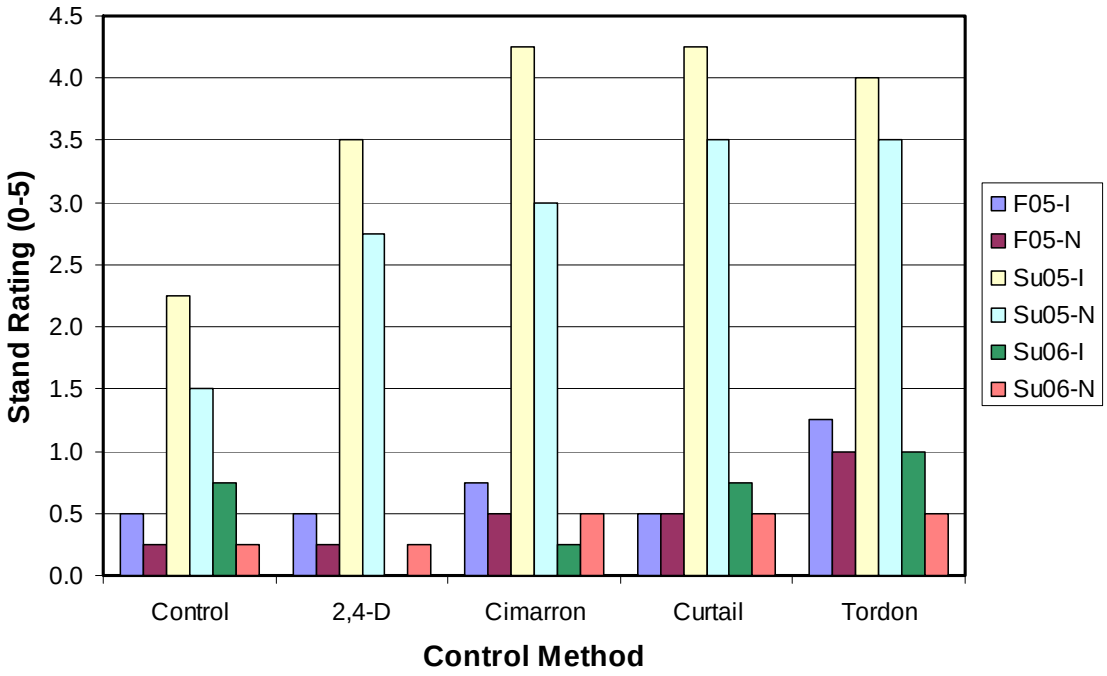
Table 3. Cover of fringed sage, grasses, forbs, and shrubs as affected by herbicide treatments on the Ranch of the Rockies, South Park, Colorado. Samples were taken on September 1, 2006.

Herbicide Treatment	Sage	Grass	Forb	Shrub
	----------%----------			
2,4-D	19.4	34.5	2.3	3.1
Cimarron	10.1	40.2	0.7	2.0
Control	34.8	15.1	1.6	0.4
Curtail	14.0	40.6	3.5	3.3
Tordon	7.9	44.3	1.9	0.3

Table 4. Effect of herbicide treatments, time of seeding, and seed mix on grass establishment at two sites in South Park, Colorado. Samples were taken on August 16, 2006, at the 63 Ranch and September 1, 2006, at the Ranch of the Rockies.

Herbicide Treatment	63 Ranch	Ranch of the Rockies
2,4-D	0.9	1.2
Cimarron	1.0	1.5
Control	0.4	0.9
Curtail	1.1	1.7
Tillage	2.4	----
Tordon	1.6	1.9
Seed Treatment		
Fall-Introduced	1.0	0.7
Fall-Native	1.0	0.5
Spring-Introduced	1.2	0.6
Spring-Native	1.6	0.4
Summer-Introduced	1.3	3.7
Summer-Native	1.5	2.9

Ratings were based on a scale of 0 (no seeded plants) to 5 (all drill rows well defined by seeded plants).



CONCLUSION

Fringed sage can be effectively controlled with several types of herbicides (Cimarron Xtra, Curtail, and Tordon) thereby allowing established grasses to increase productivity. Although Curtail performed well, it was higher priced at $35.63/acre compared to $17.11 and $19.98/acre for Tordon and Cimarron, respectively. Seeding success is often minimal in high-elevation, harsh environments such as the South Park area of Colorado. Mid-summer plantings appear to be the best approach for improving establishment of seeded grasses in areas that typically receive monsoonal (July and August) precipitation. Performance of the introduced grass mix was not consistently better than the native mix. Although native grasses are slower to establish, they may be the better choice for long-term productivity. There are thousands of acres in the South Park area alone that could benefit from control of fringed sage including over 40,000 acres that have experienced increases in sage due to the sale of irrigation water.

Project COPMC-F-0508-CR
Final Report-2007
By: Manuel Rosales

Forb Field Evaluation Planting-Land's End

OBJECTIVE

To determine adaptability of selected forbs for revegetating post-treated Russian knapweed range land.

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 or smooth brome. This field evaluation planting was set up to determine the adaptability of nine native forbs and one shrub in post treated Russian knapweed land and to determine their ability to prevent re-invasion by the weed

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

Nine forbs and one shrub were planted on October 27, 2005, with a hand pushed belt seeder. The rate of seeding was 30 pure live seeds per linear foot of row. The plot size is 4 x 20 ft with four rows per plot. The following table lists the 10 entries for the study:

Common Name	**Scientific Name**	**Release Name/accession No.**	**Plant Type**
Firecracker penstemon	*Penstemon eatonii*	Richfield	Forb
Four wing saltbush	*Atriplex canescens*	Rincon	Shrub
Fringed sage	*Artemisia frigida*	CO-9021471	Forb
Lewis flax	*Linum lewisii*	Maple Grove	Forb
Lewis flax	*Linum perenne*	Appar	Forb
Louisiana sage	*Artemisia ludoviciana*	Summit	Forb
Maximillian sunflower	*Helianthus maximiliani*	Medicine Creek	Forb
Narrow leaf penstemon	*Penstemon angustifolius*	San Juan	Forb
Utah sweet vetch	*Hedysarum boreale*	Timp	Forb
Yarrow	*Achillea millefolium*	Great Northern	Forb

Project COPMC-F-0508-CR
Final Report-2007
By: Manuel Rosales

The site is located about 10 miles south east of the city 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 site will not be irrigated. Plots will be evaluated for stand establishment and ability to compete with weeds, especially re-invasion of Russian knapweed

RESULTS

The study was evaluated on May 10, 2006; unfortunately, 'Timp' Utah sweetvetch was the only forb that had some plants established at this time. Plots will be evaluated again late spring 2007 and a determination will be made to discontinue or continue the study.

On May 17, 2007, a site visit was made to make an evaluation of the plots. The plots were full of weeds and no sign of any forbs were found. The NRCS field office at Grand Junction informed the Plant Center that the owner moved and sold the property. It was determined then to terminate the study.

SUMMARY

Russian knapweed and other weeds continue to be a problem for growers in the area, and no plant solutions to prevent re-invasion of knapweed after treatment with herbicides have been found as yet. However, to determine adaptability of plants in this area and have a successful study, cooperation with interested parties is necessary. No information on plant adaptability was gained from this study, however, it was learned that coordination, communication, and cooperation, must be a priority to have a successful off-center planting.

Project COPMC-F-0601-CR
Report-2007
By: Manuel Rosales & Patrick Davey

South Park Field Evaluation Planting

OBJECTIVE

To determine which selected materials will establish and persist in peat-rich soils once irrigated and now dryland.

INTRODUCTION

Historically, ranchers and developers have been interested in the peatlands (also referred to as fens) of South Park, Colorado. Peatlands were ditched and drained to grow crops for livestock grazing and to prevent cattle from becoming bogged down in their soft soils. Peatland is a generic term for any wetland that accumulates decayed plant material. In Colorado, peatlands are classified as fens. This type of peatland is only found in high-elevation sites above 8000 feet. These peatlands form in places where a constant supply of ground water maintains the soil saturation. This field evaluation planting was designed to help select plant materials, especially native grasses, that will grow in peatlands that were previously drained and irrigated, and no longer will be irrigated.

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

The planting site was prepared by rototilling, letting stand, spraying with roundup, and then rolling to firm up the soil prior to seeding. Seventeen native grass species and 11 introduced or manipulated grass species were planted on November 2-3, 2005. The planting was done with a four-row plot cone-seeder. The rate of seeding was 60 pure live seeds per linear foot of row (30 x 2 for critical area planting). The plot size is 4 x 20 ft with four rows per plot. Table-1 lists the 28 entries for the study:

Table 1. South Park Field Evaluation Planting. UCEPC

Common Name	Scientific Name	Release Name or Accession No.
Natives		
Arizona fescue	*Festuca arizonica*	Redondo
Bluebunch wheatgrass	*Pseudoroegneria spicata spp.spicata*	Anatone
Bluebunch wheatgrass	*Pseudoroegneria spicata spp.spicata*	Goldar
Blue grama	*Bouteloua gracilis*	Bad River
Bottlebrush squirreltail	*Elymus elymoides spp. brevifolius*	Pueblo
Bottlebrush squirreltail	*Elymus elymoides*	Tusas
Bottlebrush squirreltail	*Elymus elymoides spp.brevifolius*	Wapiti
Columbia needlegrass	*Achnatherum nelsonii*	9024804
Columbia needlegrass	*Achnatherum nelsonii*	9040137
Indian ricegrass	*Achnatherum hymenoides*	Paloma

Common Name	Scientific Name	Release Name or Accession No.
Indian ricegrass	*Achnatherum hymenoides*	Rimrock
Mountain brome	*Bromus marginatus*	Garnet
Prairie Junegrass	*Koeleria macrantha*	9092261
Sandberg's bluegrass	*Poa secunda*	High plains
Streambank wheatgrass	*Elymus lanceolatus*	Sodar
Western wheatgrass	*Pascopyrum smithii*	Arriba
Western wheatgrass	*Pascopyrum smithii*	Rosana
Introduced or Manipulated		
Basin wildrye-hybrid	*Leymus cinerus*	Continental
Crested wheatgrass	*Agropyrum cristatum*	Douglas
Crested wheatgrass	*Agropyrum cristatum*	Nordan
Crested-desertorum hybrid	*Agropyrum cristatum x A. desertorum*	Hycrest
Intermediate wheatgrass	*Thinopyrum intermedia*	Rush
Meadow brome	*Bromus biebersteinii*	Regar
Pubescent wheatgrass	*Thinopyrum intermedia*	Luna
Russian wildrye	*Psathyrostachys juncea*	Bozoisky
Siberian wheatgrass	*Agropyrum fragile spp. sibiricum*	Vavilov
Smooth brome	*Bromus inermis*	Liso
Wheatgrass-hybrid	*Elymus hoffmanni*	Newhy

The site is located 15 miles south of the city Fairplay, Park County, Colorado, on U. S. Highway 285. Elevation at the site is 9000 feet, and the annual precipitation is 10 inches. The planting site is on 63-Ranch State Wildlife Area. A six-foot tall game-fence enclosed the planting area. Plots will be evaluated for stand establishment and performance.

RESULTS

Year-2006

Table 2 presents percent plant stand (establishment) and plant vigor for the growing season of year 2006. The over-all average for plant establishment was 8.2 percent which is low. Bad River-blue grama performed best for the native grasses and Liso-smooth brome performed best for the introduced grasses. By mid summer the plots had been over run by a flush of fringed sagebrush seedlings and in some areas were covered with dense four foot circles of cutleaf nightshade. The cutlef nightshade were all pulled by hand and the fringed sage was sprayed with a mix of 2,4-D and Tordon. Also the native western wheatgrass was encroaching from the perimeter and this was sprayed with glyphosate.

Table 2. Plant Stand & Vigor for 28 entries. South Park FEP-2006

Natives			
Common Name	**Release name or accession No.**	**% Plant Stand Average[1]**	**Plant Vigor Average[1]**
Blue grama	**Bad River**	32.0	3.5
Bluebunch wheatgrass	**Anatone**	18.2	3.5
Indian ricegrass	**Rimrock**	14.5	3.5
Western wheatgrass	Rosana	12.5	3.2
Bluebunch wheatgrass	Goldar	10.5	3.7
Indian ricegrass	Paloma	7.2	3.5
Western wheatgrass	Arriba	5.5	2.7
Bottlebrush squirreltail	Pueblo	2.7	2.2
Columbia needlegrass	9024804	2.5	2.3
Mountain brome	Garnet	2.0	3.2
Columbia needlegrass	9040137	1.7	2.3
Sandberg's bluegrass	High plains	1.2	2.0
Prairie Junegrass	9092261	1.0	2.6
Streambank wheatgrass	Sodar	0.7	2.5
Bottlebrush squirreltail	Wapiti	0.5	2.0
Arizona fescue	Redondo	0.25	2.0
Bottlebrush squirreltail	Tusas	0.25	2.0
Introduced or Manipulated			
Smooth brome	**Liso**	23.0	2.7
Meadow brome	**Regar**	17.7	3.2
Russian wildrye	**Bozoisky**	14.5	3.7
Basin wildrye-hybrid	Continental	12.5	3.7
Crested wheatgrass	Nordan	11.5	3.7
Intermediate wheatgrass	Rush	8.7	3.7
Crested-desertorum hybrid	Hycrest	7.7	3.2
Pubescent wheatgrass	Luna	7.5	3.2
Siberian wheatgrass	Vavilov	7.2	3.2
Crested wheatgrass	Douglas	5.0	2.5
Wheatgrass-hybrid	Newhy	1.5	2.6

1. Average of four replications. Plant stand & vigor were statistically significantly different at the 5% level of probability. The ratings for Vigor are: 2 = poor, 3 = fair, 4 = Good, and 5 = Excellent. Plant stand is a visual estimate per plot basis; if entire four-row/ plot germinated is = 100 percent establishment.

Year-2007

The plots were evaluated on July 31, 2007. Plant stand and vigor for the 28 entries are presented in the table 3. Table-4 shows year 2006 and 2007 for comparison. Most of the entries that performed well in year-2006, performed well also for year-2007.

Table 3. Plant Stand & Vigor for 28 entries. South Park FEP-2007

Natives			
Common Name	**Release name or accession No.**	**% Plant Stand Average[1]**	**Plant Vigor Average[1]**
Western wheatgrass	Rosana	35.2	2.5
Bluebunch wheatgrass	**Anatone**	33.7	2.5
Blue grama	**Bad River**	20.0	3.0
Bluebunch wheatgrass	Goldar	14.7	2.2
Indian ricegrass	**Rimrock**	10.7	2.0
Western wheatgrass	Arriba	9.0	2.7
Sandberg's bluegrass	High Plains	6.0	2.5
Bottlebrush squirreltail	Pueblo	5.0	1.5
Columbia needlegrass	9040137	3.7	2.7
Arizona fescue	Redondo	3.2	3.2
Mountain brome	Garnet	2.7	3.0
Prairie Junegrass	9092261	2.5	1.5
Columbia needlegrass	9024804	2.0	3.2
Streambank wheatgrass	Sodar	1.3	4.2
Bottlebrush squirreltail	Tusas	1.0	3.0
Indian ricegrass	Paloma	0.5	1.5
Bottlebrush squirreltail	Wapiti	0.5	1.75
Introduced or Manipulated			
Crested wheatgrass	Nordan	41.2	1.7
Crested wheatgrass	Douglas	32.7	2.7
Meadow brome	**Regar**	31.0	2.2
Russian wildrye	**Bozoisky**	30.2	2.0
Siberian wheatgrass	Vavilov	29.0	1.7
Crested-desertorum hybrid	Hycrest	26.2	2.0
Smooth brome	**Liso**	20.0	3.0
Wheatgrass-hybrid	Newhy	12.2	3.2
Intermediate wheatgrass	Rush	11.2	3.0
Pubescent wheatgrass	Luna	11.2	3.2
Basin wildrye-hybrid	Continental	11.0	2.5

1. Plant stand was statistically significantly different at the 5% level of probability, vigor was not significant. Plant stand is a visual estimate per plot basis; if entire four-row/ plot germinated is = 100 percent establishment**.**

Table 4. Percent Plant Stand for 28 Perennial Grass Entries
South Park FEP (2006 & 2007)

Natives			
Common Name	**Release Name or Accession No.**	**%Plant Stand[1]**	
		2006	**2007**
Blue grama	Bad River	**32.0**	20.0
Bluebunch wheatgrass	Anatone	18.2	33.7
Indian ricegrass	Rimrock	14.5	10.7
Western wheatgrass	Rosana	12.5	**35.2**
Bluebunch wheatgrass	Goldar	10.5	14.7
Indian ricegrass	Paloma	7.2	0.5
Western wheatgrass	Arriba	5.5	9.0
Bottlebrush squirreltail	Pueblo	2.7	5.0
Columbia needlegrass	9024804	2.5	2.0
Mountain brome	Garnet	2.0	2.7
Columbia needlegrass	9040137	1.7	3.7
Sandberg's bluegrass	High Plains	1.2	6.0
Prairie Junegrass	9092261	1.0	2.5
Streambank wheatgrass	Sodar	0.7	1.3
Bottlebrush squirreltail	Wapiti	0.5	0.5
Arizona fescue	Redondo	0.25	3.2
Bottlebrush squirreltail	Tusas	0.25	1.0
Introduced or Manipulated			
Smooth brome	Liso	**23.0**	20.0
Meadow brome	Regar	17.7	31.0
Russian wildrye	Bozoisky	14.5	30.2
Basin wildrye-hybrid	Continental	12.5	11.0
Crested wheatgrass	Nordan	11.5	**41.2**
Intermediate wheatgrass	Rush	8.7	11.2
Crested-desertorum hybrid	Hycrest	7.7	26.2
Pubescent wheatgrass	Luna	7.5	11.2
Siberian wheatgrass	Vavilov	7.2	29.0
Crested wheatgrass	Douglas	5.0	32.7
Wheatgrass-hybrid	Newhy	1.5	12.2

1. Plant stand is a visual estimate per plot basis; if entire four-row/ plot germinated is = 100 percent establishment.

Project COPMC-F-0602-WI
Report-2007
By: Manuel Rosales

Windbreak Demonstration Planting

OBJECTIVE

To demonstrate the use of different woody species for windbreak purposes and to provide a source for plant release materials at Upper Colorado Environmental Plant Center (UCEPC).

INTRODUCTION

UCEPC is located in an area that experiences strong winds throughout the year. To protect the Center from prevailing winds, a windbreak is being planted with multipurpose benefits in mind. In addition to providing protection from the wind, the windbreak will serve for educational and demonstrational purposes, as well as aesthetic purposes.

EXPERIMENTAL DESIGN

This is a non-replicated planting.

MATERIALS & METHODS

A multiple-row windbreak with five to eight rows of woody plant materials will be planted along the west side perimeter of the Center. Three rows of evergreen trees, two rows of deciduous trees and two to three rows of shrubs will be planted during 2006-2009. Native woody species will be planted where possible, following the Natural Resources Conservation Services guidelines for establishing a windbreak/shelterbelt. The planting will be irrigated as needed until the plants get well establish. Plant materials for the windbreak will be acquired through Colorado State Forest Service tree program and/or UCEPC's own woody collections.

RESULTS/ACCOMPLISHMENTS

On May 25, 2006, sixty potted Colorado blue spruce *Picea pungens* seedlings were transplanted by hand. Tree seedlings were about 6-12 inches in height. The trees were purchased at the Local NRCS field office through the State Forest Program. Trees were planted in a single row (north-south) that runs parallel to the UCEPC-west fence at 16 feet spacing within the row Adjacent rows will be set at 20 feet between rows. Trees were watered by hand immediately after planting. Trees were irrigated during the summer with a hand-moved 2 inch-line sprinkler set. Trees were also mulched with a 2-3 inch layer of wood chips around each tree with a 2-feet diameter. The mulch kept soil moist and prevented weeds from competing with the trees.

On July 10, 2006, the trees were evaluated for survivability. All 60 trees were alive and growing well. More trees will be planted during 2007 growing season.

Project COPMC-F-0602-WI
Report-2007
By: Manuel Rosales

Growing Season of 2007

On May 10, 2007, sixty more potted Colorado blue spruce were transplanted into the existing row of spruce bringing the total to 120 trees (row- length = 1920 feet). Holes for the transplants were dug with a hand post-hole digger. Seedlings were then placed in the holes, backfilled and packed lightly. A basin of soil was made around each tree and watered immediately with a water tank carried in the pick-up truck.

On August 20, 2007, twenty-one honey suckle plants *Lonicera utahensis* propagated by cuttings at UCEPC were added to the windbreak to start a row of shrubs. These plants were also hand transplanted.

On September 12, 2007, the plants in the windbreak were evaluated for survivability. All transplants done during growing season of 2007 were alive. The planting will be evaluated during the Spring-2008 to determine survivability over the winter.

Project COPMC-F-0603-RA
Report-2007
By: Manuel Rosales

Grass & Forbs Observational Planting

OBJECTIVE

To establish grasses and forbs of Plant Materials releases and experimental species for training, educational, and demonstration purposes.

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) usually holds tours, field days, training and other events for the general public and other guests. In the past the center has shown the array of production fields and experimental studies being conducted. However, guests are often times interested in other species besides the ones being studied at the center. This planting was initiated to fill this need and provide a better service to our customers.

EXPERIMENTAL DESIGN

This is a non-replicated planting.

MATERIALS & METHODS

On August 2, 2006, a total of 60 entries; 40 grasses and 20 forbs species were seeded at the UCEPC. The species planted are UCEPC plant releases and experimental species, as well as plant releases from other Plant Materials Centers within the region (See Table 1). The planting was done in raised beds prepared with a bed former pulled with a tractor.

Each species was planted with a hand-push belt seeder, in plots 20 feet long and six feet wide, with two rows per plot. The distance between the rows is about three feet. The planting was then irrigated with a hand moved sprinkler system to ensure germination.

Table 1. Grass and Forbs Observational Planting. UCEPC

Entry #	Release Name/Accession	Common Name	Scientific Name	Seed Source
Cool Season Grass Species				
1	Arriba	Western wheatgrass	*Pascopyrum smithii*	UCEPC
2	Luna	Intermediate wheatgrass	*Thinopyrum intermedium*	UCEPC
3	San Luis	Slender wheatgrass	*Elymus trachycaulus*	UCEPC
4	Pueblo Germplasm	Squirreltail	*Elymus elymoides* spp. *brevifolius*	UCEPC
5	Wapiti Germplasm	Squirreltail	*Elymus elymoides* spp. *brevifolius*	UCEPC
6	Garnet Germplasm	Mountain brome	*Bromus marginatus*	
7	Redondo	Arizona fescue	*Festuca arizonica*	UCEPC

Entry #	Release Name/Accession	Common Name	Scientific Name	Seed Source
8	Hycrest	Crested wheatgrass	*Agropyrum cristatum x A. desertorum*	UCEPC
9	Peru Creek	Tufted hairgrass	*Deschampsia cespitosa*	UCEPC
10	Volga	Mammoth wildrye	*Leymus racemosus*	UCEPC
11	9092261	Poa	*Poa* spp.	UCEPC
12	9040137	Columbia needlegrass	*Achnatherum nelsoni*	UCEPC
13	9092282	Sandberg bluegrass	*Poa secunda*	UCEPC
14	9092272	Mutton grass	*Poa fendleriana*	UCEPC
15	9070976	Thurber's fescue	*Festuca thurberi*	UCEPC
16	9092284	Mountain muhly	*Muhlenbergia montana*	UCEPC
17	9024739	Indian ricegrass	*Achnatherum hymenoides*	
18	9070952	Bluebunch	*Pseudoroegneria spicata* spp. *spicata*	UCEPC
19	9043501	Salina wildrye	*Leymus salinus*	UCEPC
20	L-45	Basin wildrye Cross	*Leymus cinereus*	ARS-Logan, UT/UCEPC
Forbs Species				
21	ARS-2678	Kura clover	*Trifolium ambiguum*	UCEPC
22	Timp	Utah sweetvetch	*Hedysarum boreale*	UCEPC
23	Summit	Louisiana sage	*Artemisia ludoviciana*	UCEPC
24	Bandera	Rocky Mountain penstemon	*Penstemon strictus*	UCEPC
25	9024993	Rydberg's penstemon	*Penstemon rydbergii*	UCEPC
26	9070934	Sticky cinquefoil	*Potentilla glandulosa*	UCEPC
27	9092283	Utah sweetvetch	*Hedysarum boreale*	UCEPC
28	9070972	Senecio	*Senecio biglovii*	UCEPC
29	9024921	Sulphur buckwheat	*Eriogonum umbellatum*	UCEPC
30	9021471	Fringed sage	*Artemisia frigida*	UCEPC
Other PMC Cool Season Grass Species				
31	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	Aberdeen , PMC
32	Critana	Thick spike wheatgrass	*Elymus lanceolatus*	Bridger, PMC
33	Rosana	Western wheatgrass	*Pascopyrum smithii*	Bridger, PMC
34	Newhy	Hybrid wheatgrass	*Elymus hoffmanni*	Aberdeen, PMC
35	Rush	Intermediate wheatgrass	*Elytrigia intermedia*	Aberdeen , PMC
36	Trailhead	Basin wildrye	Leymus cinereus	Bridger, PMC
37	Anatone	Blue Bunch wheatgrass	*Pseudoroegneria spicata*	Aberdeen, PMC
38	Vavilov	Siberian wheatgrass	*Agropyron fragile*	Aberdeen, PMC
39	Whitmar	Beardless Wheatgrass	*Pseudoroegneria spicata*	Pullman, PMC
40	Covar	Sheep Fescue	*Festuca ovina*	Pullman, PMC
Other PMC Warm Season Grass Species				
41	9005439	Switchgrass	*Panicum virgatum*	Bridger, PMC

Entry #	Release Name/Accession	Common Name	Scientific Name	Seed Source
42	Dacotah	Switchgrass	*Panicum virgatum*	Bismarck, PMC
43	Bison	Big bluestem	*Andropogon gerardii*	Bismarck, PMC
44	Bad river	Blue grama	*Bouteloua gracilis*	Bismarck, PMC
45	Salado	Alkali sacaton	*Sporobolus airoides*	Los Lunas, PMC
46	Pierre	Sideoats grama	*Bouteloua curtipendula*	Bismarck, PMC
47	Vaughn	Sideoats grama	*Bouteloua curtipendula*	Los Lunas, PMC
48	Badlands	Little bluestem	*Schizachyrium scoparium*	Bismarck, PMC
49	Alma	Blue grama	*Bouteloua gracilis*	Los Lunas, PMC
50	Viva	Galleta grass	*Pleuraphis jamesii*	Los Lunas, PMC
Other PMC Forb species				
51	Great Northern Germplasm	Common yarrow	*Achillea millefolium*	Bridger, PMC
52	San Juan Germplasm	Penstemon	*Penstemon angustifolius*	Los Lunas, PMC
53	Richfield Germplasm	Eaton's penstemon	*Penstemon eatonii*	Bridger, PMC
54	Maple Grove Germplasm	Prairie flax	*Linum lewisii*	Aberdeen, PMC
55	Appar	Prairie flax	*Linum lewisii*	Aberdeen, PMC
56	Bismarck Germplasm	Violet prairie clover	*Dalea purpurea*	Bismarck, PMC
57	Antelope Germplasm	White prairie clover	*Dalea candida*	Bridger, PMC
58	Stillwater Germplasm	Prairie coneflower	*Ratibida columnifera*	Bridger, PMC
59	Bismarck Germplasm	Narrow-leaved purple coneflower	*Echinacea angustifoli*a	Bismarck, PMC
60	Medicine Creek Germplasm	Maximilian sunflower	*Helianthus maximilian*i	Bismarck, PMC
61		Canada milkvetch*	*Astragalus canadensis*	Pullman, PMC

*Added on Nov-20-07

RESULTS/ACCOMPLISHMENTS

On August 15, 2006, about two weeks after planting, the first evaluation was performed since some species had already emerged. Eighty percent of the grass species (including warm season grasses) had germinated, however, the forbs had only a few entries that showed emergence at this date

On September 29, 2006, since all warm season grass species (except 'Galleta') had germinated, the plots were mulched with grass-hay to protect them from frost heaving damage during the winter months.

On April 30, 2007, the plots were evaluated to determine survivability over the winter, and also to make note of the species that germinated in the spring of 2007. Most of the forbs that did not germinate during the fall of 2006 were showing about 50 percent germination. Also, the Indian ricegrass that had no germination during the fall-2006 had now 90 percent germination. Out of the ten entries of warm season grasses that germinated during the fall, only the blue grama

species and alkali sacaton could be found. Most of the other species suffered winter damage and only a few plants were visible.

On May 24, 2007, all warm season grasses were replanted including the ones that had a few plants to insure a full stand. By July 5, 2007, the warm season grasses had all germinated and were progressing well. The entire demonstrational planting was showing excellent plant vigor and stand. Observations will continue during growing season of 2008.

Project COPMC-F-0604-RA
Report-2007
By: Manuel Rosales & Patrick Davey

Sweeney's Demonstrational Planting

OBJECTIVE

To determine adaptability of 20 cool and warm season perennial grasses and forbs for educational, demonstrational, and training purposes.

INTRODUCTION

This demonstrational planting was set up as a request from the Glenwood Springs Field Office and the Conservation Districts in Garfield and Pitkin Counties in Colorado. At present, the Glenwood field office has a limited list of plant materials that can be recommended in the area. There is a need to increase the number of adapted perennial native grasses and forbs that can be recommended in the area. This technology development study was set up to fill this need.

EXPERIMENTAL DESIGN

This is a non-replicated planting.

MATERIALS & METHODS

The site was prepared with a fall application of herbicide on October 25, 2005, to eliminate existing brush, cheatgrass, native forbs, and grasses. The site received another application of herbicide on May 10, 2006, to kill some remaining brush, weeds, and perennial native grasses. The site was then plowed and disked. On November 1, 2006, a dormant planting was completed (see table 1.). Seventeen perennial cool season grasses and three warm season grasses were seeded with an old 10-foot-wide grain drill, except for Pastura-little blue stem which was hand broadcast. The plot size is 10 feet wide by 50 feet long; a total of 500 square feet per plot. All plots were dragged with a chain pulled with 2-ATVs (All terrain vehicles) after drilling to insure seed coverage and soil contact. The soil at the site is Vail silt loam. The entire site was then fenced to protect it from grazing of cattle and big game wildlife.

The site is located in the property of Cooperator and District board member, Larry Sweeney, near Rifle, Colorado. The average yearly precipitation for the site is 14-16 inches. The elevation is about 5600 feet. This is a dryland field planting with no irrigation.

Table 1. Sweeney's Demonstrational Planting.

Plot # (south-north)	**Release/Accession**	**Common Name**	**Scientific Name**
1	Arriba	Western wheatgrass	*Pascopyrum smithii*
2	Sodar	Streambank wheatgrass	*Elymus lanceolatus*
3	Douglas	Crested wheatgrass	*Agropyron cristatum*
4	Goldar	Bluebunch wheatgrass	*Pseudoroegneria spicata*
5	San Luis	Slender wheatgrass	*Elymus trachycaulus*
6	Luna	Pubescent wheatgrass	*Thinopyrum intermedium*
7	Ephraim	Crested wheatgrass	*Agropyron cristatum*
8	Newhy	Hybrid wheatgrass	*Elymus hoffmannii*
9	Lodorm	Green needlegrass	*Nassella viridula*
10	Covar	Sheep fescue	*Festuca ovina*
11	NW Colorado	Prairie Junegrass?	*Poa spp.*
12	Pueblo	Squirreltail	*Elymus elymoides*
13	Paloma	Indian ricegrass	*Achnatherum hymenoides*
14	Paiute	Orchard grass	*Dactylis glomerata*
15	Bozoisky	Russian wildrye	*Psathyrostachys juncea*
16	Trailhead	Basin wildrye	*Leymus cinereus*
17	Mandan	Canada wildrye	*Elymus canadensis*
18	Bad River	Blue grama	*Bouteloua gracilis*
19	Niner	Sideoats grama	*Bouteloua curtipendula*
20	Pastura	Little bluestem	*Schizachyrium scoparium*

RESULTS/ACCOMPLISHMENTS

On April 26, 2007, the plots were inspected to determine which species were germinating. Unfortunately, the entire area was covered with cheatgrass *Bromus tectorum* and it was very difficult to distinguish our seeded grasses. Application of herbicide was not an option since it would also kill the new grass seedlings. An attempt to get rid of cheat grass by hand-hoeing was made; however, the task was impossible since it was hard to see the rows of seedling grasses. As an alternative to hand-hoeing, the entire plot area was mowed with a hand-pushed mower to a height of about three-inches to control the growth of cheatgrass and prevent it from going to seed. The area was mowed four times until the cheat grass started to die back due to mowing and hot weather. The mowing was effective in controlling cheat grass and preventing it from forming seed heads.

On August 22, 2007, Larry Sweeney, reported on the status of the plots as follows:

1. Arriba – Western wheatgrass – Very sparse (3" - 4" growth)
2. Sodar Streambank wheatgrass – Virtually no growth
3. Douglas Crested wheatgrass - Virtually no growth

4. Goldar Bluebunch wheatgrass - Virtually no growth
5. San Luis Slender wheatgrass - Virtually no growth
6. Luna Pubescent wheatgrass - Virtually no growth
7. Ephraim Crested wheatgrass - Virtually no growth
8. Newhy Hybrid wheatgrass - Virtually no growth
9. Lodorm Green needlegrass – Almost nothing (4" – 5" growth)
10. Covar Sheep fescue – Good, but not full (2" – 3" growth)
11. NW Colorado Prairie Junegrass(Poa) – Full (5" – 10" growth)
    a. Although still much green, some browning has occurred
    b. Very few weeds in this section – Some Thistle
12. Pueblo squirreltail – Sparse (6" – 7" growth)
13. Paloma Indian ricegrass – Very sparse (5" – 6" growth)
14. Pauite Orchard grass – Sparse (3" – 4" growth)
15. Bozoisky Russian wildrye – Very sparse (4" – 5" growth)
16. Trailhead Basin wildrye – Sparse (4" growth)
17. Mandan Canada wildrye – Almost nothing (2-1/2" growth)
18. Bad River Blue grama – Nothing
19. Niner Sideoats – Nothing
20. Pastura Little blue stem – Nothing

Larry also reported that no measurable precipitation occurred during the months of May, June and July. Some Monsoonal rains occurred in late July and early August, however, he was not at home to measure.

On September 25, 2007, the plots were visited again to make a determination on re-seeding the plots. At this date it appeared that Covar-Sheep fescue, NW Colorado –Poa (Prairie Junegrass), Paloma-Indian ricegrass and Bozoisky-Russian Wildrye were the plots that had a good plant stand (35% - 40% for all of them except NW-Colorado that had 90% plant stand). A decision was made to re-seed in order to have a better demonstrational planting. On October 26, 2007, the plots were re-seeded except for NW Colorado Prairie Junegrass (Poa). The plots were re-planted with hand -Planet Jr. - seeders. The warm season plots were replaced with native perennial forbs as follow:
Plot-18- Appar-Prairie flax *Linum lewisii*
Plot-19- Timp-Utah sweetvetch *Hedysarum boreale*
Plot-20 Bandera-Rocky Mountain penstemon *Penstemon strictus*
Also plot -12 Pueblo-squirreltail was replace with Wapiti-squirreltail.

After the seeding was complete, most all of the plots were sprayed with a 3% solution of glyphosate (Round-up) to kill the existing cheatgrass and other indigenous grass plants.

Plots will be evaluated in spring-2008 to check on plant stands.

Project COPMC-F- 0605-RA
Report-2007
By: Manuel Rosales & Patrick Davey

Off-Center Planting Bluebell, Utah

OBJECTIVE

To determine adaptability of most applicable plant materials for use in low precipitation sandy sites to support Field Office Technical Guide (FOTG) and PM-releases. The top rated species will be recommended to be listed in the FOTG to be used by local NRCS field offices in Utah. These plant materials can then be recommended to solve rangeland resource concerns and natural resource concerns where plant materials are applicable. The off-center plots will also be used for educational, demonstrational, and training purposes.

INTRODUCTION

This off-center planting was requested by the NRCS Area Range Conservationist in Roosevelt, Utah, to further test the cool season grass species that did well on the Coyote Draw trial. The Coyote Draw site had very similar climatic conditions except the soils were clayey at Coyote Draw and the soils on this site are sandy soils. Currently, the local NRCS Field Office have very few native and introduced grass species to recommend to producers to plant under these conditions in order to solve the resource concerns. There is a need to increase the number of adapted perennial native grasses that can be recommended in the area. This technology development study was set up to fill this need.

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

Fifty accessions (Plant materials releases and experimentals) were planted on November 7, 2006, (See Table 1). The planting was done with a four-row plot cone-seeder. The rate of seeding was 30 pure live seeds per linear foot of row. The plot size is 4 x 20 feet with four rows per plot spaced about one foot apart. No seed bed preparation was done before planting. The average annual precipitation for the site is 8-12 inches. The soil texture for the site is sandy loam. The site is located about 15 miles west from the Roosevelt, Utah Service Center, at an elevation of about 6200 feet. Site was fenced to protect it from grazing cattle, big game wildlife, and rabbits. This is a dryland off-center planting with no irrigation.

Project COPMC-F- 0605-RA
Report-2007
By: Manuel Rosales & Patrick Davey

Table 1. Fifty Entries of Perennial Grasses for Bluebell, Utah, Off-Center Evaluation.

Entry No.	Release/ Accession	Common Name	Scientific Name	Seed Source
1	Nezpar	Indian ricegrass	*Achnatherum hymenoides*	Aberdeen, ID
2	Anatone	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	Aberdeen, ID
3	Goldar	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	Aberdeen, ID
4	Bannock	Thickspike wheatgrass	*Elymus lanceolatus*	Aberdeen, ID
5	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	Aberdeen, ID
6	Magnar	Basin wildrye	*Leymus cinereus*	Aberdeen, ID
7	Ephraim	Crested wheatgrass	*Agropyrum cristatum*	Aberdeen, ID
8	Rush	Intermediate wheatgrass	*Elytrigia intermedia*	Aberdeen, ID
9	Rimrock	Indian ricegrass	*Achnatherum hymenoides*	Bridger. MT
10	Critana	Thickspike wheatgrass	*Elymus lanceolatus*	Bridger. MT
11	Trailhead	Basin wildrye	*Leymus cinereus*	Bridger. MT
12	Goshen	Prairie sandreed	*Calamovilfa longifolia*	Bridger. MT
13	Paloma	Indian ricegrass	*Achnatherum hymenoides*	Los Lunas, NM
14	Tusas	Bottlebrush squirreltail	*Elymus elymoides*	Los Lunas, NM
15	Alma	Blue grama	*Bouteloa gracilis*	Los Lunas, NM
16	Hachita	Blue grama	*Bouteloa gracilis*	Los Lunas, NM
17	Niner	Sideoats	*Bouteloa curtipendula*	Los Lunas, NM
18	Vaughn	Sideoats	*Bouteloa curtipendula*	Los Lunas, NM
19	Aldous	Little bluestem	*Schyzachyrium scoparium*	Los Lunas, NM
20	Bad river	Blue grama	*Bouteloa gracilis*	Bismark, ND
21	Pierre	Sideoats	*Bouteloa curtipendula*	Bismark, ND
22	Badlands	Little bluestem	*Schyzachyrium scoparium*	Bismark, ND
23	Nordan	Crested wheatgrass	*Agropyrum cristatum*	Bismark, ND
24	739	Indian ricegrass	*Achnatherum hymenoides*	Meeker, CO
25	Pueblo	Bottlebrush squirreltail	*Elymus elymoides*	Meeker, CO
26	Wapiti	Bottlebrush squirreltail	*Elymus elymoides*	Meeker, CO
27	State Bridge	Bottlebrush squirreltail	*Elymus elymoides*	Meeker, CO
28	Colorado	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	Meeker, CO
29	Graystone	Needle & thread	*Hesperostipa comata*	Meeker, CO
30	Maybell	Needle & thread	*Hesperostipa comata*	Meeker, CO
31	Simms	Needle & thread	*Hesperostipa comata*	Meeker, CO
32	Yampa	Prairie Junegrass	*Koeleria comata*	Meeker, CO
33	Price	Salina wildrye	*Leymus salinus*	Meeker, CO
34	Luna	Intermediate wheatgrass	*Elytrigia intermedia*	Meeker, CO
35	Volga	Mammoth wildrye	*Leymus racemosu*	Meeker, CO
36	Arriba	Western wheatgrass	*Pascopyrum smithii*	Meeker, CO
37	Fish Creek	Bottlebrush squirreltail	*Elymus elymoides*	ARS-Logan, UT
38	Sand Hollow	Bottlebrush squirreltail	*Elymus elymoides*	ARS-Logan, UT
39	Toe Jam Creek	Bottlebrush squirreltail	*Elymus elymoides*	ARS-Logan, UT
40	P-24	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	ARS-Logan, UT
41	P-7	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	ARS-Logan, UT
42	Continental	Basin wildrye	*Leymus cinereus*	ARS-Logan, UT
43	L-46	Basin wildrye	*Leymus cinereus*	ARS-Logan, UT

Entry No.	Release/ Accession	Common Name	Scientific Name	Seed Source
44	Douglas	Crested wheatgrass	*Agropyron cristatum*	ARS-Logan, UT
45	Hycrest-II	Crested wheatgrass	*Agropyron cristatum*	ARS-Logan, UT
46	Vavilov	Siberian wheatgrass	*Agropyrum fragila*	ARS-Logan, UT
47	Bozoisky II	Russian wildrye	*Psathyrostachys juncea*	ARS-Logan, UT
48	P-22	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	ARS-Logan, UT
49	White River	Indian ricegrass	*Achnatherum hymenoides*	ARS-Logan, UT
50	Star Lake	Indian ricegrass	*Achnatherum hymenoides*	ARS-Logan, UT

RESULTS

On May 11, 2007, the plots were sprayed with herbicide Buctryl and 2,4-D at recommended rates to eliminate some of the broadleaved weeds.

On July 24, 2007, the plots were evaluated. A visual estimate of plant stand per plot was recorded and analyzed statistically (See table 2). Rabbits had gained access to the plots and had done considerable damage to most plots. Plant vigor was not taken due to the damaged performed by rabbits, making it impossible to truly assess plant vigor. The plots will continue to be evaluated in subsequent years until sufficient data is collected to make confident recommendations.

Table 2. Percent Plant Stand per Plot for 50 Perennial Grasses. Bluebell, Utah. 2007

Entry No.	Release/Accession	Common Name	% Plant Stand*
34	Luna	Intermediate wheatgrass	38.75
42	Continental	Basin wildrye	28.25
11	Trailhead	Basin wildrye	26.25
37	Fish Creek	Bottlebrush squirreltail	23.00
41	P-7	Bluebunch wheatgrass	20.25
46	Vavilov	Siberian wheatgrass	19.50
35	Volga	Mammoth wildrye	19.25
40	P-24	Bluebunch wheatgrass	19.00
8	Rush	Intermediate wheatgrass	17.25
44	Douglas	Crested wheatgrass	16.75
39	Toe Jam Creek	Bottlebrush squirreltail	14.75
48	P-22	Bluebunch wheatgrass	14.50
13	Paloma	Indian ricegrass	13.25
3	Goldar	Bluebunch wheatgrass	11.25
23	Nordan	Crested wheatgrass	10.5
38	Sand Hollow	Bottlebrush squirreltail	7.75
2	Anatone	Bluebunch wheatgrass	7.00
5	Sodar	Streambank wheatgrass	5.75
6	Magnar	Basin wildrye	5.75
47	Bozoisky_II	Russian wildrye	4.25
45	Hycrest-II	Crested wheatgrass	3.50

Entry No.	Release/Accession	Common Name	% Plant Stand*
9	Rimrock	Indian ricegrass	3.00
27	State Bridge	Bottlebrush squirreltail	3.00
36	Arriba	Western wheatgrass	3.00
10	Critana	Thickspike wheatgrass	2.75
43	L-46	Basin wildrye	2.75
50	Star Lake	Indian ricegrass	2.75
4	Bannock	Thickspike wheatgrass	2.00
1	Nezpar	Indian ricegrass	1.75
29	Graystone	Needle & thread	1.75
49	White River	Indian ricegrass	1.75
30	Maybell	Needle & thread	1.50
7	Ephraim	Crested wheatgrass	0.75
15	Alma	Blue grama	0.75
24	739	Indian ricegrass	0.75
25	Pueblo	Bottlebrush squirreltail	0.75
28	Colorado	Bluebunch wheatgrass	0.75
31	Simms	Needle & thread	0.75
16	Hachita	Blue grama	0.50
19	Aldous	Little bluestem	0.50
32	Yampa	Prairie Junegrass	0.50
33	Price	Salina wildrye	0.50
12	Goshen	Prairie sandreed	0.25
14	Tusas	Bottlebrush squirreltail	0.25
17	Niner	Sideoats	0.25
18	Vaughn	Sideoats	0.25
20	Bad river	Blue grama	0.25
21	Pierre	Sideoats	0.25
22	Badlands	Little bluestem	0.25
26	Wapiti	Bottlebrush squirreltail	0.25

*****Percent plant stand is the average of four observations. The results were significantly different at the 5% level of probability. Plant stand was measured by making a visual estimate per plot; if entire four row/plot germinated the entry was recorded as 100 percent establishment.

Project COPMC-P-0301-RA
Report - 2007
By: Manuel Rosales

Advanced Evaluation of Indian Ricegrass *Achnatherum hymenoides* for Clayey Soils

OBJECTIVE

To find a selection of Indian ricegrass that is adapted to clayey soils.

INTRODUCTION

Indian ricegrass *Achnatherum hymenoides* is a native cool-season, perennial bunchgrass; 1 to 2 feet tall that is often a major stand component of harsher, sandy sites. It occurs in Canada from Manitoba to British Columbia, in all United States west of the Missouri River, and Northern Mexico. While the species is best adapted to dry, sandy soils, it can also be found on clayey, silty, and shaley sites. It does well on southern exposures, especially at higher elevations. Indian ricegrass is found in the 6 to 18 inch precipitation zone at elevations ranging from 2000 to 10,000 feet. Stands tend to be short-lived (3 to 4 years) and reproduction is primarily from seed. It is very drought tolerant and is often a pioneer species on open or disturbed sites. It tends not to compete well with other perennial grasses. Indian ricegrass moderately tolerates saline or alkaline soils, but does best under more mesic conditions. The species performs poorly under shade and high water tables.

Indian ricegrass is highly palatable and serves to provide nutritious forage for wildlife and livestock under harsh site conditions. It reaches peak production from mid-June through mid-July, holding its nutrient value at maturity. It also has strong potential for use with mined land reclamation, critical area stabilization, and as a standing winter feed.

Past releases of Indian ricegrass ('Nezpar', 'Paloma', 'Rimrock', and Ribstone germplasm) are more adapted to light to medium textured soils. As a consequence of its good nutrition, palatability, and establishment characteristics on critical areas, there is a need for a cultivar or selection of Indian ricegrass that is adapted to heavier (clayey) soil types.

EXPERIMENTAL DESIGN

The experimental design for the advanced study is a randomized complete block with three replications.

MATERIALS & METHODS

In 1988, collections of Indian ricegrass ecotypes from heavy soils were made in Colorado, Wyoming, Utah, and Nevada. From 1991 to 1998, Upper Colorado Environmental Plant Center (UCEPC) conducted initial evaluations that led to ten superior selections for an advanced study. In September 2003, preparations were made to plant the advanced study, however, due to unforeseen circumstances the study was postponed until 2004. The advanced study was planted at UCEPC with a hand-pushed belt seeder On July 29, 2004.

Project COPMC-P-0301-RA
Report - 2007
By: Manuel Rosales

Twelve entries; nine accessions and three cultivars used as standards for comparison were planted. The rate of seeding was 30 pure live seed per linear foot of row. The soil for the study site was identified by Charles Peacock, USDA-NRCS Soil Scientist, to contain 27 percent clay (texture class-silty clay loam) in the surface with an average of 40-50 percent clay (texture class-clay) in the subsoil. A plot plan for the study and a table with the entries and their collection site are presented below:

Indian Ricegrass
Plot Plan - Summer/2004

↑
North

Rep I				Rep II				Rep III			
741	Alley	735	Alley	818	Alley	Paloma	Alley	716	Alley	Rimrock	Alley
739		818		661		664		818		735	
Rimrock		661		749		Rimrock		749		741	
749		716		735		Nezpar		715		661	
664		Nezpar		739		741		Nezpar		664	
715		Paloma		715		716		Paloma		739	

Note: The last 3 digits of the accession numbers were used in the table.
Plot size: (20 ft x 12 ft) = 240 square feet, 181.5 plots/acre
Rows/Plot = Four (3 ft centers) **Number of entries** = 12 **Alley width** = 10 feet

Accessions/Cultivar	Collection Site
9024664	Moffat Co., CO
9024716	Colorado Springs, CO
9024818	Unknown
9024715	Colorado Springs, CO
9024741	Pagosa, CO
9024661	Delta, CO
9024739	Pagosa, CO
9024735	Grand Junction, CO
9024749	Durango, CO
Nezpar	Whitebird, ID
Paloma	Pueblo, CO
Rimrock	Bridger, MT
A total of 12 entries were planted on July 29, 2004	

Project COPMC-P-0301-RA
Report - 2007
By: Manuel Rosales

RESULTS

Year-2006

Results for 2006 are presented in the following table:

Table 1. Seed Yield and Other Parameters for 12 entries of Indian Ricegrass. UCEPC-2006

Accession/ Release	Seed Yield (lb/acre)	Forage (dry-wt) Ton/acre[1]	Plant Height[2] (cm)	Percent Plant Stand[3]	Re-growth[4]
9024741	**191.0**	0.76	71.0	93.3	2.0
Rimrock	165.5	0.76	70.0	94.4	2.7
9024739	165.2	0.68	67.4	90.0	2.7
9024715	119.9	**0.91**	70.0	91.7	2.0
9024661	113.8	0.83	69.4	89.3	1.3
9024735	103.9	0.87	59.7	95.0	1.3
9024749	95.7	0.83	65.6	90.0	1.7
Nezpar	83.7	0.65	77.5	90.7	2.0
9024664	68.2	**0.94**	58.2	91.7	1.7
9024716	58.4	0.68	65.2	91.0	1.3
Paloma	24.0	0.68	52.3	60.0	1.0
9024818	13.3	0.36	47.3	61.7	1.0
Mean	**100.3**	**0.75**	**64.5**	**86.5**	**1.7**
	S[5]	**NS**	**S**	**S**	**S**

1. Air-dry above ground biomass (cut 4 inches above soil surface)
2. Plant height measure in centimeters to top of seed panicle
3. Visual estimate per plot basis.
4. Visual rating taken 35 days after forage cutting, where 1 = Excellent re-growth, 2 = Moderate & 3 = poor.
5. Statistically Significant(S) or not significant (NS) at the 5 percent level of significance.

Note: All data is the average of three replications.

Data collection will continue for at least another two more years in order to conclude the project.

Year-2007

Results for 2007 are presented in table 2. The performance of all entries for 2007 was not consistent with the results obtained for year-2006. Table 3 presents a comparison for seed yield for year 2006 and 2007 and table 4 presents a comparison for forage production for both years. The test will be continued for another year in order to have three years of data to make a better determination on the performance of the accessions as compared to the control/releases.

Table 2. Seed Yield and Other Parameters for 12 Entries of Indian Ricegrass. UCEPC-2007

Accession/ Release	Seed Yield (lb/acre)	Forage (dry-wt) Ton/acre[1]	Plant Height[2] (cm)	Percent Plant Stand[3]	Shatter[4]
9024749	195.3	1.4	76.8	92.3	2.7
9024661	180.7	1.3	76.8	92.0	2.7
9024715	160.7	1.3	71.5	95.0	2.3
9024664	155.0	1.1	77.6	97.7	2.3
Paloma	138.8	1.2	59.8	55.0	1.0
9024716	138.0	1.1	71.5	95.0	2.7
9024739	117.2	0.7	69.9	91.7	3.0
9024735	97.8	1.0	60.9	96.7	3.0
9024741	96.2	0.9	70.2	95.0	1.7
9024818	90.0	0.6	49.5	63.3	1.0
Rimrock	77.0	0.8	79.0	96.7	2.0
Nezpar	57.8	0.8	78.8	95.0	1.0
Mean	**125.4**	**1.0**	**70.2**	**88.8**	**2.1**
	S[5]	**NS**	**S**	**S**	**S**

1. Air-dry above ground biomass (cut 4 inches above soil surface)
2. Plant height measure in centimeters to top of seed panicle
3. Visual estimate per plot basis.
4. Visual rating taken on June 27, 2007, where 1 =No shatter, 2 = Moderate Shatter & 3 = Heavy Shatter
5. Statistically Significant(S) or not significant (NS) at the 5 percent level of significance.

Note: All data is the average of three replications.

Table 3. Comparison of Seed Yield for 12 Entries of Indian Ricegrass Achnatherum hymenoides Grown in 2006 and 2007. UCEPC-2007

Accession/ Release	Seed Yield (lb/acre) 2006	2007	Seed yield(lb/Acre) 2-year average	Collection Site
9024661	113.8	180.7	147.25	Delta, CO
9024749	95.7	195.3	146.50	Durango, CO
9024741	191.0	96.2	143.60	Pagosa, CO
9024739	165.2	117.2	141.20	Pagosa, CO
9024715	119.9	160.7	140.3	CO Springs, CO
Rimrock	165.5	77.0	121.25	Bridger, MT
9024664	68.2	155.0	111.6	Moffat, CO
9024735	103.9	97.8	100.85	G. Junction. CO
9024716	58.4	138.8	98.6	CO-Springs, CO
Paloma	24.0	138.8	81.4	Pueblo, CO
Nezpar	83.7	57.8	70.7	Whitebird, ID
9024818	13.3	90.0	51.6	Unknown

Table 4. Comparison of forage production for 12 entries of Indian Ricegrass Achnatherum hymenoides grown in 2006 and 2007 UCEPC-2007

Accession/ Release	Forage production[1] (tons/acre) 2006	2007	Forage production (tons/acre) 2-year average	Collection Site
9024715	0.91	1.3	1.1	CO-Springs, CO
9024749	0.83	1.4	1.1	Durango, CO
9024661	0.83	1.3	1.1	Delta, CO
9024664	0.94	1.1	1.0	Moffat, CO
9024735	0.87	1.0	1.4	G. Junction. CO
Paloma	0.68	1.2	0.9	Pueblo, CO
9024716	0.68	1.1	0.9	CO-Springs, CO
9024741	0.76	0.9	0.8	Pagosa, CO
Rimrock	0.76	0.8	0.8	Bridger, MT
Nezpar	0.65	1.8	1.2	Whitebird, ID
9024739	0.68	0.7	0.7	Pagosa, CO
9024818	0.36	0.6	0.5	Unknown

1. Forage dry weight of above ground biomass cut 4-inches above soil surface.

Project: COPMC-P-0701-CR
Report- 2007
By: Heather Plumb

Initial Evaluation of Blue Wildrye for Routt-Medicine Bow National Forest

OBJECTIVE

To evaluate different seed sources of Blue Wildrye *Elymus glaucus* for revegetation in critical areas, forest lands, and mining land in Routt-Medicine Bow National Forest.

INTRODUCTION

There is a constant demand for plants that are ideal for revegetation work on critical land sites, mining lands, and forested lands. Upper Colorado Environmental Plant Center (UCEPC) and the Routt-Medicine Bow National Forest are working together to evaluate if *Elymus glaucus* Blue Wildrye is an ideal plant for revegetation in disturbed land sites.

EXPERIMENTAL DESIGN

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

MATERIALS AND METHODS

Forty-two collection of Blue Wildrye were attained from Routt-Medicine Bow National Forest and cleaned at UCEPC. Twenty-seven collections from the forty-two original collections from Routt- Medicine Bow National Forest were used in the initial evaluation study as well as two plant material collections from the UCEPC. For comparison Blue Wildrye releases "Arlington" and "Elkton" from Corvallis Oregon and two potential Blue Wildrye releases from Pullman Washington were used in the evaluation. A total of thirty-three collections were used in the initial evaluation. Table 1 lists the accessions used in the evaluation. No PLS seed testing was preformed on the Routt- Medicine Bow National Forest seed collections or the two plant material collections from UCEPC, thus seed viability was assumed. Planting began on August 1, 2007, a total of forty-nine plots were planted due to high wind conditions, the remainder of the plots had to be planted on August 2, 2007. The plots were designed as 16 foot long rows, three rows per plot, three replications for each entry, 30 seeds per linear foot, 12 foot and six foot spacings between plantings for alleyways. Table 3 provides a visual for the plot plan design. This configuration allowed for 14.6 grams of seed per entry for a single test. This plot design was used due to the fact the collection grams made by the Routt-Medicine Bow National Forest were insufficient to have more replications and longer row lengths.

Plot locations were determined by using Excel. Random plot numbers were placed into the Excel randomization function and random plots were chosen. Table 2 lists the random numbers for the plots used. A belt seeder was used for the entire planting of the three replications. Prior to planting five grams of Blue Wildrye seed were measured out for each entry and placed in seed packets. These packets were spaced out evenly over the belt on the seeder for planting.
After seeding no irrigation was needed for germination due to a thunderstorm shower that provided enough water for germination to occur.

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The parameters of the evaluation to be examined are Year 1: Seed emergence. Year 2-Advanced Evaluation: vigor**,** percent stand cover**,** seed production rating**,** date of greenup**,** date of seed ripeness**,** disease, insects, and nutrient problems.

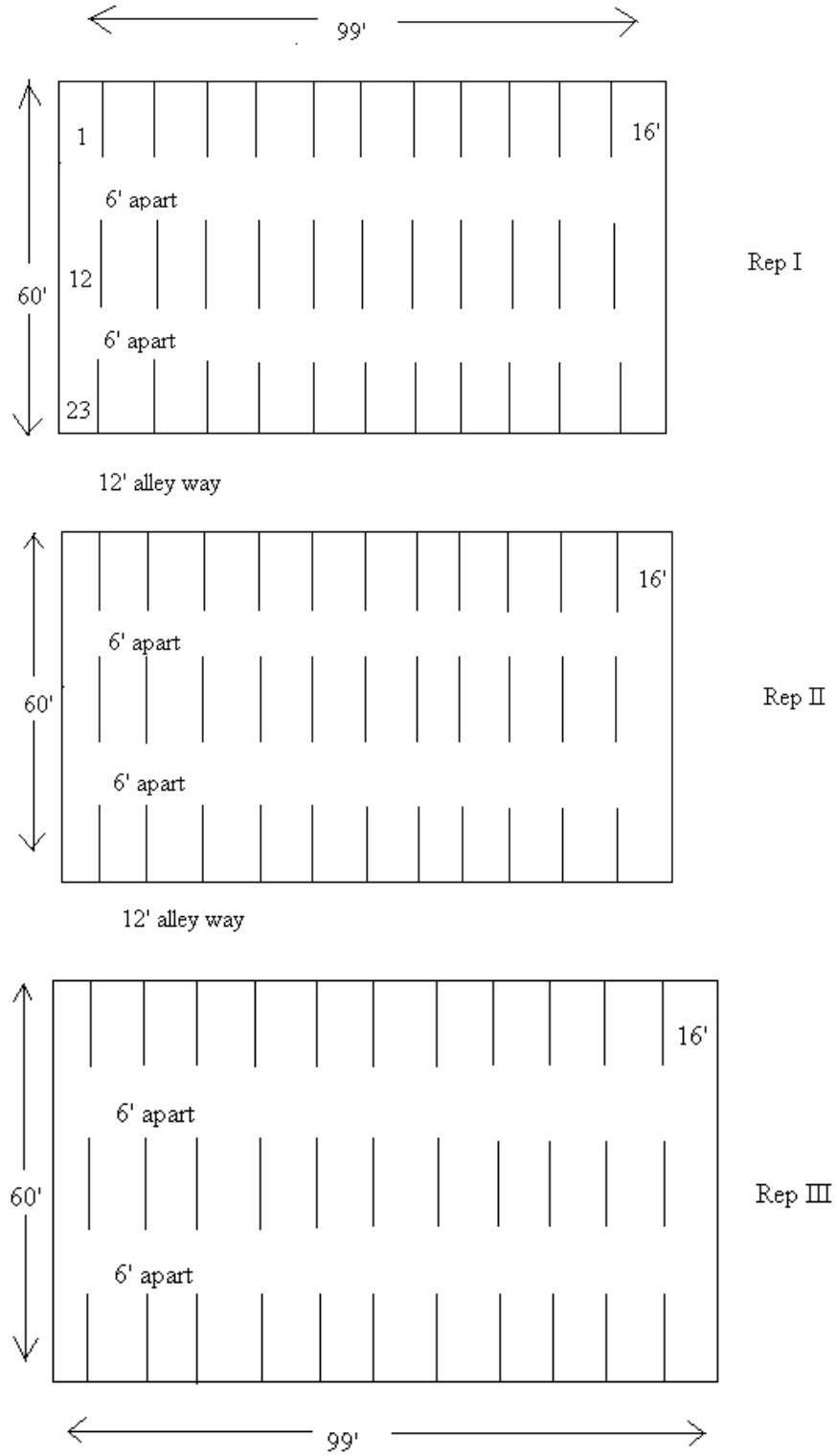
Table 1. List of Blue Wildrye accessions used in the Initial Evaluation.

Number of Entries	Collection	Id in plot design
1	080106-A1	A
2	080106-A2	AA
3	073106-A2	AB
4	073106-A1	AC
5	072706-A3	AD
6	072006-A1	AE
7	214-03	AF
8	214-02	AG
9	221-03	AH
10	080406-A1	B
11	080106-A4	C
12	091406-A1	D
13	091406-A2	E
14	481-02	F
15	091206-A1	G
16	481-06	H
17	481-04	I
18	091206-A3	J
19	091206-A2	K
20	481-07	L
21	221-02	M
22	080306-A1	N
23	481-05	O
24	080106-A3	P
25	Marvine Creek	Q
26	Uncompaghre 04	R
27	080906-A1	S
28	214-01	T
29	221-01	V
30	SP05-1	W
31	BO5-1	X
32	SBR-06-Arling	Y
33	SBR-06-Elkton	Z

Table 2. Randomization blocks from Excel used to determine plots

	Block 1		Block 2		Block 3	
Plot no	Treatment	Random no	Treatment	Random no	Treatment	Random no
1	A	0.12685	Z	0.827168	N	0.934148
2	AA	0.093156	Q	0.253182	X	0.607366
3	AB	0.174891	L	0.675272	F	0.432386
4	AC	0.617568	AD	0.832958	H	0.512774
5	AD	0.582068	V	0.431124	Y	0.615301
6	AE	0.737657	K	0.109453	P	0.30672
7	AF	0.857693	B	0.480481	O	0.094621
8	AG	0.605914	H	0.22079	L	0.843278
9	AH	0.087742	AF	0.027586	J	0.732068
10	B	0.196349	AA	0.242081	AH	0.837903
11	C	0.832278	S	0.327228	Z	0.055589
12	D	0.492825	I	0.630387	AF	0.327078
13	E	0.584923	R	0.186464	D	0.220671
14	F	0.234286	E	0.262094	M	0.640431
15	G	0.303769	J	0.768045	V	0.765237
16	H	0.514176	AH	0.01053	C	0.369469
17	I	0.579793	AE	0.816434	K	0.723174
18	J	0.811658	AB	0.207076	I	0.740771
19	K	0.316422	C	0.086017	G	0.560539
20	L	0.236978	M	0.037421	AC	0.014513
21	M	0.625428	N	0.17345	AA	0.746739
22	N	0.934488	A	0.557107	AD	0.339793
23	O	0.797779	X	0.366823	AB	0.789311
24	P	0.643109	G	0.94481	T	0.821769
25	Q	0.644642	AG	0.51776	S	0.03205
26	R	0.481264	T	0.091443	AG	0.358766
27	S	0.061983	P	0.686283	Q	0.661964
28	T	0.557049	O	0.290737	AE	0.274787
29	V	0.585388	D	0.191142	E	0.787584
30	W	0.072611	Y	0.514224	A	0.757198
31	X	0.309719	AC	0.043549	R	0.30303
32	Y	0.434518	F	0.392722	W	0.412138
33	Z	0.830207	W	0.199344	B	0.846997

Table 3. The plot plan design for Blue Wildrye



Project: COPMC-P-0701-CR
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By: Heather Plumb

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
STUDY PLAN

Study ID Code	COPMC-P-0701-CR	
Title	Initial Evaluation of Blue Wildrye	
National Project No.	Critical Area 1.1	
Study Type	Initial Evaluation	
Study Status	Active	
Location	UCEPC	
Study Leader	Heather Plumb, COPMC	
Duration	2007-2011	
Cooperators	Routt-Medicine Bow National Forest	
Land Use	Critical Area Forest Land Mine Land	
Vegetative Practices	Primary Secondary	342 Critical Area Planting Forest Land, Mineland

Resource Concerns

Resource	Consideration/Problem
Air	Particulate reduction
Animals	Forage production & habitat
Soil	Carbon sequestration, erosion, weed control
Water	Erosion
Human	Native plants

Long Range Plan

The study is linked to the NRCS 2006 National Strategic Plan, 2006-2010 National PM Strategic Plan and the UCEPC Long Range Plan for product development

Description

Commercially available releases and soon to be released selections of blue wildrye from the Pacific Northwest will be compared to accessions originating primarily from Northwest Colorado and South central Wyoming.

Status of Knowledge

Blue Wildrye (*Elymus glaucus* and *Elymus glaucus* var. *jepsonii*) is a tall, rapidly developing, loosely tufted, native perennial bunch grass. They can grow to be up to five feet tall with an upright growth habit that contains very few stems per plant. It is considered under most conditions a short lived plant living three to eight years. This species is primarily self-pollinated and self fertile. Seedheads form a long, narrow, bearded spike with awns that turn purple when ripe. Leaf blades are flat and thin ranging from 4-12 mm wide. It provides good early season forage, but later becomes too coarse and stemmy for wildlife consumption. They are adapted to disturbed and undisturbed land areas. It tolerates a wide variation in soil and weather conditions, though *glaucus* prefers moisture, it tolerates drought conditions. Blue Wildrye is excellent for meadow and streambank restoration, swale seeding, reseeding burned and disturbed sites. It is great wildlife habitat for birds, mammals and waterfowl.

USDA, OAES and NRCS have released three accessions of Blue Wildrye; “Arlington” in 1995, “Elkton” in 1997 and “Mariposa” in 2000. “Arlington” and “Elkton” are a native, cool season perennial bunch grass. They establish in low elevations (200-400 feet above sea level). They establish rapidly from seed, but are short lived plants. They are appropriate for uses on erosion control and swift self-perpetuating cover on logging roads, clear cut timberlands, burned areas and steep hillsides. “Mariposa” does well growing on loamy to clay loamy soils. It is best grown on moderate well drained, moist, medium textured soils. It persists on moderately deep road cut slopes and does not tolerate poor drainage or prolonged flooding. It grows at an elevation of 600 feet above sea level.

Average seeds per ft^2 at 1 lb/acre would be 2.6 seeds. Seeding rate is five to seven lbs/ac PLS.

Experimental Design

Randomized Complete Block

Treatment:

33 selected accessions of blue wildrye

Replications:

Each treatment will be replicated 3 times
33 plots total per replication.

Materials and methods

A number of collections of Blue Wildrye were attained from Routt- Medicine Bow National Forest and cleaned at the Upper Colorado Environmental Plant Center (UCEPC). Twenty-seven collections from Routt- Medicine Bow National Forest were used in the initial evaluation study as well as two plant material collections from the UCEPC. For comparison Blue Wildrye releases “Arlington” and “Elkton” from Corvallis Oregon and two potential Blue wildrye releases from Pullman Washington were used in the evaluation. A total of 33 collections were used in the initial evaluation.

No PLS seed testing was preformed on the Routt- Medicine Bow National Forest seed collections or the two plant material collections from the UCEPC, thus seed viability was assumed.

For the plot plan design, plots were designed as 16 foot long rows, three rows per plot, three replications for each entry, 30 seeds per linear foot,12 foot and six foot spacing’s between plantings for alley ways. This configuration allowed for 14.6 grams of seed per entry for a single test. This plot design was used due to the fact the collection grams made by the Routt-Medicine Bow National Forest were insufficient to have more replications and longer row lengths. Plot locations were determined by using Excel. Random plot numbers were placed into the Excel randomization function and random plots were chosen.

Planting equipment consisted of a belt seeder. Prior to planting, five grams of Blue Wildrye seed were measured out for each entry and placed in seed packets. These packets were spaced out evenly over the belt on the seeder for planting.

The planting was irrigated to ensure seed establishment. No irrigation will be applied after the establishment year. Weeds will be controlled by the most appropriate method. Plots will be evaluated as follows:

Year 1:

- Seed emergence

Year 2- 5:

- Vigor
- Percent Stand Cover
- Seed production rating

- Date of greenup
- Date of seed ripeness
- Comments (disease, insects, nutrient problems)
- Digital photos from established photo points at harvest

Final Evaluations

Evaluations will be submitted to WNTSC PMS who will develop an annual report for submission into all participating PMC annual reports.

Technology Transfer Products

Annual reports

Literature Cited

PMC release documentation, Commercial literature

1. USDA, NRCS. 2007. The PLANTS Database (http://plants.usda.gov, 3 August 2007). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
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4. Corvallis Plant Material Center. 1995. Notice of release of “Arlington” Blue Wildrye.
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Project COPMC-S-0201-WL
Project Report-2007
By: Steve Parr

Seed Increase of Prairie Junegrass
Koeleria macrantha

INTRODUCTION

Koeleria macrantha prairie Junegrass is a perennial, cool-season bunchgrass that is widely distributed throughout the United States. According to Hitchcock, 1935, its range extends from Ontario to British Columbia, south to Delaware, Missouri, California, and Mexico. The species is also widely distributed in the temperate regions of the old world. In the Central Rocky Mountains, it is commonly found as a component of prairies, open woods, mountain parks, sagebrush, and mountain brush communities. In Colorado, it is found in elevations ranging from below 4000 feet to over 11,000 feet. The species provides good forage for both livestock and grazing wildlife species, and fair forage for browsing species of wildlife. *Koeleria macrantha* is usually sparsely distributed and is generally not found as the dominant range species in a particular stand. Because of this, its importance as forage to both wildlife and livestock may be more related to its abundance than its preference.

Prairie Junegrass also responds well after fire and studies have found positive effects to plant size and seed head abundance following fire. Other studies show it has increased in abundance after prolonged drought conditions and man induced surface disturbances. Although prairie Junegrass has a number of characteristics that make it an attractive product for inclusion in seed mixtures for revegetation, there is only one released variety, Barkoel, which is from the Netherlands. There is no release from the United States. This may be a factor in whether the species is recommended in mixtures. Because of the potential benefit to native ranges, prairie Junegrass has been a product under selection at Upper Colorado Environmental Plant Center (UCEPC) since 1984.

Forty accessions of *Koeleria macrantha* were planted as a fall seeding, Project 08I115, on August 23, 1985. Due to poor establishment of this planting, a spring planting, Project 08I152, was established on June 12, 1986. Because of insufficient seed, only 32 accessions of the original 40 were included in Project 08I152. In addition, 19 International collections were included in Project 08I152, bringing its total number of accessions up to 51. In 1988, Projects 08I115 and 08I152 were combined into a single project designated as 08I115.

In 1991, Dr. Jack Carlson, who was at the time the Northwestern Regional Plant Materials Specialist for the SCS, recommended that a composite of the best strains from the Central Highlands of Turkey (PI-204451, PI-206274, PI-383672, PI-383673, and PI-383674), be made. In addition, Dr. Carlson recommended that a second composite be put together that consisted of the best performing strains from Northwestern Colorado. At that time, Northwest Colorado accessions 9024197, 9024421, and 9039787 were recommended.

In 1993, Dr. Gary Noller, UCEPC Senior Scientist, determined the top three Northwest Colorado and the top three Turkish Central Highlands accessions for the project. Dr. Noller recommended that accessions PI-383672, PI-383673, and PI-204451 be chosen from the Turkish Ecotypes. In

addition, Dr. Noller recommended that accessions 9024197, 9039786, and 9039787 be chosen to represent the Northwest Colorado ecotypes. Accession 9024197 is from Rio Blanco County, while accession 9039786 and 9039787 are from Routt County.

During the summer of 1994, UCEPC established separate crossing nurseries for the Northwest Colorado and Central Turkish Highland accessions in UCEPC. The nurseries were established with vegetative culms transplanted from UCEPC Field 21 onto 3-foot centers. Each nursery was laid out in a Randomized Complete Block design and included three replications. Each genotype is represented within a given replication seven times. The Northwest Colorado crossing block represents Project 08A207 while the Turkish Central Highlands crossing block represents Project 08A208. Dr. Tom Jones, ARS, Logan, Utah pointed out that *K. macrantha* cross-pollinates and is self-incompatible. Upon cross-pollination, seed borne on each individual representing one of the three accessions will be considered a half-sib family (one parent known, one parent unknown).

OBJECTIVE

To develop a release of *Koeleria macrantha* for conservation use from a composite selection of superior Northwest Colorado ecotypes.

METHODS FOR PRODUCT DEVELOPMENT

The original project methodology was to utilize genotypic recurrent selection only for the establishment of an F1 nursery. The original parental plants, 63 in all, were to provide the seed source for 63 F1 type plants, replicated three times, to produce an F1 nursery with 189 plants.

Each of the F1 plants was to be maintained as a separate line and eventually used to create an F2 nursery. The F1 seed, F2 seed, and Parental seed would be compared and a subsequent release be initiated based on the results.

In 1996, seed was collected and harvested by individual plant, but was not identified as to which plant or accession. In 1997-2000, seed was harvested and identified for parental determination. In 2001-2003, the seed from the crossing block was bulk harvested. Because a recurrent selection process would take an additional three to five years to establish and compare seed production results, it was determined by UCEPC to go forward with a release of prairie Junegrass based on results of advanced evaluations.

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By: Steve Parr

RESULTS

Individual plant harvests were conducted with reference to accession from years 1997-1999. Harvest results from accession 1 (9024197) from Rio Blanco County and accession 2 (9039786) and accession 3 (9039787) from Routt County are provided below.

Year	Accession 1	Accession 2	Accession 3	Total
1997	209	240	225	674
1998	653	710	581	1944
1999	174	237	255	666
Totals:	1036	1187	1061	

Analysis of variance statistics were run for the randomized complete block design of this study. Although there is an apparent accessional difference, the difference is not significant at the 5% level. Of the 63 parental plants, there is mortality in ten.

CONCLUSION

Data from three years (1997-1999) indicates there is no significant difference in accessional performance relative to seed production. Furthermore, accession 9039786 has produced the highest total and highest average amount of seed over the three-year period. However, this accession has also had the highest plant mortality with five dead plants out of ten total dead plants in the project. On the other hand, the poorest producing accession, #9039787, had the least mortality with two plants.

Because there is no statistically significant difference between accessions for seed production, and there are other characteristics within accessions that may contribute positive attributes (plant survival) to the germplasm, it was determined that a blend of all three accessions be used to establish a Northwest Colorado Junegrass seed increase field for eventual release.

2002

On July 16, 2002, blended seed from the 2001 harvest was used to seed one acre of prairie Junegrass in Field 11 at UCEPC. Seed density was targeted at 30 seeds per linear foot and the seeding was completed with a hand pushed Planet Junior. A poor to weak stand was noted until late fall, when a good stand was finally evident.

2003

On July 15, 2003, 47 pounds of Junegrass were harvested by direct combining. Seed test results indicated a low purity and 71% germination. This resulted in 24 PLS pounds produced on the one seeded acre in the first production year. This seed will be used for testing at other locations to test for the range of adaptation for the release of this product.

2004

On July 7, 2004, 221 pounds of cleaned Junegrass were harvested by direct combine from the seed increase field of one acre. Seed test results from this field show that purity is 93.4% and germination 45.0%. This resulted in 93 pounds of Pure Live Seed per acre.

2005

July 13, 2005, 100 pounds of clean seed were harvested with the combine. Seed test results are not available at this time.

2006

In 2006, 120 pounds were harvested with the combine on July 1. However, the pure live seed component is only 23%. An additional problem was identified during seed analysis with species identity. The Colorado Seed Laboratory reported the seed to be that of *Poa secunda*, big bluegrass. An additional lot was sent for resampling, but it too, was determined to be big bluegrass. Identification was attempted by UCEPC personnel, but there are very close resemblances of several *Poa* species to *Koeleria*. Tom Jones with ARS was asked if ARS could do genetic testing of our product or if he knew of competent taxonomists with whom he felt comfortable, but he suggested using university taxonomists. After our product heads out, we will send samples to several taxonomists for physical identification.

2007

On July 2, 134 clean pounds of seed were harvested from UCEPC field 11A. However, seed quality was extremely poor. Purity was identified at 40 percent and germination at only 4%. The results of this seed test, along with a number of other seed samples of harvested products this year, were very low in germination. We do not know why this is the case, nor do we have any ideas why this has occurred. We have speculated that the only variable that we did differently in 2007 was to apply a pre-emergent herbicide, Pendulum, to suppress annual weeds.

Field observations noted a lot of white or pale stems that may be the result of stem maggots, but a positive identification of a damage causing insect has not been obtained to date. This will be monitored in 2008.

Taxonomic identity has also been challenging for this species. In 2006, as noted above, seed test results from the Colorado Seed Laboratory indicated that we had not been producing a Junegrass, but rather a bluegrass. Other than seed identification, vegetative identification was the next step to determine species, or perhaps variety or source, identity.

Seed was planted in the greenhouse, and samples of headed material were sent to Dr. Mary Barkworth, Utah State University Herbarium, for taxonomic identification. Dr. Barkworth felt the material was most closely related to a *Poa*, but she was not certain which one. As a result, we sent seed samples of individually collected accessions from our crossing block, as well as some 'Sherman' obtained from Pullman, WA PMC and three Junegrass accessions that were from original collections and used in the initial evaluation project, to Dr. Steve Larson, ARS in Logan, Utah for genetic comparison and identification. At this time, Dr. Larson noted that all samples submitted are germinating, and results will be obtained in a few weeks.

If the materials by accession are identified as products other than 'Sherman', then release potential still exists. If the original collections are identified as *Koeleria*, then the initial evaluation results for the Junegrass Initial Evaluation Project will be reviewed, the top performers pulled, germinated and planted in an advanced evaluation planting. In addition, if the three accessions from our "Junegrass" crossing block are *Poa ampla*, but not 'Sherman', we can still release a blended big bluegrass. For now, however, this progress report identifies what is known at this time.

Project COPMC-S-0401-CR
Project Report 2007
By Steve Parr

Seed Increase for Fire Rehabilitation Needs
Bureau of Land Management-Colorado

INTRODUCTION

The Bureau of Land Management has reseeded over 50 thousand acres in western Colorado over the past 15 years. Like many western states, large wildfires in Colorado are recently more common; being both more numerous and larger in scale than had been historic wildfires. In fact, the largest fire in Colorado's history occurred in 1988. The "I Do" fire near Maybell, Colorado, consumed more than 15,000 acres with about one third of those acres on BLM managed lands. Only two years later, the "Bircher" fire near Cortez, Colorado, broke the record again by burning over 23,000 acres. In 2002, the Hayman fire consumed over 70,000 acres. The trend does not appear to have peaked, as much of the west is consumed by individual wildfire events burning thousands of acres annually. Since much of the burned acreage is also treated with some type of seeding to reduce erosion and to reestablish vegetative cover, seed has been in high demand.

With increases in sizes of wildfires and frequency of events, the demand on the seed industry, especially for native species, has been greater than the supply during recent years. This demand has created an unfavorable situation in which seed of desired species may be in short supply, costly, of low quality (poor germination or purity), or unavailable altogether. This often results in price fluctuations and quality or even species sacrifices by entities purchasing seed for revegetation projects. These seed substitutions often result in revegetation projects achieving less than they are capable of based on testing.

BACKGROUND

During the record fire season of 2000, BLM of Colorado treated over 18,000 acres at a cost of over one million dollars. Limited availability and quality of desired native materials prompted the BLM office in Meeker, Colorado, to contact Upper Colorado Environmental Plant Center (UCEPC) about a potential cooperative project for seed increase. An informational meeting was held on January 16, 2001, with UCEPC staff and Meeker BLM personnel to determine what the local BLM office needed and how UCEPC could help them get what they needed. What was expressed by BLM as the most important items included a consistent supply of locally adapted native seed with purity and germination standards no less than the industry standard for certified seed of that individual species, and at a price that was not prohibitive for project inclusion.

Interest in the project soon expanded from the Meeker field office to include a good portion of those offices affected by the same chronic seed source problems related to revegetation projects. Jim Cagney of the Meeker BLM office contacted Mark Stiles about the project potential in late February, and interest was expressed at the state level. On March 19, 2001, a meeting was held at UCEPC, which included local and state BLM personnel, Plant Center staff, and members of the Administrative Board. BLM needs were addressed as well as the capabilities of UCEPC to deliver products and services to meet the expressed needs. A review of UCEPC facilities and its

structure as well as a potential scope of activities were discussed. In addition, a list of potential seed increase species was reviewed and Rusty Roberts agreed to survey field offices for input regarding desired species for fire rehabilitation.

Rusty reported back via e-mail on May 7, 2001, that six of the species reviewed during the meeting in March had favorable responses and three additional species were added to the list of candidates. A preliminary proposal from UCEPC was submitted to Dennis Zachman of the state BLM office for review. Dennis submitted to the state a proposal to determine the level and willingness of the state to support a seed increase project. Revisions and further proposal development continued, but species for the increase effort had to be targeted so collections could be initiated and conducted as efficiently as possible.

Rusty followed up with an e-mail to field offices on June 7, 2001, that five species had been selected for initial increase efforts and that contact by UCEPC personnel would be forthcoming. On June 8, a detailed project proposal with budgetary estimates was submitted by UCEPC to Dennis Zachman for inclusion into a cooperative agreement between BLM, UCEPC, and NRCS.

METHODS

Project activities started with a sit down session in Grand Junction on June 25, 2001. This, as with the other sit down sessions at field office locations, was extremely beneficial in identifying potential collection sites, revegetation history, grazing or other use history, fire history etc. These factors and others were discussed to aid in selecting the sites with the highest potential for successful collecting.

A few days later, on July 3, the first day of collection by UCEPC occurred in the Little Park area on the Uncompahgre Plateau south of Grand Junction. A recap of the coordination meetings, collection areas, and clean seed amounts obtained from 2001, 2002, 2003, and 2004 is included in this report as a separate attachment.

Seed collection results were disappointing for the first year. Drought conditions over much of the collection area produced little amounts of viable seed. In addition, a hard freeze occurred on May 20, which also contributed to the poor seed fill in much of Northwest Colorado. Seed of one species, Utah sweetvetch, was collected in quantities large enough to plant a seed increase field, but was collected primarily from one site. It is the recommendation of UCEPC that we add to the genetic variability and diversity of the increase species by collecting from several locations, bulking the seed and then planting the source field. Additional collections were obtained in 2007, but on a limited scale. The other four materials, bottlebrush squirreltail, beardless bluebunch wheatgrass, western wheatgrass, and Sandberg's bluegrass were collected in gram quantities in 2001. One species that was noted to have produced good quantities of seed but was not collected was bluebunch wheatgrass *Pseudoroegneria spicata spicata*. Our agreement called for the collection of beardless bluebunch *Pseudoroegneria spicata inermis*. Because of such limited success with beardless bluebunch collections (12 grams), we decided

during our coordination meeting with Dennis Zachman on March 30, 2002, to expand the collection list to include bluebunch wheatgrass and needle and thread. Adding these two species would increase the opportunities to collect quantities necessary to establish some production fields for the project.

In 2002, collection results were also limited. As the driest recorded year since the establishment of the Plant Center, extremely poor seed fill resulted in collections of gram quantities of two species, Sandberg's bluegrass and bottlebrush squirreltail. A single site produced a little less than two pounds of needle and thread.

As fate would have it, collections in 2003 were quite good. Even though 2002 was one of the driest years in recorded history in the west, spring moisture was adequate to produce seed in most early season species in 2003. As a result, good quantities of seed of five of the targeted six species were obtained. Utah sweetvetch was the only targeted species that did not produce good collections in 2003. One site located north of Gypsum, Colorado, had good numbers of plants blooming on a collection trip June 17, 2003. The following week, a brush fire encompassed the area which prohibited access. In addition, Carla Scheck, Glenwood office BLM indicated there would likely be no seed to collect for a few years on the sites we were using because of the scope and location of the fire.

A cool but dry spring in 2004 also resulted in extremely poor seed fill. On two collection trips, no seed of targeted materials was collected. As a result, no additional attempts at seed collection were made in 2004. Seed collection quantities were good in 2003, and after confirmation with Dennis Zachman, BLM state office, it was determined to proceed with the project. As planned, blended collections were used for the seed increase plantings to maximize species diversity within the range of anticipated use.

Bottlebrush squirreltail was planted using two separate collections from separate years, but from the same source. Accession 9092275 was collected in 2001 and again in 2003. Together, the collections provided adequate seed for an increase planting. Furthermore, the bottlebrush squirreltail complex was undergoing taxonomic transformation during the collection years. Historically, bottlebrush squirreltail was know as *Sitanion hystrix*, but was renamed *Elymus elymoides.* There had been much confusion on separate species, subspecies or genetic gradients of individual populations by taxonomists with squirreltails. Currently, there are two accepted species, *E. multisetus* and *E. elymoides*, with four subspecies of the latter. In Colorado, two subspecies of *E. elymoides* exist in identifiable populations: *E. elymoides elymoides* and *E. elymoides brevifolius.* We had also collected from extreme northwest Colorado an *E. elymoides elymoides* sub-species. Again, after consultation with Dennis Zachman, we opted to use the same source material rather than mixing sub-species or waiting for a good collection opportunity for the *elymoides* sub-species.

Western wheatgrass is represented by one collection, accession 9092278, from one location during a single year. This increase, although containing the least genetic diversity of the collected increase species, was also the only collected population with enough viability in the seed to establish a planting.

The third material, bluebunch wheatgrass, was the most equally represented blend used for increase. Three collections from northwest Colorado were utilized to establish this species. Collections were obtained from Pisgah Mountain in north central Colorado, State Bridge in the central portion of the mountains and Irish Canyon in extreme northwest Colorado. These collections are identified by accessions 9092276, 9092277, and 9092274, respectively.

On April 28, 2005, a site visit was conducted with the State Plant Materials Specialist and the State Range Conservationist for NRCS to determine the collection potential for Utah sweetvetch. It was determined that the site would not have adequate seed for a collection effort, so no collection effort for this species was conducted for 2005. To date, Utah sweetvetch has been collected one year out of five from a single site. Concern had been expressed about the lack of genetic composition for a material that may be used throughout the state of Colorado on BLM lands. However, the species has been recognized as being an important component in the fire rehabilitation seed mix. Because the species is also insect pollinated, subsequent seed collections could be added to a seed production field to increase the genetic base if the opportunity exists for additional collections.

2006

A collection trip was taken on June 2, 2006, along Highway 64 and Highway 40 in extreme northwest Colorado. A small amount of seed was acquired from the trip, but seed collection potential looked to be grim for 2006. Thirteen grams of Sandberg's bluegrass were collected from two different sites. No other collections of target species were made in 2006.

Two additional plantings for Utah sweetvetch were made by UCEPC in 2006 in order to improve the stand. Seed harvest of two of the three fields planted in 2004 was accomplished in 2006. In addition to seed harvest and maintenance, a comprehensive plan for the infusion of contracted seed production will also be completed. It is estimated that seed distribution to growers will be initiated in 2008 and 2009 for contracted seed increase.

2007

In light of the difficulties encountered with Utah sweetvetch collections, activities for 2007 included a transplant effort of containerized stock and two intra-seedings in the spaced planting. The Sandberg's bluegrass was not strongly evident in 2006, so additional efforts were necessary for the establishment of it in 2007. A small seeding was also conducted in the north end of the

bottlebrush squirreltail field. The bluebunch and western fields have filled in nicely, and they were productive in 2007.

Collections were done on several dates in 2007, and seed for each of the increase materials was acquired. However, most of the collections were limited in quantity and will likely be used more for testing than seed increase.

Species	Date	Collection Amt.	Location
Bluebunch wheatgrass	July 18, 2007	25 g	Little Hills
Bottlebrush squirreltail	June 7, 2007	89 g	Masadona
Sandberg's bluegrass	June 7, 2007 June 8, 2007 June 8, 2007 July 23, 2007 Undated	20 g 5 g 3 g 16 g 15 g	Moffat Cty. Rd. 61 Gypsum drainage Gypsum radio tower Ryan Ridge R. Blanco Cty. Rd.73
Utah sweetvetch	Undated July 18, 2007 July 23, 2007	2 g 23 g 22 g	Blair Mesa " " " "
Western wheatgrass	Aug.16, 2007	324 g	Irish Canyon

In 2007, seed was harvested from the bottlebrush squirreltail, western wheatgrass, and the bluebunch wheatgrass fields. No seed was harvested from the Utah sweetvetch or Sandberg's bluegrass fields, as work to establish stands continues for both of these products.

The table below outlines the establishment and production accomplishments of UCEPC to date.

SPECIES	UCEPC FIELD #	ACREAGE	PLANTING DATE	HARVEST DATE	YIELD
Bluebunch	6	0.87	Aug.13, 2004	6/29/2006	32 lb
				7/6/2007	61 lb
Bottlebrush	17	0.80	Aug. 13, 2004	7/13/2006	45 lb
				7/20/2007	55 lb
Sandberg's bluegrass	12	1.00	Aug. 8, 2005 Aug. 9, 2007	No harvest	
Utah sweetvetch	12	1.00	Sept. 15, 2005	No harvest	
			Intra-seeded June 6, 2007		
			Transplanted June 2007		
Western wheatgrass	7A	0.80	Aug. 13, 2004	8/2/2007	212 lb

CONCLUSION

After attempting to collect seed since 2001, seed from minimal prior collections was used to supplement sparse or weak stands of previously planted materials; specifically Utah sweetvetch and Sandberg's bluegrass. Additional collections may be necessary to supplement the existing collections and to ensure that "source seed" is on hand for future testing or development. Additional field establishment efforts will be necessary to obtain good stands of target materials. Coordination between UCEPC and field offices will again be necessary as this project progresses. A comprehensive and equitable distribution plan must also be completed and agreed upon for pre-determined contract production.

Seed production has been obtained on three of five species. Three species, bluebunch wheatgrass, western wheatgrass, and bottlebrush squirreltail, all have excellent stands and appear to be good producers. UCEPC has released two bottlebrush squirreltail sources, and the BLM source looks to be as good as our two previous releases. All three materials should produce seed again in 2008. The Utah sweetvetch may produce a limited amount of seed. Colorado State University Extension Entomologist Bob Hammon also brought some leafcutter bees to the Plant Center in 2007 in an effort to assure the presence of pollinators for the crop. However, UCEPC had difficulty keeping deer out of the sweetvetch, and as a result, there was no production. Efforts to supplement the breeder seed will be a priority, as will the establishment of Sandberg's bluegrass.

A coordinated plan for seed dispersal will need to be developed this year so that seed increase efforts on a large scale will be initiated. Coordination partners include Upper Colorado Environmental Plant Center, Colorado Seed Growers Association, and BLM.

Project COPMC-S-0402-WL
Project Report 2007
By Steve Parr

Seed Increase for Uncompahgre Restoration Project

INTRODUCTION

Years of noticeable mule deer declines in areas that once held healthy populations prompted a series of studies by Colorado Division of Wildlife to determine the cause(s) for these dramatic population declines. What was discovered was not specific to mule deer, but rather was much more widespread. It was apparent that many of the problems related to mule deer declines were shared by other species, including plants. Because of the recognition of declining habitat on the Uncompahgre Plateau, and the ramifications that unchecked decline would have on mule deer and other species, a collaborative, community based effort was formulated to address the concerns. As a result, the Public Lands Partnership was created. Upper Colorado Environmental Plant Center (UCEPC) was contacted by Rick Sherman. A summary of this partnership and the Uncompahgre Plateau Project is provided below.

EXECUTIVE SUMMARY

The Uncompahgre Plateau Project (UP) was formalized in a 2001 MOU by the Public Lands Partnership (PLP), Bureau of Land Management (BLM), Colorado Division of Wildlife (CDOW), and U.S. Forest Service (USFS). These organizations formed a partnership to work collaboratively to restore and sustain the ecological, social, cultural, and economic values of the Uncompahgre Plateau. The UP area, located in southwest Colorado, comprises over 1.5 million acres of private, state, and federal lands. Approximately 75 percent of the area is public land.

Native plant communities on the Plateau are maturing and becoming less diverse and productive. As a result, water quality, wildlife habitat, and forage yields have declined while soil erosion and noxious weed invasion have increased. Changes on the Plateau have resulted due to natural processes and past management practices including fire suppression and historic overgrazing. A decline in landscape health is particularly evident in the pinyon-juniper zone. A number of agency management plans and studies document these concerns. UP is assisting in the coordination of management across jurisdictional boundaries to address ecosystem needs.

The overarching goal of the project is to improve the ecosystem health and natural functions of the Uncompahgre Plateau through active restoration projects. Sustaining social, cultural, and economic values to the local communities are also important goals. The primary role of UP is to help coordinate and facilitate restoration activities on the Plateau. UP does not supercede management authority on any federal, state, or private lands.

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METHODS

Collections

No seed collections were conducted by UCEPC in 2005 or 2006. To date, UCEPC has collected four grass species, three shrubs, and two forbs that can be utilized for seed increase or containerized production. Table 1 outlines the clean seed quantities collected during the 2002, 2003, and 2004 field seasons. A total of five collection days were used to obtain the seed. The six materials collected in 2002 were from two trips. The first trip on July 1 was conducted south and east of Montrose and the second trip, July 19, was done on the Uncompahgre Plateau. In 2003, a collection was conducted June 23 on Sims Mesa and on July 30, the entire staff again collected on the Plateau. A single trip, August 12, was taken to the Uncompahgre Plateau in 2004. All of these materials remain on inventory at the Plant Center.

Table 1
Uncompahgre Restoration Project
UCEPC Collections

Species	Scientific name	2002	2003	2004
Blue wildrye	*Elymus glaucus*	---	---	308 g
Bluestem penstemon*	*Penstemon cyanocaulis*	11 g	76 g	
Bottlebrush squirreltail	*Elymus elymoides*	47 g	361 g	
Indian ricegrass	*Achnatherum hymenoides*	---	361 g	
Lewis flax*	*Linum lewisii*	23 g	---	
Mexican cliffrose	*Cowania mexicana*	2 g	---	
Mountain mahogany	*Cercocarpus montanus*	18 g	566 g	
Needle and thread	*Hesperostipa comata*	---	169 g	
Utah serviceberry*	*Amelanchier utahensis*	13 g	87 g (rust)	
Utah serviceberry*	*Amelanchier utahensis*		120 g	

* Positive identification pending

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Plantings

2004

The project plans had originally called for the use of seed from collections rather than greenhouse grown stock. However, region wide drought conditions did not provide good collectible populations of target materials. Steve Monsen, Native Plant Coordinator for the UP Project, provided seed to greenhouses for container production. In 2004, three species were provided to UCPEC for field increase as containerized stock. These materials were placed in production fields with the use of two Holland Old Faithful model transplanters. On June 16, 2004, a crew of eight people planted six rows (0.2 acre) of yarrow plugs that were grown in cone type containers. The crew started preparing the plugs for planting at 10:30 a.m. and by 3:30 p.m. the yarrow transplanting was done. The following day, 0.27 acre of muttongrass was transplanted by 12:30 p.m. and on June 18, 0.27 acre of Junegrass was done. A crew of seven transplanted the muttongrass and six people transplanted the Junegrass.

Two transplanters were placed on a toolbar, each with seating for two. This allowed four people to transplant into two rows, alternating the placement of plugs. Depth adjustments were made on the planting shoe for the size of the rooted stock. As the shoe opened the furrow, the plugs were placed at a slight angle in the furrow, held in place until the packer wheels approached the planting spot, and then released as the packer wheels pressed the soil around the plug. The second person would have the next plug in place while the first person closely observed and adjusted the placement of the plug being planted. Alternating in this way with two people planting per row provided excellent placement. Two people followed on foot, one for each row, to adjust planting depths on the transplants as necessary. Hand move sprinklers were set immediately after the plantings were completed each day. Survival and stand establishment were excellent on all three products utilizing these methods.

2005

An additional material was planted in UCEPC Field 3A. Approximately 1800 “Conetainer” type transplants of *Senecio multilobatus* were planted the first of July 2005 in the same manner the other materials were planted.

2007

One additional material was provided to UCEPC for seed increase from direct seeding. A planting of 0.2 acre of bluestem penstemon was completed on August 17, 2007. Germination and establishment success will be evaluated in the spring of 2008 to determine the potential for this species.

Harvests

Each product was harvested with the Hege plot combine in 2005 and 2006. All materials except the Senecio were harvested in 2007 with a pull type swather. The swathed windrows were then picked up with pitchforks and transported to seed drying areas in buildings. After the material was dry, it was run through the Hege combine repeatedly until no appreciable seed recovery was obtained.

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A small amount of Senecio was harvested by hand in 2007. It is apparent that the product is either a biennial or a short lived perennial. The Senecio was planted in 2005, harvested in 2006 and the vast majority of plants died after harvest. During the spring of 2007, however, it was noted that a large number of seedlings were emerging. Jim Free, UP Technical Committee, viewed the fields, including the Senecio seedlings, on a visit June 21, 2007. From appearances in the fall of 2007, there should be a crop in 2008.

RESULTS

On November 2, 2004, forty-three clean grams of UP yarrow were hand collected. This represents the first field produced seed by UCEPC for this project. Each field established in 2004 produced seed in 2005 and 2006. The Senecio field, established in 2005, also produced seed in 2006.

In 2007, seed was harvested from Junegrass, muttongrass and yarrow fields with the use of a swather and a small amount of Senecio was hand clipped.

Below, a summary of planting dates, acreage, harvest dates and harvest amounts is provided as a table.

Species	Accession	Year Established	Acreage	Harvest Amount	Harvest Date
Junegrass	9092273	6/18/2004	0.27 acre	-0-	NA
				15 lb	7/26/2005
				10.4 lb	7/12/2006
				9.0 lb	7/12/2007
Muttongrass	9092272	6/17/2004	0.27 acre	-0-	NA
				2 lb	6/8/2005
				16.5 lb	5/30/2006
				5.0	5/30/2007
Senecio	9092280	7/1/2005	0.13 acre	-0-	NA
				15 lb	6/21/2006
				292 g	7/5/2007
Yarrow	9092271	6/16/2004	0.20 acre	43 g	11/2/2004
				17.5 lb	8/6/2005
				14 lb	8/2/2006
				10 lb	7/27/2007

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2006
After harvest, the Senecio plants went dormant, which is not unusual for cool season materials. However, with time, even the leaves dried up and became decadent. Upon further observation, it was apparent that many of the plants were dead or dying. Bob Hammon, Colorado State University Extension Agent and area entomologist, was summoned for assistance with diagnosis of any insect or fungal pest problems that may have had an effect on plant mortality.

With further assistance from Laura Pottorff, three fungal pathogens were isolated from the Senecio samples Bob provided and could be the cause of both root rot and crown rot. The two species, *Colletotrichum spp.* and *Pythium spp.*, were considered most suspect for causing harm to the plants while the third isolated pathogen, *Fusarium,* was largely disregarded as being a primary concern.

It appeared that over 70 percent of the field was dead from an observation made in September. However, there were some "volunteer" plants showing up that may warrant further observation before removing the field.

One reference indicated that the species may be a "short lived perennial, or a biennial or winter annual". This characteristic could further explain the behavior of the plant after seed harvest. Although the plugs were planted in 2005, they did not produce flowers until 2006. In this regard, the plants behaved at UCEPC much like a biennial. The identified pathogens may have infected already weak or dying plants.

Another disturbing result this year was the very low Pure Live Seed component in each of the four harvests, (see included seed test results). The muttongrass, for example, had a purity analysis of 93.63 percent, but only 20 percent germination.

		2006 Harvest Results		
Species	**Clean Weight**	**Purity %**	**Germination %**	**PLS Pounds**
Muttongrass	16.5 lb	93.63	20	3.09
Prairie Junegrass	10.4 lb	83.25	75	6.49
Senecio	15 lb	40.94	20	1.23
Yarrow	14 lb	26.79	66	2.48

2007
No seed test results are complete at this time.

CONCLUSION

UCEPC will continue to produce seed of the muttongrass and Junegrass fields established in 2004 if this is agreeable with the Uncompahgre Technical Committee. The production of yarrow will be determined on a year by year basis, as will the Senecio which was not under contract for 2007. The bluestem penstemon planted in 2007 will also be evaluated for contractual addition in 2008. It is anticipated that other materials will be planted and the size of the established fields may be expanded to increase the amount of seed produced and delivered to UP growers.

A formal agreement between UCEPC, NRCS, and the PLP was ratified in August of 2007 and extends through 2011. An annual work plan will be developed between the three parties prior to the field season of each fiscal year for the life of the agreement.

Project COPMC-S-0701-CR
Project Report 2007
By Steve Parr

Seed Increase of Blue Wildrye for Medicine Bow-Routt National Forest

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) and Medicine Bow-Routt National Forest formally entered Cooperative Agreement 06-CS-11020604-042 in August of 2006. The agreement calls for the increase of a single species, blue wildrye, collected within the boundaries of Medicine Bow-Routt National Forest. In addition, UCEPC will initiate an Initial Evaluation Planting of no less than 30 accessions of blue wildrye collections from several seed collection zones from within Routt-Medicine Bow. These collections will serve as the primary components in the IEP. UCEPC is also to provide 16 man hours of seed collection training to Forest Service personnel, including sub-contractors.

Seed increase efforts will be limited to a single source collection, and will utilize collection ELGL-080106-A1 which is from California Park.

OBJECTIVES

There are multiple objectives which the agreement will attempt to complete. These objectives are outlined below.

1) UCEPC will train Routt Medicine Bow personnel in proper seed collection and curation methods.
2) Routt Medicine Bow National Forest personnel will make at least 30 collections of blue wildrye and western wheatgrass for initial evaluation plantings at UCEPC and North Park High School.
3) UCEPC will clean 30 Forest Service collections of each species for IEP use.
4) UCEPC will increase one third acre of a single accession of Medicine Bow-Routt collected blue wildrye.
5) Medicine Bow-Routt National Forest and UCEPC will provide technical assistance to North Park High School faculty and students.

Native seed of local ecotypes is often limited at best, and more commonly is unavailable. The overall objective of this project is to share technology on seed collection methods so that successful collections of identified priority species can be obtained by Medicine Bow-Routt National Forest. Once seed collections are obtained, common garden studies will be initiated at UCEPC to identify potential superior performers that can be released by UCEPC and increased by the commercial seed industry. In addition, because of the identified need of a source of local seed, UCEPC will also increase a one-third acre planting of blue wildrye for Medicine Bow-Routt National Forest uses. Blue wildrye and western wheatgrass are also listed as high priority species for UCEPC, and collections for initial evaluations are important for project development.

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METHODS

Plant center facilities and operations were shown to John Proctor, Medicine Bow-Routt National Forest Botanist, on May 15, 2006. John had been instrumental in moving the project forward, and felt a tour of the Plant Center would be helpful.

Dr. Gary Noller and Steve Parr from UCEPC met John and several staff and seasonal employees of Medicine Bow-Routt National Forest on July 6 at California Park, north of Hayden, Colorado, for a hands-on training in seed collection methods. Methods for determining seed maturation and caryopsis development were identified, and handouts of publications covering the information were supplied for reference. Actual on site collections were evaluated for "filled" seed, and areas for collecting three species, western wheatgrass, blue wildrye and bluebunch wheatgrass were investigated for collection potential. After a day's training, the collectors were confident in their ability to make successful collections.

On August 8, 2006, Mary Mahalovich, U.S. Forest Service Geneticist, and John Proctor visited UCEPC. Manuel Rosales and Steve Parr gave a tour to Mary and John on seed production, cleaning, storage, and harvest methods.

2007

From clean seed amounts, a decision was made by John Proctor to increase a single source from Seed Zone 215, 080106-A1. There were three collections of adequate quantity to increase, all from Seed Zone 215. Following is correspondence from Steve Parr to John Proctor on March 2, 2007:

John:

I wanted to let you know that we have completed the seed cleaning for 2006 products. From your collections, there are three individual sites that have adequate seed for a 1/3 acre increase. 073106 A1 had 870 clean grams, 080106 A1 had 770 clean grams and 080106 A2 had 447 grams of clean seed. Any of these could be used to plant the 1/3 acre planting, pending seed test results. If you were more interested in using a blend of seed from other collections, let me know. I will have a full report prepared and sent to you by month's end. Hope you have wintered well.

Seed samples were sent to the Colorado State Seed Lab for analysis. The selected source had excellent purity and germination results. On August 10, a one third acre planting was conducted in prepared seed beds and irrigated with a linear move sprinkler system at 2" for a 12 hour set on August 17. Excellent emergence was noted two weeks later and vigorous growth continued until late fall.

RESULTS

Collections of blue wildrye were conducted by Medicine Bow-Routt staff during July and August in four different seed collection zones in the Routt National Forest. In all, 39 accessions

of blue wildrye were collected. Each of these collections was cleaned by UCEPC in December of 2006. There were also two limited collections of western wheatgrass that were provided to UCEPC for use in an initial evaluation planting. Cleaned seed quantities and Forest Service collection numbers and seed collection zones are provided in the table below for reference. UCEPC will inventory and accession each collection that is used for seed increase and in our Initial Evaluation Planting, but will need to obtain specific collection information prior to planting.

Seed Collection Zone	Species	Collection	Collection Date	Clean Seed (grams)
214	Blue wildrye	214-01	8/15/06	40
	" "	214-02	8/10/06	47
	" "	214-03	8/24/06	99
	" "	072006-A1*		45
	" "	080906-A1	8/09/06	38
	" "	081006-A1		31
	" "	083106-A1		27
	" "	080906-A2		32
	" "	083106-A2		25
	" "	091306-A2		27
	" "	072706-A3		45
215	Blue wildrye	073106-A1		870
	" "	080106-A1		770
	" "	082406-A1		32
	" "	073106-A2		270
	" "	080106-A2		447
	" "	080106-A3		193
	" "	080106-A4		269
221	Blue wildrye	221-01	8/23/06	36
	" "	221-02	8/24/06	53
	" "	221-03	8/15/06	136
	" "	080306-A1		177
	" "	080406-A1		267
	" "	080306-A3		23
481	Blue wildrye	481-01	8/16/06	4
	" "	481-02	8/14/06	129
	" "	481-03	8/14/06	33
	" "	481-04	8/17/06	130
	" "	481-05	8/16/06	75
	" "	481-06	8/16/06	128

Seed Collection Zone	Species	Collection	Collection Date	Clean Seed (grams)
	“ “	481-07	8/17/06	92
	“ “	481-08	8/7/06#	9
	“ “	081806-A1		28
	“ “	091206-A1		97
	“ “	091306-A1		27
	“ “	091406-A1		72
	“ “	091206-A2		86
	“ “	091406-A2		100
	“ “	091206-A3		91
215	Western wheatgrass	082306-A1 Sack hadA2; sheet A1		8
	Western	082306-A2 Sack had A1; sheet A2		9

* Collection date on sack was 7/28/06
# Collection date inconsistent with collection sequence

CONCLUSION

Collection 080106-A1 was submitted for seed analysis and testing and was used as the single source for seed increase for Medicine Bow-Routt as called for in the agreement. A one-third acre field of blue wildrye was established in August of 2007. Additional collections of western wheatgrass, bluebunch wheatgrass, and other species may be conducted in 2008, as opportunities present themselves.

Project COPMC-S-0702-CR
Project Report 2007
By: Steve Parr

Evaluation of Two Native Grasses for Revegetation Uses in Boulder County, Colorado

INTRODUCTION

Interest in the use of native seed for revegetation and restoration activities has increased substantially in the last decade. Moreover, the use of more localized, site specific sources of native seed for specific revegetation needs has also gained favor among many land management agencies. Traditional concepts of desirable traits for materials used in revegetation included the potential for the product to prevent or reduce soil loss, the value as a grazeable product to livestock, most often cattle, the ease of establishment, availability of seed, and the persistence of the material on the site once established. Often, materials were chosen without regard to their affect on surrounding plant communities or ecosystems or the origin of the selected material, whether identified as native or introduced.

In contrast, the National Park Service, which is charged with genetic resource preservation, used native, site indigenous materials where practical for revegetation uses, especially since the late 1980's. In fact, seed of the same species, if not from the same site or one in close proximity to the revegetation site, is considered alien. This concept has gained considerable favor with many other public land management entities, and is used more widely in decisions about material selection for revegetation.

Boulder County, Colorado, has acquired many thousands of acres of farm and ranch lands for the preservation of open space. Some of the land uses today on those properties are consistent with historic uses. However, in some cases it is more desirable, if not appropriate, to accelerate the conversion of some agricultural lands to native rangelands. In addition, planned disturbances within the county could utilize a native seed source for revegetation if such an activity met the goals of Boulder County. In order to accomplish this, sustained seed sources of localized, native Boulder County materials were needed and desired. From this identified need, a seed increase project has been initiated between Boulder County and Upper Colorado Environmental Plant Center (UCEPC).

OBJECTIVE

This project will evaluate the cultural aspects of seed increase efforts of two indigenous, native grass species from Boulder County for use in revegetation projects by Boulder County Parks and Open Space.

Project COPMC-S-0702-CR
Project Report 2007
By: Steve Parr

METHODS

Personnel from Boulder County Parks and Open Space collected seed from several sources of big bluestem, Griffith's wheatgrass and poverty oatgrass over several years. Correspondence between David Hirt, Plant Ecologist for Boulder County, and Steve Parr, UCEPC Manager, led to decisions to attempt seed increase for Griffith's wheatgrass and poverty oatgrass. Seed tests were conducted for each of the seed lots, and decisions were made on seed quantities and seed lots to be used for the increase. While both lots chosen had good germination, off type species in each collection presented a concern. Kentucky bluegrass was present in the poverty oatgrass, but proper management should successfully reduce or potentially eliminate those plants from an increase field. The Griffith's wheatgrass, however, had high amounts of contaminants in the form of Japanese brome and downy brome.

The only practical way to manage for the amount of contaminant in the Griffith's wheatgrass collection was to plant late enough in the summer to germinate the annual bromes without presenting an additional seed contamination problem (the annual bromes would not produce seed during the establishment year). By establishing the target material early enough to reach adequate maturity during the establishment year, but late enough to eliminate annual brome seed formation, seed production should be accomplished the following year. However, in order to reduce the hand rouging necessary to remove the bromes, establishment timing had to incorporate the application of herbicide for annual brome control in the fall. We believe this was successfully accomplished. Spring evaluations will determine the level of success for this project.

Because the use of 'Plateau' herbicide on Griffith's wheatgrass is not known, a split planting was done as a dormant seeding. Two methods and two timings were done for the initial planting of Griffith's wheatgrass.

A literature search in the Plants Database indicated that poverty oatgrass was tolerant of frost heaving. We conducted one half of the planting in August to compare against a dormant planting. To our surprise, the poverty oatgrass was being lifted, roots and all, in early October. The dormant fall planting will be used to compare to the summer planting. From observations, it was also noted that the poverty oatgrass went dormant quite early in the fall compared to other 'cool season' grasses. As a seedling crop, often there is photosynthetic activity until snow cover to induce dormancy. The poverty oatgrass did not follow that pattern, and suspended growth well before snow cover.

Griffith's Wheatgrass

A 1/3 acre planting was done on August 10, 2007, with a hand pushed Plant Junior seeder. Calibration targeted 30 pls seeds per foot of row. The field was irrigated for establishment, and an excellent stand resulted. The annual bromes also germinated as anticipated. On November 2, 2007, six ounces of Plateau per acre was applied to the August planting for annual brome control.

On October 11, 2007, a separate dormant planting of 1/3 acre was conducted. This planting will compare planting methods and plant response to Plateau herbicide effects. A total of 1.5 pounds of the 2003 Rabbit Mountain seed lot was used for both plantings. Approximately two pounds remain on inventory.

Poverty Oatgrass

The planting of poverty oatgrass was also conducted as a split application. One-third acre was planted on August 10 and 1/3 acre was planted as a dormant planting on October 11. Buctril herbicide was used on November 2 to control winter annual broadleaf weeds. Eight tenths of one pound of 2004 Heil Valley Ranch was used in the planting with the target again being 30 pls seeds per linear foot of row. Approximately 1.2 pounds of this lot remain on inventory.

RESULTS

The initial establishment of both materials was very good. Both products responded well to irrigation and germinated readily after a single irrigation of a two -12 hour set from overhead sprinkling. While the Griffith's continued to produce above and below ground biomass late into the season, the growth of poverty oatgrass stopped or nearly stopped by early October. The plants also started to change color and go dormant by mid October. Additionally, we noted substantial frost heave damage to the oatgrass field established in August. If the frost heave damage is severe enough to warrant an inner seeding, that will be conducted as soon as soil temperatures warrant. From minimal work conducted on the oatgrass, it has behaved much like a late seral stage, warm season species. Griffith's wheatgrass has performed very well to date. Additional notes and observations will be made on both products this spring and throughout the production year.

Project No. COPMC-S-9104-WL
Project Report-2007
By: Terri Blanke

Clark Source Serviceberry

OBJECTIVE

Release root sprouting selection of Saskatoon serviceberry; accession 9021441.

INTRODUCTION

The Saskatoon serviceberry *Amelanchier alnifolia* is a native shrub found in the North Central United States, Northern Great Plains, Central and Rocky Mountain states. It is a cool season, clump forming deciduous shrub or small tree that will grow from three to ten feet. Stems will be numerous, branching and erect with a dark grey to reddish brown bark. Leaves are alternate, simple oblong to nearly rounded and grow one to two inches is size. They will be toothed above the middle and somewhat hairy beneath. Flowers are white, bell shaped and clustered with red to purple diminutive apple-like pome fruit. The fruit contains four to ten dark seeds and is covered with a leathery seed coat. Roots will be well branched and both deep and superficial. This plant can reproduce by sprout suckers as well as seeds. Seed for the accession 9021442 was collected in 1975 from Clark (thus its name) in Routt County, Colorado. The estimated elevation was 7200 feet. The plant is winter hardy, moderately drought tolerant, and has good fire tolerance of native and established stands and has a moderately strong tolerance to close browsing or defoliation.

EXPERIMENTAL DESIGN

This study is a non-replicated test.

MATERIALS & METHODS

Clark's serviceberry was planted in the Upper Colorado Environmental Plant Center orchard on August 8, 1977. Fourteen years later and due to superior performance, it along with two other shrubs, Silver Buffaloberry and Chokecherry were chosen for isolation and further evaluation.

On May 24, 1991, twenty-two serviceberry sprouts were dug by hand. A channel was plowed and the sprouts were planted in one row on ten foot spacings next to the channel. They were hand-watered as needed. In July of 1992, thirty sprouts were potted for field increase. Only five of the original plants had survived. Eight of the potted sprouts were transplanted in 1993 and in April of 1994, seven additional holes were planted with multiple plants, watered and pruned back. The planting receives no supplemental water.

Project No. COPMC-S-9104-WL
Project Report-2007
By: Terri Blanke

RESULTS

The planting was evaluated from 1991 to 1994. Seed was never collected from the serviceberry. The wildlife has browsed it heavily since the beginning of the project. There are currently 15 small bushes remaining. The remaining shrubs were fenced, measured and photographed in the fall of 2006. On April 3, 2007, the serviceberry shrubs were again evaluated. There was very little new growth. An herbicide was applied around the shrubs to help suppress weeds. Hand weeding continued through the summer and on August 31, 2007, the plants were pruned and re-evaluated. The table below shows how the serviceberry have performed since 2006.

Clark's Serviceberry Performance

Shrub No.	2006 Height	2007 Height/width	Remarks			Rating*
			Leaders	Size	Misc	
1	27"	54" x 46"	18" new leader	Large leaves		1
2	21"	24" x 23"			Only ¼ of plant is alive	7
3	18"	22" x 36"	New leader		Low /good color	3
4	16"	23" x 19"			New suckers underneath	5
5	18"	34" x 36"	New leader		Sparse/poor color	7
6	21"	36" x 36"	New leader		Browsed heavily	3
7	13"	25" x 20"	Few new leaders		Browsed	7
8	14"	23" x 22"	Some new leaders	Small		7
9	9"	8" x 3"	No new leaders	Very small		7
10	15"	28" x 17"	Some new leaders	Small		5
11	16"	20" x 24"	Few new leaders	Small		7
12	12"	16" x 10"	Few leaders	Small	Good color	7
13	15"	16" x 8"	No new leaders		Bugs/dry	7
14	14"	18" x 10"	Poor leaders		Dry/new suckers	7
15	15"	18" x 14"	Few leaders		Sparse/good color	5

*Ratings: 1-excellent, 3-good, 5-fair, 7-poor

CONCLUSION

Generally, survival has been good. By reducing the wildlife browsing and competition from weeds, the serviceberry have shown much improvement. We will continue to monitor the shrubs for survivability and the possibility of a release.

Project No. COPMC-T-0502-RA
Project Report-2007
By: Manuel Rosales

Mountain Brome *Bromus marginatus* Seed Treatment-Spring Seeding

OBJECTIVE

To determine effectiveness of fungicides in controlling or reducing incidence of head smut *Ustilago bullata*, in Mountain Brome (Garnet Germplasm).

INTRODUCTION

During the year 2000, Upper Colorado Environmental Plant Center (UCEPC) released Garnet Germplasm mountain brome as a tested class release. The term "Germplasm" denotes that the material is not a cultivar, but a pre-cultivar release recognized by the Association of Official Seed Certifying Agencies. Garnet Germplasm was selected for its head smut *Ustilago bullata* resistance, longevity, and ease of establishment and good production of both forage and seed. Mountain brome is widely used for conservation and reclamation plantings in Colorado. Unfortunately, seed producers in Colorado have reported more than 5% incidence of the disease smut in Garnet Germplasm. This might imply that Garnet is not totally resistant to head smut or perhaps another strain of the disease has been developed to which Garnet is susceptible. The disease is limiting production of Garnet and its use for conservation purposes. Distribution of Garnet Germplasm from UCEPC has been suspended. At present, there is no known means to control smut in our seed production fields, nor can we recommend to our seed producers any control method for smut.

This fungal disease has been reported to reduce seedling establishment. It can affect seed yields substantially, depending on incidence of infected plants. Head smut, when present in the head, produces smut instead of seed, thereby, reducing seed production. It can also reduce forage production. The disease is found on a wide range of grass hosts, but is a most important disease of cool-season grasses, especially **brome grasses** and wheat grasses. Head smut has been reported as being primarily seed-borne; however, reports also indicate that spores in the soil can infect emerging seedlings. The fungus develops systemically within the host plant. At flowering the ovaries in the infected plants are converted to bulky masses of spores covered by a thin membrane. Black or brown spore masses are released when this membrane breaks. Fungal spores disperse by wind. Spores infect seed embryos at flowering. The disease also affects the morphology of the plant. The internodes in the stem are shortened, producing a shorter stem that bears a more erect, compact panicle.

This technology development study was designed to determine if seed treatment with fungicide can prevent or reduce the incidence of head smut. Also, the study is being conducted at two planting times, **spring** versus **fall** to find out if environmental conditions during germination and establishment influence head smut incidence.

Project No. COPMC-T-0502-RA
Project Report-2007
By: Manuel Rosales

EXPERIMENTAL DESIGN

The statistical design for the study is a randomized complete block with a split plot arrangement, replicated three times.

Treatments consist of:

1. **Contaminated seed**
    a. Treated with vitavax-captan
    b. Treated with Dividend
    c. Untreated seed /check
2. **Non-contaminated seed**
    a. Treated with vitavax-captan
    b. Treated with Dividend
    c. Untreated seed /check

MATERIALS & METHODS

Contaminated and uncontaminated seed of Garnet mountain brome was treated with two fungicides prior to planting. The two fungicides were selected with the assistance and advice of Dr. Ned Tisserat, Plant Pathologist with Colorado State University. Naturally-infected seed of Garnet mountain brome was secured from a grower's field for a source of contaminated seed. The uncontaminated seed was from seed grown and harvested at UCEPC, from a non-infected field, with seed lot number SG1-04-UC6. The two fungicides used were: Enhance (vitavax-captan 20-20) and Dividend Extreme. Both seed treatment fungicides were used following the recommended rates to control head smut (often called loose smut) according to label instructions.

The experimental site is located at UCEPC in a field that previously had mountain brome and was infected with head smut. The site was chosen to insure that we get an infection by the disease and evaluate the effectiveness of the fungicides. Seed bed preparation was done by preparing flat-beds spaced at three foot center. The **plot size** is 240 square feet: 12 feet wide by 20 feet in length. Each plot consists of four rows spaced at three-foot centers. All the data to be collected will be from the two middle rows to eliminate border effect. The **Spring- study** was planted on **May 24, 2005**. The seed was drilled with a hand-pushed Planet Junior seeder. The rate of seeding was 30 pure live seeds per linear foot of row. The plots received no initial fertilizer or irrigation.

The parameters to be measured in the study are: **percent plant stand**, **disease incidence**, and **seed yield**. Disease incidence will be assessed by counting the total number of panicles within a random length of three to ten feet in the middle of the plots, and getting a percent of infected panicles within this length. Seed yield and percent stand will also be collected from this area. The study will be conducted for at least three years depending on survivability of the stand.

Project No. COPMC-T-0502-RA
Project Report-2007
By: Manuel Rosales

RESULTS

Year-2005: Excellent stands were established in all plots seeded on May 24, 2005. In June 14, 2005, all plots had 90-100 percent germination. On September 26, 2005, all plots were growing well, with an average height of 4-6 inches.

Year-2006:
Results for 2006 are presented in the following table:

Table 1. Effect of fungicide treatment on seed yield, % smutted heads, and plant height on infected and non-infected seed of Garnet Germplasm Mountain Brome tested release. UCEPC-2006

Seed Quality	*Fungicide*	*Seed Yield (lb/A)*	*% Smutted Heads**	*Plant Height (cm)*
Clean Seed	Control	279 bc	8 c	69 a
	Dividend	321 ab	0 c	72 a
	Vitavax	301 b	0 c	74 a
Infected Seed	Control	154 c	68 a	68 a
	Dividend	447 a	1 c	71 a
	Vitavax	328 ab	37 b	71 a
Mean		305	19	71

Means within columns followed by the same letters are not significantly different as determined by least significant difference test (LSD) at P<0.05 for the interaction seed quality by fungicide
*** Percent smutted heads was calculated by counting the number of smutted heads out of a total number of heads in a meter sample within each plot.**

As indicated in the table above, the fungicide treatment had a positive effect in the contaminated seed infected with the smut disease. Dividend performed better than Vitavax for the growing season of 2006. Pure live seed (as per lab results) of seed treated with Dividend was double the percentage of seed treated with Vitavax or control.

We will collect data again for the growing season of 2007 to determine if the effect of the fungicide in protecting against the disease lasts for more than one season of growth.

Project No. COPMC-T-0502-RA
Project Report-2007
By: Manuel Rosales

Year-2007

The data for 2007 is presented in Table 2.

Table 2. Effect of fungicide treatment on smut disease, and other parameters on infected and non-infected seed of Mountain Brome-Garnet Germplasm. UCEPC-2007

Seed Quality	Fungicide	Percent Smutted Seed[1]	Seed Yield (lb/A)	Plant Height (cm)	Plant Stand
Clean Seed	**Control**	4.9	218.0	85.4	100
	Dividend	0.4	271.3	89.9	100
	Vitavax	1.1	229.1	82.5	100
Infected Seed	**Control**	56.8	170.6	91.9	100
	Dividend	3.0	297.8	89.2	99.3
	Vitavax	17.8	319.3	92.4	99.3
Mean		14.0	251.0	88.5	99.8
LSD (0.05)*		20.5	NS	NS	NS

1. Percent smutted seed was calculated by counting the number of smutted heads out of a total number of heads in a meter sample within each plot per three replications.

* Least significantly different (LSD) at P<0.05 for the interaction seed-quality by fungicide. NS = Not Significant different at P<0.05.

SUMMARY

The Fungicide treatment applied to the seed at planting on May of 2005 is still having an effect on controlling the smut disease, as compared with the control treatment. Even though the seed yield was not statistically significantly different, one needs to keep in mind that once a field or plot is infected with the disease the seed produced from this field is going to be contaminated due to the action of the harvesting equipment which mixes all the seed. The degree of contamination will be dependent upon the incidence or percentage of the smut disease in the field. In addition, seed quality on contaminated seed results in lower percent pure live seed. In order to efficiently control the smut disease, a seed producer has to plant in a field that has not been contaminated with the disease before, use clean-treated (uncontaminated) seed, and observe field sanitation by removing infected seed heads as soon as they appear in the field.

This test will be continued for one more year to determine if the effect of the fungicide treatment lasts for at least three years of production.

Project No. COPMC-T-0503-RA
Final Report-2007
By: Manuel Rosales

Prairie Junegrass *Koeleria macrantha* Seeding Study

OBJECTIVE

To determine best time for establishing Prairie Junegrass

INTRODUCTION

Koeleria macrantha prairie Junegrass is a perennial, cool-season bunchgrass that is widely distributed throughout the United States. According to Hitchcock, 1935, its range extends from Ontario to British Columbia, south to Delaware, Missouri, California, and Mexico. The species is also widely distributed in the temperate regions of the old world. In the Central Rocky Mountains, it is commonly found as a component of prairies, open woods, mountain parks, sagebrush, and mountain brush communities. It is found in elevations ranging from below 4000 feet to over 11,000 feet. The species provides good forage for both livestock and grazing wildlife species, and fair forage for browsing species of wildlife. *Koeleria macrantha* is usually sparsely distributed and is generally not found as the dominant range species in a particular stand. Because of this, its importance as forage to both wildlife and livestock may be more related to its abundance than its preference.

This is a technology development study designed to generate the information needed to develop the agronomic production techniques for a release of Junegrass

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

A composite blend of three accessions (9024197, 9039786, and 9039787) of Junegrass was seeded on September 12, 2005, (late summer planting) and October 18, 2005, (fall planting) and May 18 for spring 2006. The **plot size** is six feet wide by 20 feet long with two rows per plot. Seed was drilled and also broadcast at each date. The seed was drilled with a hand pushed Planet Junior seeder, in flat beds spaced at three foot centers. The target seed rate for drilled seed was 40 pure live seeds per linear foot of row. The broadcast seed rate was about three times more than the drilled seed. Broadcasting was accomplished by raking the entire seed bed, then the seed was broadcast by hand, and covered by dragging the rake upside down, with a final packing of the seed bed.

The plots were neither irrigated nor fertilized and will be kept as a dryland planting.

RESULTS

2006 Growing Season

Even though some seed germinated for late summer planting and fall planting, none of the seedling survived the winter of 2005-2006 due to frost heaving. Plots were evaluated on July 11, 2006, and no plants were visible to do any type of evaluation. The study is being replanted with summer component, replanted on July 28, 2006, and dormant planting on October 13, 2006. The spring component will be replanted as soon as possible during spring 2007.

2007 Growing Season

The spring component of the study was replanted on April 20, 2007. On July 19, 2007, the study was evaluated for percent plant stand. The results are presented in the following table.

Percent plant stand for a composite[1] of Junegrass seeded drill and broadcast at spring, summer, and fall. UCEPC-2007

Time & Method of Seeding	Date Seeded	Percent Plant Stand[2]
Summer-Drill	July 28, 2006	48.33 a*
Summer-Broadcast	July 28, 2006	10.00 ab
Spring-Drill	April 20, 2007	8.33 ab
Fall-Broadcast	October 13, 2006	1.66 b
Fall-Drill	October 13, 2006	1.1.66 b
Spring -Broadcast	April 20, 2007	0.00 b
Mean		11.68

* Means followed by the same letters are not significantly different as determined by Tukey's HSD at P<0.05.

1. Composite – is a blend of three accessions of Junegrass :(9024197 + 9039786 + 9039787)
2. Percent stand is a visual estimate of the average per plot of three replications.

SUMMARY

Results indicate that the summer seeding, either by drilling or broadcasting, performed better than seeding in spring or fall. However, statistically speaking, the results indicate that the summer drill treatment was only significantly different from fall-broadcast, fall-drill and spring-broadcast treatments.

Project No. COPMC-T-0504-RA
Project Report-2007
By: Manuel Rosales

Mountain Brome *Bromus marginatus* Seed Treatment-Fall Seeding

OBJECTIVE

To determine if seed treatment materials (fungicides), and time of seeding affects smut incidence in Mountain Brome.

INTRODUCTION

During the year 2000, Upper Colorado Environmental Plant Center (UCEPC) released Garnet Germplasm mountain brome as a tested class release. The term "Germplasm" denotes the material is not a cultivar, but a pre-cultivar release recognized by the Association of Official Seed Certifying Agencies. Garnet Germplasm was selected for its head smut *Ustilago bullata* resistance, longevity, and ease of establishment and good production of both forage and seed. Mountain brome is widely used for conservation and reclamation plantings in Colorado. Unfortunately, seed producers in Colorado have reported more than 5% incidence of the disease smut in Garnet Germplasm. This might imply that Garnet is not totally resistant to head smut or perhaps another strain of the disease has been developed to which Garnet is susceptible. The disease is limiting production of Garnet and its use for conservation purposes. Distribution of Garnet Germplasm has been suspended from UCEPC. At present there is no means to control smut in our seed production fields, nor can we recommend to our seed producers any control method for smut.

This fungal disease has been reported to reduce seedling establishment. It can affect seed yields substantially, depending on incidence of infected plants. Head smut, when present in the head, produces smut instead of seed, thereby, reducing seed production. It can also reduce forage production. The disease is found on a wide range of grass hosts, but is a most important disease of cool-season grasses, especially **brome grasses** and wheat grasses. Head smut has been reported as being primarily seed-borne; however, reports also indicate that spores in the soil can infect emerging seedlings. The fungus develops systemically within the host plant. At flowering, the ovaries in the infected plants are converted to bulky masses of spores covered by a thin membrane. Black or brown spore masses are released when this membrane breaks. Fungal spores disperse by wind. Spores infect seed embryos at flowering. The disease also affects the morphology of the plant. The internodes in the stem are shortened, producing a shorter stem that bears a more erect, compact panicle.

This technology development study was designed to determine if seed treatment with fungicide can prevent or reduce the incidence of head smut. Also, the study is being conducted at two planting times, **spring** versus **fall,** to find out if environmental conditions during germination and establishment influence head smut incidence.

Project No. COPMC-T-0504-RA
Project Report-2007
By: Manuel Rosales

EXPERIMENTAL DESIGN

The statistical design for the study is a randomized complete block with a split plot arrangement, replicated three times.

Treatments consist of:

1. **Contaminated seed**
    a. Treated with vitavax-captan
    b. Treated with Dividend
    c. Untreated seed /check
2. **Non-contaminated seed**
    a. Treated with vitavax-captan
    b. Treated with Dividend
    c. Untreated seed /check

MATERIALS & METHODS

Contaminated and uncontaminated seed of Garnet mountain brome was treated with two fungicides prior to planting. The two fungicides were selected with the assistance and advice of Dr. Ned Tisserat, Plant Pathologist with Colorado State University. Naturally-infected seed of Garnet mountain brome was secure from a grower's field for a source of contaminated seed. The uncontaminated seed was from seed grown and harvested at UCEPC, from a non-infected field, with seed lot number SG1-04-UC6. The two fungicides used were: Enhance (vitavax-captan 20-20) and Dividend Extreme. Both seed treatment fungicides were used following the recommended rates to control head smut (often called loose smut) according to label instructions.

The experimental site is located at UCEPC in a field that previously had mountain brome and was infected with head smut. The site was chosen to insure that we get an infection by the disease and evaluate the effectiveness of the fungicides. Seed bed preparation was done by preparing flat-beds spaced at three foot centers. The **plot size** is 240 square feet: 12 feet wide x 20 feet in length. Each plot consists of 4-rows spaced at three foot centers. All the data to be collected will be done from the two middle rows to eliminate boarder effect. The **Fall Study** was planted on **October 18, 2005**. The seed was drilled with a hand-pushed Planet Junior seeder. The rate of seeding was 30 pure live seeds per linear foot of row. The plots received no initial fertilizer or irrigation.

The parameters to be measured in the study are: **percent plant stand**, **disease incidence**, and **seed yield**. Disease incidence will be assessed by counting the total number of panicles within a random length of three to ten feet in the middle of the plots, and getting a percent of infected panicles within this length. Seed yield and percent stand will also be collected from this area. The study will be conducted for at least three years depending on survivability of the stand.

Project No. COPMC-T-0504-RA
Project Report-2007
By: Manuel Rosales

RESULTS

Year-2006

Plots were examined on May 19, 2006, to determine how they were progressing after the winter season. Most plots had emerged at this time with an average seedling height of three inches. Replication No. III suffered water erosion after the snow melted in the spring, and some plots had fewer plants as compared to the other two replications in the test.
On July 7, 2006, the study was evaluated for percent plant stand. Results are presented in the following table. No seed was produced this year.

Table1. Percent plant stand for Garnet Germplasm Mountain Brome tested release (fall treatment study). UCEPC-2006.

Seed Quality	*Fungicide*	*% Plant Stand*
Clean Seed	**Control**	**60.0**
	Dividend	**56.7**
	Vitavax	**55.0**
Infected Seed	**Control**	**51.7**
	Dividend	**58.3**
	Vitavax	**68.3**
Mean		**58.3**
LSD (0.05)*		**7.84**

*Least Significant Difference at P<0.05. For same level of seed quality.
Percent plant stand is a visual estimate based on plot stand. Four complete rows/plot = 100 percent plant stand.

Year-2007

This is the first year of seed production for this test. The plots were evaluated on June 27-30 and harvested on July 2 of 2007. Results are presented in Table 2.

Table 2. Effect of fungicide treatment on smut disease, and other parameters on infected and non-infected seed of Mountain Brome-Garnet Germplasm. Fall seeded trial-UCEPC-2007

Seed Quality	Fungicide	Percent Smutted seed[1]	Seed Yield (Lb/A)	Plant Height (cm)	Plant Stand
Clean Seed	**Control**	0	293.7	85.1	86.7
	Dividend	2.1	243.0	80.9	86.7
	Vitavax	1.1	244.7	85.7	86.0
Infected Seed	**Control**	64.7	252.1	80.8	81.7
	Dividend	11.7	357.6	80.8	78.3
	Vitavax	1.1	400.8	80.2	91.6
Mean		13.2	298.7	82.2	85.2
LSD (0.05)*		45.3	NS	NS	NS

1. Percent smutted seed was calculated by counting the number of smutted heads out of a total number of heads in a meter sample within each plot per three replications.
* Least significantly different (LSD) at P<0.05 for the interaction seed-quality by fungicide. NS = Not Significant different at P<0.05.

SUMMARY

The fungicide treatments were statistically significantly different from the control treatment on the infected seed. This is the same pattern observed for the spring seeded test. Statistically speaking, however, results indicate that the fungicides Vitavax and Dividend are equal in effectiveness in controlling the smutted disease at the P<0.05. Even though the seed yield was not statistically significantly different, one needs to keep in mind that once a field or plot is infected with the disease, the seed produced from this field is going to be contaminated due to the action of the harvesting equipment which mixes all the seed. The degree of contamination will be dependent upon the degree of infection. The test will be continued for one more year, to determine if the fall planted test follows the same pattern of the spring planted test. (See report-year 2007 - COPMC-T-0502 for spring results).

Project COPMC-T-0601-UR
Final Report-2007
By: Manuel Rosales

Native Shrub Seeding Trial

OBJECTIVE

To determine relative success with direct seeding of native shrubs identified for conservation use.

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) identified a number of native shrub species, with different conservation attributes such as wildlife habitat improvement, windbreaks, restoration, landscaping, riparian enhancement, etc., since its inception in 1975. Most of the shrubs planted in 1977 are still growing at the center and produce viable seed. Most of these shrubs have potential for conservation use and could be released by UCEPC. However, there is still some information that is needed before completing their release and deleted use by the general public. Propagation techniques are still lacking to grow the shrubs, and provide a continuous supply of plant materials to our customers. This technology development study makes an effort to fulfill this gap.

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

Seven native shrub species were direct-seeded on January 11, 2006. Two of the seven species were planted with and without the pulp or flesh. The seed used for the planting was collected from the shrubs growing at the Center. Plots were planted by hand at the rate of 30 seeds per plot (one seed/linear foot). Plot size is 30 feet long by three feet wide.

Table-1 list the species and source, and Table 2 presents the plot plan for the study:

Table 1. Native Shrub Seeding Trial

Entry No.	Common Name/ Scientific Name	Weight / 30 Seed or Berries	Accession No.	Seed Lot UCEPC	Year Harvested
1	Chokecherry *Prunus virginiana*	5.0 gram	9024060	F-18	1998
2	Silver Buffaloberry(w/o flesh) *Shepherdia argentea*	0.2 gram	9008027?	F-18	2003
3	Squaw apple *Peraphyllum ramosissimum*	0.6 gram	untagged	F-15	1999
4	Cliff Fendlerbush *Fendlera rupicola*	0.1 gram	9024143	F-15	1995
5	Maybell Bitterbrush *Purshia tridentata*	1.4 gram	Release	F-18&21	1997
6	Smith's Buckthorn(w/o flesh) *Rhamnus smithii*	0.3 gram	9024308	F-15	1998

Entry No.	Common Name/ Scientific Name	Weight / 30 Seed or Berries	Accession No.	Seed Lot UCEPC	Year Harvested
7	Silver Buffaloberry(w/ flesh)	1.4 gram	900827	?	2004
8	Smith's Buckthorn(w/ flesh)	1.8 gram	9024308	F-15	2004
9	Serviceberry *Amelanchier utahensis*	0.4 gram	9021438	F-3	2005

Table 2. Plot Plan for Native Shrub Seeding Trial

Block-I	**Block-II**	**Block-III**
4-Cliff	**1**-Chokecherry	**3**-Squaw apple
1-Chokecherry	**8**- Smith's B. w/ flesh	**5**-Maybell
2-Silver B. w/o flesh	**6**- Smith's B. w/o flesh	**9**-Serviceberry
8-Smith's B. w/ flesh	**5**-Maybell	**7**- Silver B. w/ flesh
3-Squaw apple	**2**- Silver B. w/o flesh	**4**-Cliff
7-Silver B. w/ flesh	**7**- Silver B. w/ flesh	**8**- Smith's B. w/ flesh
5-Maybell	**9**-Serviceberry	**6**- Smith's B. w/o flesh
9-Serviceberry	**4**-Cliff	**1**-Chokecherry
6-Smith's B. w/o flesh	**3**-Squaw apple	**2**- Silver B. w/o flesh
Row direction	⇨	**West**

A seed-cut test was performed in all entries before planting to determine viability. All seed entries had 90-100 percent seed fill as determined by the seed-cut test. Entries will be evaluated for percent establishment and growth rate for two years.

RESULTS

On July 12, 2006, the plots were weeded and evaluated for emergency. Only two species, Maybell bitterbrush and serviceberry, had a few plants that germinated within the entire test. Four plants germinated for bitterbrush and five plants of serviceberry. We believed frost heaving of our clayey soils might be the culprit of such poor germination. The seeds might have been pushed out of the soil and dehydrated.

Year -2007: Plots were evaluated again during early summer of July 12, 2007, to make a final determination for the study. No new species had germinated except Squaw apple which had one plant. The four plants of bitterbrush and five plants of serviceberry that germinated during 2006 were growing well and had about 12-15 inches of growth.

SUMMARY

Due to the lack of germination on most of the species during the two years since the test was planted, it was decided to terminate this study. A new study will be started and the seeding rate will be increased to provide the species with a better chance of germination.

Project COPMC-T-0602-UR
Final Report-2007
By: Manuel Rosales

Native Shrub Seeding Trial - Greenhouse

OBJECTIVE

To determine germination rate with non-stratified seed of native shrub species.

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) has identified a number of native shrub species with different conservation attributes such as wildlife habitat improvement, windbreaks, landscaping, riparian enhancement, etc., since its inception in 1975. Most of the shrubs planted in 1977 are still growing at UCEPC. The shrubs have potential of being released for conservation use by the general public. There is still some information that is needed before completing their release. Propagation techniques are still lacking to routinely grow the shrubs and provide a continuous supply of plant materials to our customers. This technology development study makes an effort to fulfill this gap. The greenhouse study is a complement of the native shrub seeding trial that is being conducted under field conditions at UCEPC.

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

Seven native shrub species were seeded in the greenhouse on January 17, 2006. Two of the nine species, Silver Buffaloberry and Smith's buckthorn, were seeded with and without the pulp. The seed used for the planting was collected from the shrubs growing at UCEPC. Thirty "Ray Leach" cone-containers per species were filled with a professional, super fine, soil potting mix (ten containers per replication with three replications per species) and then seeded. Table-1 lists the species and source.

Table 1. Native Shrub Seeding Trial

Entry No.	Common Name/ Scientific Name	Weight / 30 Seed or Berries	Accession No.	Seed Lot UCEPC	Year Harvested
1	Chokecherry *Prunus Virginiana*	5.0 gram	9024060	F-18	1998
2	Silver Buffaloberry(w/o pulp) *Shepherdia argentea*	0.2 gram	9008027?	F-18	2003
3	Squaw apple *Peraphyllum ramosissimum*	0.6 gram	untagged	F-15	1999
4	Cliff Fendlerbush Fendlera rupicola	0.1 gram	9024143	F-15	1995
5	Maybell Bitterbrush *Purshia tridentata*	1.4 gram	Release	F-18&21	1997
6	Smith's Buckthorn(w/o pulp) *Rhamnus smithii*	0.3 gram	9024308	F-15	1998

Entry No.	Common Name/ Scientific Name	Weight / 30 Seed or Berries	Accession No.	Seed Lot UCEPC	Year Harvested
7	Silver Buffaloberry(w/ berry)	1.4 gram	900827	?	2004
8	Smith's Buckthorn(w/ berry)	1.8 gram	9024308	F-15	2004
9	Serviceberry *Amelanchier utahensis*	0.4 gram	9021438	F-3	2005

A seed cut-test was performed in all entries before planting to determine viability. All seed entries had 90-100 percent seed fill. Entries will be evaluated for germination rate for one year. All entries were seeded without cold stratification treatment.

RESULTS

Out of the nine entries that were planted, only four entries germinated during the evaluation period of 12 months.

Results are presented in the following table:

Table 2. Germination rate for nine native shrubs evaluated for 12 month (Jan-2006 to Jan-2007). UCEPC-2006.

Shrub Entry	Total Germination Out of 30 seeds	Percent Germination	Cold Stratification Requirement[1]
Maybell Bitterbrush	22	**73.3 a***	Yes
Silver Buffaloberry w/o pulp	19	**63.3 a**	Yes
Silver Buffaloberry w/pulp	8	**26.7 b**	Yes
Squaw apple	4	**13. 3 b**	Yes
Chokecherry	0	**0**	Yes
Cliff Fendlerbush	0	**0**	Yes
Smith's Buckthorn w/o pulp	0	**0**	Not Listed
Smith's Buckthorn w/pulp	0	**0**	Not listed
Serviceberry	0	**0**	No

1. Cold stratification requirement as stated in plant profile of USDA-NRCS Plants Database. USDA, NRCS. 2006. The Plants database , Version 3.5 (http://plants.usda.gov)

* Means within column followed by the same letters are not significantly different as determined by least significant difference test at P<0.05. Only the four entries that germinated were evaluated statistically.
Note: Entries were planted without cold stratification treatment to determine if cold stratification was needed. Seed had been in cold dry storage(40-50 F^0) at UCEPC. See table-1 for year harvested.

The study was kept and monitored until summer of 2007, however, no more plants germinated in any of the species.

Project COPMC-T-0602-UR
Final Report-2007
By: Manuel Rosales

SUMMARY

Out of the seven species studied in this test, only three germinated without cold stratification treatment prior to seeding; *Purshia tridentata, Shepherdia argentea,* and *Peraphyllum ramosissimum*. One can make the conclusion that these species do not need cold stratification, however, most temperate species do best when seeds are cold stratified or planted during the fall to get natural stratification during the winter months. Based on the data collected at UCEPC, the above species appear to germinate without cold stratification.

Project COPMC-T-0702-UR
Final Report-2007
By: Manuel Rosales

Direct Seeding of Native Shrubs

OBJECTIVE

To determine success of direct seeding of some better performing shrubs under field conditions.

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) identified a number of native shrub species, with different conservation attributes such as wildlife habitat improvement, windbreaks, restoration, landscaping, riparian enhancement, etc., since its inception in 1975. Most of the shrubs planted in 1977 are still growing at UCEPC and produce viable seed. Most of these shrubs have potential for conservation use and could be released by UCEPC. However, there is still some information that is needed before completing their release and use by the general public. Propagation techniques are still lacking to grow the shrubs and provide a continuous supply of plant materials to our customers. This technology development study makes an effort to fulfill this gap.

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

Sixteen native shrub species were direct-seeded on November 6, 2006. Most of the seed used for this study was harvested at UCEPC in previous years with the exception of a few species that were collected outside the center. Plots were planted with a hand-pushed belt seeder at the rate of 20 seeds per linear foot. Plot size is 20 feet long by 3 feet wide. The plots will be irrigated as needed. The study will be conducted for three years.

Table-1 list the species and source, and Table 2 presents the plot plan for the study.

Table 1. Sixteen Native Shrub Species Direct Seeded at Upper Colorado Environmental Plant Center*

Common Name	Scientific Name	Accession No.	Seed Source	Year Harvested
Antelope Bitterbrush	*Purshia tridentata*	9038521	UCEPC 95-F21	1995
Apache Plume	*Fallugia paradoxa*	9024141	UCEPC 83-EPC	1983
Basin Big Sagebrush	*Artemisia tridentata* spp. tridentata		Tom Brown Site-00	2000
Black Chokecherry	*Prunus virginiana* var. melanocarpa	9024060	UCEPC 03-F18	2003

Common Name	Scientific Name	Accession No.	Seed Source	Year Harvested
Cliff Fendlerbush	*Fendlera rupicola*	9024143	UCEPC 04-EPC	2004
Fringed Sage	*Artemisia frigida*	9021471	UCEPC 06-EPC	2006
Golden Currant	*Ribes aureum*	9030913	UCEPC 99-F15	1999
Littleleaf Mock Orange	*Philadelphus microphyllus*	9024096	UCEPC 98-F15	1998
Red Barberry	*Berberis haematocarpa*	9024220	UCEPC 02-F15	2002
Rockspirea	*Holodiscus dumosus*	9024154	UCEPC 95-F15	1995
Silver Buffaloberry	*Shepherdia argentea*	9008027	UCEPC 03-F15	2003
Silver Sage	*Artemisia cana*	9070850	04-Cedar Springs	2004
Smith's Buckthorn	*Rhamnus smithii*	9024308	UCEPC 98-F15	1998
Squaw Apple	*Peraphyllum ramosissimum*	9007948	UCEPC 03-F15	2003
Utah Serviceberry	*Amelanchier utahensis*	9021438	UCEPC 97-F3	1997
Wyoming Big Sagebrush	*Artemisia tridentata* Nutt. ssp. *wyomingensis*		Tom Brown Site-00	2000

*Planting Date: November 6, 2006

Table 2. Plot Plan for Direct Seeded Shrub Trial

→N								
Block-III	Bush Oceanspray	Silver Buffaloberry	Apache Plume	Smith's Buckthorn	Squaw Apple	Cliff Fendlerbush	Red Barberry	Littleleaf Mock Orange
	Golden Currant	Fringed Sage	Antelope Bitterbrush	WY Big Sagebrush	Black Chokecherry*	Silver Sage	Utah Serviceberry	Basin Big Sagebrush
Block-II	WY Big Sagebrush	Silver Buffaloberry	Black Chokecherry*	Smith's Buckthorn	Littleleaf Mock Orange	Cliff Fendlerbush	Antelope Bitterbrush	Squaw Apple
	Apache Plum	Basin Big Sagebrush	Red Barberry	Fringe Sage	Bush Oceanspray	Utah Serviceberry	Golden Currant	Silver Sage
Block-I	Squaw Apple	Apache Plume	Red Barberry	Basin Big Sagebrush	Black Chokecherry*	Golden Currant	Fringe Sage	Silver Sage
	Antelope Bitterbrush	Smith's Buckthorn	Littleleaf Mock Orange	Utah Serviceberry	WY Big Sagebrush	Cliff Fendlerbush	Silver Buffaloberry	Bush Oceanspray
* Chokecherry seed with pulp or flesh								

RESULTS

On May 23, 2007, the plots were checked for germination. Some plots had some shrubs that had germinated at this time with about two to three true leaves and about one to two inches tall. The grass hay used for mulching provided protection against frost heaving of clay soil, however, this also created a weed problem since hay had viable grass seed and germinated along with the shrubs. Plots were hand weeded at this time to control broadleaved weeds and an application of the herbicide "SELECT" which controls grassy weeds was also applied at the rate of one ounce per three gallons of water plus 1.5 ounce of oil.

On July 19, 2007, the trial was evaluated for plant stand. The herbicide "SELECT" stopped the growth of grassy weeds but did not completely kill them. Plots were hand weeded for the second time. The results are presented in the following table.

Table 3. Percent Plant Stand for 16 shrub species direct seeded at the Upper Colorado Environmental Plant Center*.

Common Name	Scientific Name	Percent Plant Stand
Antelope Bitterbrush	*Purshia tridentata*	96.6 a **
Apache Plume	*Fallugia paradoxa*	0 e
Basin Big Sagebrush	*Artemesia tridentata spp. tridentata*	6.7 e
Black Chokecherry	*Prunus virginiana var. melanocarpa*	11.7 e
Cliff Fendlerbush	*Fendlera rupicola*	55.0 bc
Fringed Sage	*Artemisia frigida*	90. 0 a
Golden Currant	*Ribes aureum*	43.3 cd
Littleleaf Mock Orange	*Philadelphus microphyllus*	0 e
Red Barberry	*Berberis haematocarpa*	5 e
Rockspirea	*Holodiscus dumosus*	0 e
Silver Buffaloberry	*Shepherdia argentea*	21.7 de
Silver Sage	*Artemisia cana*	41.7 cd
Smith's Buckthorn	*Rhamnus smithii*	1.7 e
Squaw Apple	*Peraphyllum ramosissimum*	71.6 ab
Utah Serviceberry	*Amelanchier utahensis*	91.7 a
Wyoming Big Sagebrush	*Artemisia tridentata spp. wyomingensis*	0 e

* Planting Date: November 6, 2006
** Means followed by the same letters are not significantly different as determined by least significant difference test at $P<0.05$.

Seed Production - 2007
Upper Colorado Envronmental Plant Center
by Dr. Gary L. Noller

INTRODUCTION

The following plant materials had seed harvested in 2007. This report does not include seed produced for special contracts. Species and planting information can be requested from the UCEPC.

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
GRASSES								
Smooth Brome	*Bromus inermis*	08S229	9030693	1996	0.01	7/22	25	2.19 lb
'Liso'				1997	0.01	7/26	25	1.10 lb
				1998	0.01	8/12	25	1.25 lb Heavy shatter
				1999	0.01	No harvest	25	--
				2000	0.01	No harvest	25	--
				2001	0.01	No harvest	25	--
				2002	0.01	No harvest	25	--
				2003	0.01	7/16	25	256.00 g
				2004	0.01	No harvest	25	--
				2005	0.01	No harvest	25	--
				2006	0.01	No harvest	25	--
				2007	0.01	No harvest	25	--
Mountain Brome	*Bromus marginatus*	08S217	9005308	1989	0.20	--	17	--
Garnet - tested class				1990	0.20	--	17	75.00 lb
				1991	0.20	--	17	92.00 lb
				1992	0.20	--	17	104.00 lb
				1993	0.20	--	17	6.20 lb
				1994	1.00	--	6	1235.00 lb
				1995	1.00	--	6	1266.00 lb
				1996	1.00	7/8	6	610.00 lb
				1997	1.00	7/8	6	473.00 lb
				1998	1.00	7/12	6	479.00 lb
				1999	1.00	7/8 - 7/9	6	607.00 lb
				2000	1.00	6/28	6	6.60 lb
				2000	--	Plowed 26 rows	6	
				2000	0.18	6 rows not plowed	6	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2001	0.18	6/27	6	43.00 lb
				2002	0.18	6/5	6	10.00 lb
				2003	0.18	7/1	6	41.00 lb
				2004	0.18	7/1	6	95.00 lb
				2004	1.10	New planting	6	
				2005	0.18	7/8	6	33.00 lb
				2005	1.10	7/8	6	37.00 lb
				2006	0.18	6/26	6	16.50 lb
				2006	1.10	6/26	6	112.00 lb
				2007	0.18	6/29	6	95.00 lb
				2007	1.10	6/30	6	287.00 lb
Purple reedgrass	*Calamagrostis purpurascens*		9070968	2005	plot	Planted	20	
				2006	plot	7/26	20	1.00 g
				2007	plot	7/31	20	5.00 g
Bottlebrush Squirreltail Wapiti - selected class	*Elymus elymoides*		9040189	2005	1.00	New planting	18	
			Poor stand	2006	1.00	No harvest	18	--
				2007	1.00	7/20 - 8/8	18	24.00 lb
Bottlebrush Squirreltail Pueblo - selected class	*Elymus elymoides*		9040187	2006	0.50	New planting	18	
				2007	0.50	8/10	18	422.00 g
'Peru creek'	*Deschampsia caespitosa*		9024403	2006	plot	7/26	20	13.00 g
				2007		7/30	20	57.00 g
Slender Wheatgrass 'San Luis'	*Elymus trachycaulus*		483079	2004	1.00	New planting	3	
				2005	1.00	7/22	3	204.00 lb
				2006	1.00	7/15	3	253.00 lb
				2007	1.00	7/28	3	96.00 lb
				2007	1.00	Plowed 11/7		
Pubescent wheatgrass 'Luna' Foundation	*Elytrigia intermedia*	08S216	106831	1993	1.00	--	11	
				1994	1.00	--	11	379.00 lb
				1995	1.00	9/30	11	335.00 lb
				1996	1.00	8/15	11	150.00 lb
				1997	1.00	8/20	11	161.00 lb
				1997	0.66	Planted 6/6	11	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				1998	1.66	8/26	11	353.00 lb	
				1999	0.66	Removed 1993 planting	11	121.50 lb	
				2000	0.66	No harvest	11	--	
				2001	0.66	8/16	11	24.50 lb	
				2002	0.66	Field plowed	11		
				2002	0.70	Planted 7/18	11		
				2003	0.70	9/8	11	43.00 lb	
				2004	0.70	8/24	11	213.00 lb	
				2005	0.70	8/15	11	138.00 lb	
				2006	0.70	9/27	11	10.00 lb	
				2006	1.30	July (New planting)	11		
				2007	1.30	8/7	11	637.00 lb	
Arizona fescue	*Festuca arizonica*	08S214	469218	1994	1.00	--	6		
'Redondo'				1995	1.00	8/7	6	191.50 lb	
Foundation				1996	1.00	8/1	6	97.00 lb	
				1997	1.00	8/11	6	111.00 lb	
				1998	1.00	8/8	6	89.00 lb	
				1999	1.00	8/3	6	33.50 lb	
				2000	1.00	7/21	6	57.00 lb	
				2001	1.00	8/1	6	45.00 lb	
				2002	1.00	7/30	6	54.00 lb	
				2003	1.00	No harvest	6	--	Reduced to .18 ac
				2004	1.00	New planting	18		
				2005	0.18	7/28	6	9.00 lb	
				2005	1.00	No harvest	18	--	Replant
				2006	0.18	No harvest	6	--	
				2006	1.00	No harvest	18	--	
				2007	0.18	7/27	6	1.00 lb	
Thurber fescue	*Festuca thurberi*		9024002	2007	plot	7/11	20	190.00 g	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
Praire junegrass	*Koeleria cristata*	08S244	9092261	2002	1.00	Planted 7/16/02	11A		
	Not released			2003	1.00	7/17	11A	47.00	lb
				2004	1.00	7/7	11A	221.00	lb
				2005	1.00	7/13	11A	100.00	lb
				2006	1.00	7/1	11A	120.00	lb
Big bluegrass	*Poa secunda*			2007	1.00	7/2	11A	134.00	lb
Name changed									
Salina wildrye	*Leymus salinus*	08S213	9043501	1996	0.02	7/22	Hqts.	154.00	g
				1996	0.10	7/22	4	631.00	g
				1996	0.20	Planted	4	No harvest	Breeders
				1997	0.02	Field plowed	Hqts.	No harvest	Foundation
				1997	0.10	7/21	4	2.96	lb Breeders
				1997	0.20	7/21	4	5.32	lb Foundation
				1998	0.10	8/4	4	4.00	lb Breeders
				1998	0.20	8/4	4	9.00	lb Foundation
				1999	0.10	7/15	4	22.00	g Breeders
				1999	0.20	7/15	4	32.00	g Foundation
				2000	0.10	No harvest	4	--	Foundation
				2000	0.20	7/7	4	6.00	g Breeders
				2001	0.20	7/9	4	174.00	g Breeders
				2001	0.10	7/9	4	227.00	g Foundation
				2002	0.10	7/11	4	7.00	g Breeders
				2002	0.20	7/11	4	23.00	g Foundation
				2003	0.10	7/9	4	1.69	lb Breeders
				2003	0.20	7/9	4	0.60	lb Foundation
				2004	0.10	7/9	4	19.00	g Foundation
				2004	0.20	7/9	4	146.00	g Breeders
				2004	0.10	New planting	4		Foundation
				2005	0.10	7/13	4	1.40	lb Foundation
				2005	0.30	7/13	4	302.00	g Breeders
				2006	0.30	7/13	4	83.00	g Foundation
				2006	0.10	7/13	4	2.00	g Breeders
				2007	0.30	7/11	4	5.50	lb Foundation
				2007	0.10	7/13	4	296.00	g Breeders
Western wheatgrass	*Pascopyron smithii*	08S226	432402	1996	1.00	Planted	4		
'Arriba'				1997	1.00	8/14	4	640.00	lb
Foundation				1998	1.00	8/22	4	238.00	lb

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				1999	1.00	8/26	4	87.00 lb
				1999	0.80	New planting 10/6	6A	
				2000	0.80	No harvest	6A	--
				2000	1.00	Field plowed	4	
				2001	0.80	8/3	6A	173.00 lb
				2002	0.80	8/14	6A	100.00 lb
				2003	0.80	8/22	6A	126.00 lb
				2004	0.80	No harvest-plowed	6A	
				2004	1.30	New planting	4	
				2005	1.30	8/27	4	35.00 lb
				2006	1.30	7/28	4	273.00 lb
				2007	1.30	8/5	4	108.00 lb
				2007	1.30	Fall plowed	4	
				2007	1.13	New planting - 8/9	1A	34 rows
FORBS								
Fringed sage	*Artemisia frigida*		9021471	2006	plot	9/26	20	2.45 lb
				2007	plot	9/27	20	539.00 g
Louisiana sage	*Artemisia ludoviciana*	08S109	9021474	1984	0.25	--	2	
'Summit'				1985	0.25	No harvest	2	--
Foundation				1986	0.25	10/6	2	2.44 g
				1987	0.25	9/14	2	0.96 g
				1988	0.25	10/5	2	0.10 g
				1989	0.25	10/11	2	4.00 g
				1990	0.25	No harvest	2	--
				1991	0.25	9/10	2	3.43 lb
				1992	0.25	9/2	2	57.00 g
				1993	0.25	9/15	2	4.39 lb
				1994	0.35	9/8	2	4.38 lb
				1995	0.35	9/11	2	28.00 lb
				1996	0.35	9/10	2	0.78 lb
				1997	0.35	9/8	2	0.90 lb
				1998	0.35	Stand dead-field plowed	2	
				1998	0.06	New planting	2	No harvest
				1999	0.06	Field plowed	--	
				1999	0.10	New planting	25	
				2000	0.10	No harvest	25	--

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2001	0.10	No harvest	25	--
				2002	0.10	No harvest	25	--
				2003	0.10	No harvest	25	--
				2004	0.10	No harvest	25	--
				2005	0.10	No harvest	25	--
				2006	0.10	No harvest	25	--
				2007	0.10	No harvest	25	--
				2007	plot	New planting	Hdqtrs	
Utah sweetvetch	*Hedysarum boreale*		9024375	2005	1.00	New planting	1	
'Timp'				2006	1.00	Poor stand	1	No harvest
				2007	1.00	Late July	1	45.00 g
Rocky Mtn penstemon	*Penstemon strictus*		9004712	2004	0.10	New planting	8A	
'Bandera'				2005	0.10	No harvest	8A	--
Foundation				2006	0.10	No harvest (Deer used heavily)	8A	--
				2007	0.10	8/24	8A	5.00 lb
SHRUBS								
Serviceberry	*Amelanchier alnifolia*	08S078Z	9021438	1984	0.25	--	3	
Long's ridge				1993	0.25	--	3	2.88 lb
				1994	0.25	--	3	0.88 lb
				1995	0.25	--	3	1.77 lb
				1996	0.25	No harvest	3	--
				1997	0.25	--	3	131.00 g
				1998	0.25	7/30	3	0.18 lb
				1999	0.25	No harvest	3	--
				2000	0.25	7/20 - 8/9	3	283.00 g
				2001	0.25	No harvest	3	--
				2002	0.25	No harvest	3	--
				2003	0.25	7/10 - 8/13	3	2.64 lb
				2004	0.25	No harvest	3	--
				2005	0.25	No harvest	3	--
				2006	0.25	1/6	3	0.80 lb
				2007	0.25	8/2	3	449.00 g

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight		
Mountain mahogany	*Cercocarpus montanus*	08S035Z	477976	1979	0.02	--	17			
'Montane'				1984	0.02	9/24	17	43.00	g	
Foundation				1985	0.02	9/11	17	286.00	g	
				1986	0.02	10/7	17	37.00	g	
				1987	0.02	8/31 - 9/15	17	2.47	lb	
				1988	0.02	9/1 - 9/13	17	2.05	lb	
				1989	0.02	9/15	17	0.20	lb	
				1990	0.02	No harvest	17	--		
				1991	0.02	10/17	17	285.00	g	
				1992	0.02	9/21	17	0.83	lb	
				1993	0.02	9/15	17	2.44	lb	
				1994	0.02	8/12	17	2.30	lb	Not all harvested
				1995	0.02	No harvest	17	--		
				1996	0.02	--	17	0.82	lb	Not all harvested
				1997	0.02	No harvest	17	--		
				1998	0.02	11/2	17	0.86	lb	
				1999	0.02	No harvest	17	--		
				2000	0.02	No harvest	17	--		
				2001	0.02	No harvest	17	--		
				2002	0.02	No harvest	17	--		
				2003	0.02	No harvest	17	--		
				2004	0.02	No harvest	17	--		
				2005	0.02	No harvest	17	--		
				2006	0.02	No harvest	17	--		
				2007	0.02	No harvest	18	--		
Winterfat	*Krascheninnikovia lanata*	08S161	9040973	1985	0.04	--	21			
'Hatch'				1986	0.04	--	21	9.00	g	
Foundation				1987	0.04	--	21	137.00	g	
				1988	0.30	9/22 - 11/8	21	249.00	g	
				1989	0.30	9/29 - 11/8	21	1.11	lb	
				1990	0.30	10/11 - 10/17	21	0.96	lb	
				1991	0.30	--	21	2.55	lb	
				1992	0.30	10/2	21	275.00	g	
				1993	0.30	10/13	21	0.60	lb	
				1994	0.30	10/12	21	0.92	lb	
				1995	0.30	10/11	21	2.80	lb	
				1996	0.30	11/1	21	361.00	g	Heavy shatter
				1997	0.30	11/25	21	428.00	g	Heavy shatter

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				1998	0.30	12/9	21	19.00 g
				1999	0.30	10/26	21	2.18 lb
				2000	0.30	10/16	21	5.00 lb
				2001	0.30	No harvest	21	--
				2002	0.30	10/16-10/17	21	2.60 lb
				2003	0.30	No harvest	21	--
				2004	0.30	10/15	21	0.93 lb
	Brush beat and disced			2005	0.30	No harvest	21	--
Bitterbrush	*Purshia tridentata*	08S077Z	9024373	1983	0.30	--	18	
Maybell select class		08A210		1984	0.30	--	21	
				1987	0.30	--	18	13.00 lb
				1988	0.30	--	18	12.80 lb
				1989	0.30	--	18	16.00 lb
				1987-90	0.30	No harvest	21	--
				1990-92	0.30	No harvest	18	--
				1991	0.30	--	21	3.90 lb
				1992	0.30	--	21	7.40 lb
				1993	0.30	--	21	18.50 lb
				1993	0.30	--	18	18.00 lb
				1994	0.30	--	18	56.00 lb
				1994	0.30	--	21	56.00 lb
				1995	0.60	--	18-21	14.00 lb
				1996	0.60	7/22	18-21	9.66 lb
				1997	0.60	7/23 - 8/7	18-21	30.00 lb
				1998	0.60	7/31	18-21	7.00 lb
				1999	0.60	7/28	18-21	8.62 lb
				1999	0.30	Field 21 plowed	18	
				2000	0.30	7/18	21	8.00 lb
				2001	0.30	7/19	21	5.18 lb
				2002	0.30	7/23	21	30.00 g
				2003	0.30	No harvest-shattered		--
				2004	0.30	No harvest-shattered		--
				2005	0.30	No harvest-brushbeat	21	--
Bitterbrush	*Purshia tridentata*	08A073J	9038521	1995	0.01	7/29	21	239.00 g
Fire tolerant				1996	0.01	8/15	21	66.00 g
				1997	0.01	No harvest	21	--
				1998	0.01	No harvest	21	--
				1999	0.01	8/6	21	27.00 g

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2000	0.01	7/18	21	153.00 g
				2001	0.01	7/19	21	159.00 g
				2002	0.01	No harvest	21	--
				2003	0.01	No harvest	21	--
				2004	0.01	No harvest	21	--
				2005	0.01	No harvest	21	
				2006	0.01	No harvest	21	--
				2007	0.01	No harvest	21	--
Chokecherry	*Prunus virginiana*	08S235	9024060	1997	0.01	8/15	18	11.90 lb
			EPC229	1998	0.01	8/25-8/27	18	115.00 lb
				1999	0.01	8/20	18	9.00 lb
				2000	0.01	7/28	18	30.50 lb
				2001	0.01	--	18	21.92 lb
				2002	0.01	July - Aug.	18	Few grams
				2003	0.01	8/4	18	4.80 lb
				2004	0.01	No harvest	18	--
				2005	0.01	No harvest	18	--
				2006	0.01	No harvest	18	--
				2007	0.01	8/10	18	47.00 g
Silver buffaloberry	*Shepherdia argentea*	08S235	9008027	1998	0.01	9/1	18	13.00 g
			EPC476	1999	0.01	No harvest	18	--
				2000	0.01	No harvest	18	--
				2001	0.01	No harvest	18	--
				2002	0.01	No harvest	18	--
				2003	0.01	8/10	18	238.00 g
				2004	0.01	No harvest	18	--
				2005	0.01	No harvest	18	--
				2006	0.01	No harvest	18	--
				2007	0.01	Mid August	18	751.00 g
Thinleaf alder	*Alnus tenuifolia*		9070975	2000	0.25	10/4	3	558.00 g
				2001	0.25	10/2-10/3	3	2.13 lb
				2002	0.25	No harvest	3	--
				2003	0.25	No harvest	3	--
				2004	0.25	No harvest	3	--
				2005	0.25	No harvest	3	--

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2006	0.25	No harvest	3	--
				2007	0.25	No harvest	3	--

Live Plant Production - 2007

Upper Colorado Environmental Plant Center

By Dr. Gary L. Noller

INTRODUCTION

Only two live plant shipments were provided by Upper Colorado Environmental Plant Center in 2007, except for materials that were grown for **special contracts**. One request was for cuttings that went to the Rose Lake PMC Michigan. The other was for Maybell bitterbrush plants for a pipeline revegetation project. The Distribution and Deliver Records (D&Ds) are attached.

RECEIVED
APR 04 2007
By

SCS-ECS-596a

DISTRIBUTION AND DELIVER RECORD
MEEKER, COLORADO ENVIRONMENTAL PLANT CENTER

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ORDER NUMBER: CO PMC-07-007-Research

D & D TO: SOIL CONSERVATION SERVICE
ATTN: PAT DAVEY
655 PARFET STREET
LAKEWOOD, CO 80215

SHIP TO: John Leif, Manager
USDA - NRCS
Rose Lake Plant Materials Center
7472 Stoll Road
East Lansing, MI 48823

Order Date: 3/08/2007 **Ship Date:** 3/28/2007 **Ship via:** FED-EX O.9IGHT

PM-1 No: **Number of Packages:** 1

ACCESSION	COMMON NAME / SCIENTIFIC NAME	LOT NUMBER / STORAGE LOC	CERT CLASS / TYPE	QUANTITY SHIPPED BULK	PLS	U/M
9024169	Redosier Dogwood *Cornus sericea spp.*			12		Cuttings
9024090	Bearberry Honeysuckle *Lonicera involucrata*			12		Cuttings
9070981	Coyote Willow *Salix exigua*			12		cuttings
9024096	Mock Orange *Philadelphus microphyllus*			12		cuttings
9024154	Rock spirea *Holodiscus dumosus*			12		cuttings
9007949	Mountain Ninebark *Physocarpus monogynus*			12		Cuttings

FOR: Soil Bio. Engineering Techniques

****

PLEASE SIGN AND RETURN ONE COPY TO:
UCEPC
5538 RBC #4
Meeker, CO 81641

****

Cost to ship $121.41 FedEx bill

Ordered by: PMS **Order filled by:** Barton, Blankle Rosales

Received by John Leif **Approved by** Manuel Rosales

Title PMC Manager **Name/Title** Manuel Rosales / Cons. Agronomist

Date 3-29-07 **Date** 3/28/07

Billed To:

SCS-ECS-596a

DISTRIBUTION AND DELIVER RECORD
MEEKER, COLORADO ENVIRONMENTAL PLANT CENTER

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ORDER NUMBER: CO PMC-07-011

D & D TO: SOIL CONSERVATION SERVICE
ATTN: PAT DAVEY
655 PARFET STREET
LAKEWOOD, CO 80215

SHIP TO: KENDRICK MOHOLT
BIO RESOURCES, INC
135 EAST CENTER STREET
LOGAN UT 84321
435 753-5370

CC :

Order Date: April 30, 2007 **Ship Date:** May 1, 2007 **Ship via:** Picked up

PM-1 No: N/A **Number of Packages:** See below

ACCESSION	COMMON NAME SCIENTIFIC NAME	LOT NUMBER STORAGE LOC	CERT CLASS TYPE	QUANTITY SHIPPED BULK	PLS	U/M
	"Maybell Source"					
	Antelope bitterbush	1" x 8" paper carton		5184		
	Purshia tridentata	1" x 8" tapered cone		611		
		Assorted containers		25		
				5820		Total Plants

FOR: Contract work

****

PLEASE SIGN AND RETURN ONE COPY TO:
UCEPC
5538 RBC #4
Meeker, CO 81641

****

Ordered by: Kendrick Moholt **Order filled by:** Terri Blanke

Received by Pete Chitwood **Approved by** Terri Blanke

Title _____ **Name/Title** Plant Technician

Date _____ **Date** 5/1/07

Billed To: _____
_____
_____

Project 08S208
Annual Report – December 2007
By: Terri Blanke

MESA VERDE
COOPERATIVE AGREEMENT

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC) signed an amendment to an agreement with Mesa Verde National Park September 24, 2003, for the production of containerized material. Two additional agreements were made directly between Mesa Verde National Park and UCEPC for the production of another 320 similar containerized materials. A total of 4420 plants were to be provided to Mesa Verde National Park in order to complete those contracts. The table below shows contract species, targeted quantities, and UCEPC delivered quantities. In addition to the above, a new contract has been initiated. An agreement between Mesa Verde National Park and UCEPC was signed on August 8, 2007. The agreement is a three year contract for UCEPC to propagate 415 PLS pounds of selected indigenous grasses. This seed would be collected by the park staff in the summer of 2007.

Contract Species with Deliverable Targets

Common Name	Scientific Name	Target Qty.	Del. Qty.	Deficit	Adjusted Numbers
Bitterbrush	*Purshia tridentata*	40	15	25	
Chokecherry	*Prunus virginiana*	250	297		47
Douglas fir	*Pseudotsuga menziesii*	100	39	61	
Fendlerbush	*Fendlera rupicola*	150	489		339
Fourwing saltbush	*Atriplex canescens*	100	293		193
Gambel oak	*Quercus gambelii*	875	1166		291
Mountain mahogany	*Cercocarpos montanus*	260	237	23	
Penstemon	*Penstemon linarioides*		7		**7**
Pinyon pine	*Pinus edulis*	35	49	14	
Rabbitbrush	*Chrysothamnus nauseosus*	160	310		150
Rocky Mt. juniper	*Juniperus scopulorum*	20	21		1
Snowberry	*Symphoricarpos oreophilus*	880	310	570	
Squaw apple	*Peraphyllum ramosissima*	135	85	50	
Utah juniper	*Juniperus utahensis*	35	13	22	
Utah serviceberry	*Amelanchier utahensis*	875	574	301	
Woods' rose	*Rosa woodsii*	320	134	186	
Yucca	*Yucca baccata*	185	289		104
	Total:	**4420**	**4328**	**1252**	**1132**

OBJECTIVE – Work continues on the main entrance road to Mesa Verde National Park. The objective of this agreement is for UCEPC to produce quality plants of the target numbers by species for restoration work after road construction. The addition of containerized shrubs to the revegetation work will contribute to the overall appearance and aesthetic appeal of the construction work once completed. The indigenous grasses that have adapted to the area's poor soil will be helpful in improving the drainage and erosion problems, thereby protecting the new pavement.

ACTIVITIES - UCEPC initiated production on the above containerized species in 2003. UCEPC utilized four different types of containers to optimally match root structure with container in terms of shape and size. Six cell "Tubepacks", four cell "Bookplanters", ten cubic inch "Conetainers" and thirty-two cubic inch "Zipsets" were all used for production. A standard soil mix of vermiculite, perlite, and peat moss was used in each container type for propagation. In most cases, materials were planted as they germinated after and during cold moist treatment. Deliveries were made in 2005, 2006, and 2007. We anticipate a final delivery in 2008. In July, UCEPC received seed from Mesa Verde National Park. After cleaning, a total of 185 grams of Indian Ricegrass, *Achnatherum hymenoides,* and 63 grams of needle and thread, *Hesperostipa comata,* had been collected. This seed, along with five other materials previously grown for Mesa Verde National Park by UCEPC, will be used to establish the increase fields. The table below shows targeted species and amounts.

Common Name	**Scientific Name**	**Seed Production Acres**	**PLS # Seed**
Indian ricegrass	*Achnatherum hymenoides*	*0.5*	*50*
Louisiana sage	*Artemisia ludoviciana*	*0.02*	*5*
Muttongrass	*Poa fendleriana*	*0.5*	*5*
Needle and thread	*Hesperostipa comata*	*0.5*	*Hay bales*
Salina wildrye	*Leymus salinus*	*0.5*	*50*
Slender wheatgrass	*Elymus trachycaulus*	*0.5*	*100*
Western wheatgrass	*Pascopyrum smithii*	*1.0*	*200*
Yarrow	*Achillea millefolium*	*0.02*	*5*
	Total:	***3.5***	***415***

RESULTS – On September 5, 2007, UCEPC planted four fields. One half of an acre of *Poa fendleriana,* muttongrass, one half of an acre of *Elymus trachycaulus,* slender wheatgrass, one acre of *Pascopyrum smithii,* western wheatgrass, and one half acre of *Leymus salinus,* salina wildrye, were planted into prepared beds. November 13, 2007, two additional fields were planted, 7 – 50' rows of *Achillea millefolium,* yarrow, and 7-50' rows of *Artemisia ludoviciana,* Louisiana sage.

On September 10, 2007, a UCEPC employee delivered 178 containerized plants to the park for the revegetation of areas along the entrance road and around the resident housing. (See Distribution and Delivery sheet # CO PMC-07-014). In addition, on October 25, 2007, a shipment of three species of Mesa Verde seed was sent to the park. A total of 17 PLS lbs consisting of 7 lbs of *Achillea millefolium,* Yarrow, 6.5 lbs of *Poa fendleriana,* muttongrass, and 3.8 lbs of *Artemisia ludoviciana,* Louisiana sage, were shipped to MVNP for the Federal Highway Administration's work on the road project. This seed was field produced by UCEPC in a previous agreement (See Distribution and Delivery sheet # CO PMC-07-20 Park).

Since UCEPC is 92 plants short of the agreement, additional material is still being produced through 2008 to make up for the shortfall. Woods' rose (*Rosa woodsii*) has been planted at UCEPC for rooting stock and propagation of several shrubs species continues.

SUMMARY – Production of containerized materials will continue into 2008 to make up for materials not delivered by UCEPC in 2007. Utah serviceberry, mountain snowberry, bitterbrush, and Woods' rose fell short of their target numbers and efforts will be focused on producing these materials. Due to the small quantity of *Stipa comata* and Indian ricegrass seed, exact increase measures have not yet been determined. Due to a very wet winter, we are optimistic that the new plantings will establish well.

Project 08S232
Annual Report – December 2007
By: Dr. Gary L. Noller

DINOSAUR NATIONAL MONUMENT
COOPERATIVE AGREEMENT

Project 08S232
Annual Report – December 2007

INTRODUCTION - This report covers the activities conducted by Upper Colorado Environmental Plant Center for the Dinosaur National Monument Plant Materials Agreement in 2007. The agreement was initiated in September of 1996 and was amended in August 1997. A new agreement was developed in 2002. These agreements involve collecting and increasing five grass species native to Dinosaur National Monument. One grass seed field was removed so that the agreement now involves four grasses. These grasses will be used for restoration and to prevent non-indigenous weedy plants from invading. No personnel from Dinosaur National Monument came to the plant center in 2007. Seed was harvested from all seed fields in 2007.

TARGETED SPECIES OF GRASS

Common Name	**Number**	**Scientific Name** (Old)
Alkali sacaton	9070954	*Sporobolus airoides*
Bluebunch wheatgrass	9070952	*Pseudoroegneria spicata ssp. spicata* (*Agropyron spicatum)*
Great basin wildrye	9070951	*Leymus cinereus* (*Elymus cinereus)*
Indian ricegrass	9070953	*Oryzopsis hymenoides*
Salina wildrye	(not collected)	*Leymus salinus ssp. salinus* (*Elymus salinus)*
Sand dropseed	(not collected)	*Sporobolus cryptandrus*
Western wheatgrass	9070955	*Pascopyron smithii* (*Agropyron smithii*)

In 2002 an additional species was added to the targeted list:

Squirreltail	(not collected)	*Elymus elymoides* (*Sitanion hystrix*)

SEED COLLECTION AND CONDITIONING INFORMATION

INTRODUCTION - No additional seed was collected from Dinosaur National Monument for seed production at the plant center in 2007.

Project 08S232
Annual Report – December 2007

SEED PRODUCTION

INTRODUCTION - Seed fields were planted on November 5 and 6, 1997, and one additional field was added on July 20, 1998. In addition, one seed field (western wheatgrass) was removed in 1999, reducing the number of seed fields to four. Two seed fields (Indian ricegrass and alkali sacaton) were interseeded in 1999, to improve stands. An additional planting of bluebunch wheatgrass was planted in 2001 due to the poor appearance of the field and no seed production in 2001. The original planting of bluebunch wheatgrass was removed after harvest in 2005. Table 1 lists the seed from Dinosaur National Monument stored at the plant center. The following updates the seed fields through 2007.

1. Indian ricegrass - November 5, 1997 - planted 8 rows (0.24 acre) - field 4 - planted at rate of about 30 seeds per foot of row - total seed lot (1.42 lb) used. Harvested light seed crop (52.0 g), September 8, 1998 - moderate to good stand November 20, 1998. Harvested July 14, 1999, produced 1.24 lb clean seed. Harvested July 3, 2000, produced 0.97 lb clean seed. Harvested July 9, 2001, produced 0.97 lb clean seed. Harvested July 2, 2002, produced 3.6 lb clean seed. Harvested July 11, 2003, produced 8.0 lb of clean seed. Harvested July 8, 2004, produced 10.0 lb of clean seed. Harvested July 12, 2005, produced 12.0 lbs clean seed. Harvested July 3, 2006, produced 5.6 lbs of clean seed. Harvested June 28 - July13, 2007, produced 8.0 lbs of clean seed.

2. Bluebunch wheatgrass - November 5, 1997 - planted 8 rows (0.24 acre) - field 1 - planted at rate of about 30 seeds per foot of row - had few seed heads 1998, no harvest - good stand November 20, 1998. Harvested July 20, 1999, produced 16.5 lb clean seed. Harvested July 12, 2000, produced 1.4 lb clean seed. Not harvested in 2001. November 16, 2001, planted 6 rows (0.18 acre) at a rate of about 30 seeds per foot of row (0.35 lb planted), field 1, just south of original planting. New planting had good stand 2002, no harvest. Harvested old stand July 12, 2002, produced 300 g clean seed. Harvested both plantings July 16, 2003, produced 32.0 lb clean seed. Harvested July 14, 2004, produced 25.5 lb clean seed. Harvested July 20 and 21, 2005, produced 13.0 lbs of clean seed. The original 8 rows of this planting were removed after 2005 harvest due to off types. Field now 0.18 ac – Harvested July 5, 2006, produced 10.8 lbs of clean seed. Harvested July 9 – 13, 2007, produced 18.0 lbs of clean seed.

3. Western wheatgrass - November 6, 1997 - planted 8 rows (0.24 acre) - field 6A - planted at rate of about 20 seeds per foot of row, due to small quantity of seed and rhizomatous habit of species. Noted some off type plants in 1998, will rouge these out in 1999 - few seed heads 1998, no harvest - excellent stand with numerous sprouts November 20, 1998. Field had numerous off type plants 1999, field plowed.

4. Basin wildrye - November 6, 1997 - planted 8 rows (0.24 acre) - field 8A - planted at rate of about 30 seeds per foot of row. Few seed heads fall 1998, no harvest - excellent stand November 20, 1998. Harvested August 5, 1999, produced 29.0 lb clean seed. Harvested July 25, 2000, produced 5.5 lb of clean seed. Harvested July17, 2001, produced 10.8 lb of clean seed. Harvested July 23, 2002, produces 25.0 lb. clean seed. Harvested July 25, 2003, produced 52.0 lb clean seed. Harvested July 28, 2004, produced 43.0 lb of clean

seed. Harvested August 4 and 5, 2005, produced 37.0 lbs of clean seed. Harvested July 24, 2006, produced 74.0 lb of clean seed. Harvested July 21, 2007, produced 83.0 lbs of clean seed.

5. Alkali sacaton - July 20, 1998 - planted 6 rows (0.18 acre) - field 4 - planted at a rate of about 30 seeds per foot of row - noted seedlings on September 2, 1998 - fair stand November 20, 1998. Harvested September 1, 1999, produced 99 g of clean seed. Harvested two seed crops in 2000 (July 12 and September 11), produced 2.4 lb clean seed. Harvested two seed crops in 2001 (July 18 and September 14) produced 13.0 lb of clean seed. Harvested two seed crops 2002 (July 17 and September 10) produced 6.2 lb clean seed. Harvested only once on August 4, 2003, produced 6.0 lb clean seed. Harvested two seed crops July 16 and September 10, 2004, produced 8.0 lb clean seed. Harvested August 9, 2005, produced 2.0 lb of clean seed. Harvested July 18, 2006, produced 88.0 g of clean seed. Harvested July 13 – 19, 2007, produced 354.0 g of clean seed.

SEED SHIPMENTS
No seed was provided to Dinosaur in 2007.

SUMMARY

1. A cooperative agreement between Dinosaur National Monument and Upper Colorado Environmental Plant Center was initiated in September of 1996 and amended in August of 1997. A new agreement was developed in 2002.

2. The agreement involved the collection, evaluation and increase of five grasses native to Dinosaur National Monument. Only four seed fields are now grown for seed production.

3. Seed fields were planted in November 1997 for four contract species and the final seed field (alkali sacaton) was added in July 1998.

4. The western wheatgrass seed field was plowed in 1999, due to numerous off type plants, which reduced the number of seed fields to four.

5. Two seed fields (Indian ricegrass and alkali sacaton) were interseeded in 1999, to improve stands.

6. A new planting of bluebunch wheatgrass was planted in 2001, and had a good stand in 2002, but was not harvested. The original planting did produce seed in 2002. Both plantings were harvested in 2003, 2004, and 2005. The original eight rows were removed after the 2005 harvest. The planting now has 0.18 ac.

7. No Dinosaur personnel came to the plant center in 2007.

8. Seed crops were harvested from all seed production fields in 2007.

Table 1. A listing of seed from Dinosaur National Monument by species and year of harvest stored at the plant center.

SPECIES	YEAR	BULK	PLS
Alkali Sacaton	1999 harvest	99.00 g	no test
	2000 2-harvests	2.40 lb	0.70 lb
	2001 " "	13.00 lb	1.50 lb
	2002 2-harvests	6.20 lb	4.50 lb
	2003 1-harvest	6.00 lb	2.40 lb
	2004-2 harvests	8.00 lb	2.26 lb
	2005-1 harvest	2.00 lb	0.08 lb
	2006-1 harvest	88.00 g	no test
	2007- 1 harvest	354.00 g	no test
Basin wildrye	1997 (park collected)	10.69 lb	8.60 lb
	1999 harvest	29.00 lb	25.70 lb
	2000 "	5.50 lb	4.00 lb
	2001 "	10.80 lb	7.40 lb
	2002 "	25.00 lb	17.60 lb
	2003 "	52.00 lb	42.60 lb
	2004 "	43.00 lb	31.10 lb
	2005 "	37.00 lb	24.60 lb
	2006 "	74.00 lb	30.30 lb
	2007 "	83.00 lb	no test
Bluebunch wheatgrass	1997 (park collected)	0.46 lb	no test
	1999 harvest lot 1	10.50 lb	8.40 lb
	lot 2	6.00 lb	3.60 lb
	2000 harvest	1.40 lb	0.80 lb
	2001 NO harvest	---	---
	2002 (old planting)	300.00 g	215.00 g
	2003 (both plantings)	32.00 lb	25.90 lb
	2004 (both plantings)	25.50 lb	21.62 lb
	2005 (both plantings)	13.00 lb	9.50 1b
	2006(2-planting only)	10.80 lb	9.10 lb
	2007 (new planting)	18.00 lb	no test
Indian ricegrass	1997 (park collected)	8.00 g	no test
	1999 harvest	1.24 lb	0.80 lb
	2000 "	0.97 lb	0.30 lb
	2001 "	0.97 lb	0.50 lb
	2002 "	3.60 lb	1.15 lb
	2003 "	8.00 lb	3.60 lb
	2004 "	10.00 lb	3.80 lb
	2005 "	12.00 lb	4.80 lb
	2006 "	5.60 lb	3.80 lb
	2007 "	8.00 lb	no test

Project 08S239
Annual Report – December 2007
By: Steve Parr

BRYCE CANYON NATIONAL PARK
COOPERATIVE AGREEMENT

Project 08S239
Annual Report 2007

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC) signed Interagency Agreement 1211-04-004 with Bryce Canyon National Park, USDA Natural Resources Conservation Service, and NPS Denver Service Center in January 2004. The agreement, as amended in April 2007, called for the continued production of slender wheatgrass, *Elymus trachycaulus*, through 2008 and the delivery of 100 containerized shrubs produced under amendment number two.

OBJECTIVE - The intent of the amendments to the agreement is for UCEPC to produce seed and plants of native, indigenous species for revegetation purposes on disturbances within Bryce Canyon National Park through 2008.

ACTIVITIES – In 2007, work continued to produce 100 containerized shrubs for restoration work in Bryce Canyon. Production of black sagebrush, antelope bitterbrush, Parry's rabbitbrush, and yellow rabbitbrush has resulted in over 100 plants on inventory. In addition, more seed was shipped to UCEPC January 14, 2008, as a supplement to present shrub production. As for field production, the 1.2 acres that were planted August 13, 2004, will continue in production through 2008.

PLANT PRODUCTION – Seed of seven species was received by UCEPC for cleaning and propagation as called for in Amendment 2. The table below identifies the amount of seed received and cleaned seed quantities by species, as well as the current live plant production inventory.

Species	**Collected Weight**	**Clean Weight 2007**	**Clean Wt. 2008**	**Plant Production Inventory**
Antelope bitterbrush	34.4 g	19 g		15
Black sagebrush	104.0 g	7 g	17 g	30
Bottlebrush squirreltail			8 g	
Douglas rabbitbrush			13 g	
Gray rabbitbrush			12 g	
Indian ricegrass	169.7 g	54 g		Delivered
Long flowered rabbitbrush	1.1 g	< 1 g		No germination
Needle and thread	576.9 g	238 g		Delivered
Parry's rabbitbrush	4.4 g	< 1 g		40
Three awn			4 g	
Yellow rabbitbrush	0.9 g	< 1 g	11 g	29

The targeted production quantities for the above species were identified by the amendment. In 2006, seed of field produced slender wheatgrass was easily produced for the containerized production target of 3500 plugs. At half the amount of slender wheatgrass, a target of 1750 each of needle and thread and Indian ricegrass were identified for revegetation needs with live plants

for a total of 7000 grass plugs. As suspected, there was considerable dormancy in the Indian ricegrass seed that had been collected by Bryce personnel in 2005. Thirty grams of 54 grams were used in the first germination attempts with less than 1% germination. Our germination trials also included one trial with scarified seed. However, 86 grams of some old Bryce Indian ricegrass seed was on inventory at UCEPC from an agreement in 1990. This seed was used in an attempt to produce the 1750 targeted Indian ricegrass plugs. While the total Indian ricegrass number delivered was nearly 500 plants short of the target amount, slender wheatgrass and needle and thread were delivered in quantities exceeding the target amounts by nearly 1000 and 400 live plants respectively. In all, 950 plants above target were delivered to Bryce Canyon for revegetation work. For production of the 100 targeted shrubs, approximately 40 black sage, 40 antelope bitterbrush, and 20 rabbitbrush plants were identified for large container production. Shrub production by species is being altered because of germination success of the cleaned species. Germination efforts have been conducted on each of the collected species.

Live Plant Production		
Species	**Target Quantities**	**Delivered Quantities**
Indian ricegrass	1750	1255
Needle and thread	1750	2158
Slender wheatgrass	3500	4520
Totals	**7000**	**7933**

SEED PRODUCTION -The following quantities of seed have been produced for Bryce Canyon:

Species	**Scientific Name**	**Seed Production**		**Fiscal Year**
Nodding brome	*Bromus anomalus*	185 lb	49 PLS	1999
		34 lb	9 PLS	2000
		Field plowed		2001
		2.4 lb	1 PLS	2002
		50 lb	33 PLS	2003
		138 lb	83 PLS	2004
		Field plowed		2005
Slender wheatgrass	*Elymus trachycaulus*	30.5 lb	28 PLS	1999
		103 lb	78 PLS	2000
		246 lb	211 PLS	2001
		149 lb	120 PLS	2002
		240 lb	213 PLS	2003
		398 lb	232 PLS	2004
		189 lb	117 PLS	2005
		267 lb	230 PLS	2006
		499 lb	369 PLS	2007

Total Seed Inventory

8 bulk pounds of slender wheatgrass 2004 seed lot

9 bulk pounds of slender wheatgrass	2005 seed lot
267 bulk pounds of slender wheatgrass	2006 seed lot
499 bulk pounds of slender wheatgrass	2007 seed lot

Total seed inventory is a little more than 700 PLS pounds, with 2008 production to add to inventory.

DISCUSSION – A third amendment between UCEPC and Bryce Canyon will direct activities for field production of slender wheatgrass through 2008 and containerized production of a minimum of 100 shrub species for park uses. The containerized shrubs will be delivered to the park when requested in 2008.

Project 08S240
Annual Report 2007
By: Steve Parr

GRAND TETON NATIONAL PARK
COOPERATIVE AGREEMENT

INTRODUCTION - This report covers the activities related to the cooperative agreement between Upper Colorado Environmental Plant Center (UCEPC) and Grand Teton National Park. The fully executed agreement, Interagency Agreement 1211-07-002, was formally signed in April of 2007. The agreement calls for the production of a single species, slender wheatgrass, for 2007 and 2008.

ACTIVITIES - A new one-acre field was planted on August 23, 2005. This field produced 617 clean pounds of seed in 2007. The cleaned seed appears to be of good quality and had a reasonably good bushel weight of 21 pounds, one pound more than UCEPC's released slender wheatgrass, 'San Luis' with 98 percent purity and 75 percent germination for a total of 457 pls pounds. We conducted a germination test in our greenhouse to compare results with Colorado State Seed Laboratory, and had an average germination of 73%.

Two seed shipments were made to Grand Teton National Park this fall. A shipment on September 28, 2007, included grass seed of five species that was produced under a previous agreement and one shipment on October 24 of a single species, bluebunch wheatgrass, for park uses.

Project Number COPMC-S-0307CR
Annual Report 2007
By: Manuel Rosales

GREAT SAND DUNES NATIONAL PARK AND PRESERVE COOPERATIVE AGREEMENT

INTRODUCTION - This report covers the activities of the Upper Colorado Environmental Plant Center (UCEPC) for 2007, as they relate to Interagency Project Number IA1211-03-001 for the production of seed materials for Great Sand Dunes National Park and Preserve. This agreement was signed into effect in February of 2003, and called for the production of two materials (blue grama and Indian ricegrass) through 2005 for revegetation uses within the park. In addition, an amendment to the above interagency agreement was signed in 2004. The amendment stipulated that UCEPC would establish two-tenths of an acre seed increase of ring muhly. In 2006, a second amendment was added to the agreement. The second amendment provided for an extension of the agreement through 2008 and reimbursement to UCEPC for cost incurred in FY06, while a third amendment was added to cover production and reimbursement for 2007.

ACTIVITIES (2005-2007) – The re-plantings of blue grama and ring muhly done in 2005 germinated well and were progressing very well during the growing season of 2005, however, during the winter of 2005-2006, ring muhly and blue grama suffered severe winter damage by frost heaving to the point that we thought we had lost them. Most plants were uplifted from the ground. However, despite their bad appearance, both plantings survived and produced some seed (see Results). In addition, six more rows of blue grama were replanted on August 2, 2006.

The 0.5 acre field of Indian ricegrass had done so well in 2006 that it was harvested twice and is progressing well, to the point that this year it was again harvested twice.

On July 12, 2006, Fred Bunch, Phyllis Bovin, Ola Bovin, Jessica Hendrix, and Russ Hass were at the UCEPC to visit the production fields for the Great Sand Dunes National Park and Preserve. Park personnel were pleased with the productions fields.

On November 16, 2006, a mixture of 18.1 pounds of pure live seed of Indian ricegrass (all the seed harvested in 2006) and 10.9 pounds of pure live seed of ‘San Luis’ slender wheatgrass were delivered to the park to re-vegetate a four acre field. In addition, 25 straw bales of ‘San Luis’ slender wheatgrass were delivered, along with the seed for use in the revegetation project

RESULTS –
2006-Growing Season: Despite the damage incurred during the winter, we were able to harvest and clean 20 pounds of blue grama, 14 grams of ring muhly and 31 pounds of Indian ricegrass for the 2006 growing season.

Seed from Indian ricegrass and blue grama collected at the park and sent for cleaning at UCEPC during 2006, resulted in 4.2 pounds of clean seed for Indian ricegrass and **no seed** for blue grama (seed heads were empty or had immature seed).

2007-Growing season: On August 21, about 500 plugs of blue grama were hand-transplanted to fill gaps in the original field. In addition, on September 4, five rows of blue grama were inter-seeded to fill the gaps in the north side of field. Thrips (insects) were found on some of the blue grama seed and will be monitored closely during the growing season of 2008 since they can reduce the amount of seed produced. The following table presents production by species for 2007.

Species	Scientific name	Establishment Acres	Harvest Date	Clean weight
Blue grama	*Bouteloua gracilis*	1.0	10/9	17 lb
Indian ricegrass	*Achnatherum hymenoides*	0.5	7/5	38 lb
Ring muhly	*Muhlenbergia torreyi*	0.2	10/10	0.8 lb

Seed from Indian rice grass and blue grama collected at the park and cleaned at UCEPC during 2007, resulted in 3.5 pounds of clean seed for Indian ricegrass and 27 grams for blue grama.

Project COPMC-S-0308-CR
Annual Report - December 2007
By: Steve Parr

ROCKY MOUNTAIN NATIONAL PARK
COOPERATIVE AGREEMENT

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC), Rocky Mountain National Park (ROMO), and the USDA Natural Resources Conservation Service (NRCS), signed a cooperative plant materials agreement (IA Project No. 1211-03003) in June 2003. In September 2006, the agreement was amended to continue production of the same plant materials through 2008. This agreement, as amended, involves seed production of four forbs and four grass species for revegetation of the Bear Lake Road Project. The Bear Lake Road Project involves widening Bear Lake Road by two feet for ten miles, adding pullouts and retaining walls, widening switchbacks, and expanding some of the parking lots. This will amount to 20 acres of disturbance with an elevation change of 1500 feet. The first of two phases was completed in December 2005. Seed production of the same species has been identified for use in the second phase with the potential addition of more species in 2008.

A separate agreement was signed in August 2007 to increase seed for the Colorado River Power Line project. Seed increase products have not all been determined at this time, but there is a production target of 210 pounds of seed.

Bear Lake Road Project

Common Name	Scientific Name	Symbol	Accession
Grasses			
Blue grama	*Bouteloua gracilis*	BOGR	9070991
Junegrass	*Koeleria macrantha*	KOCR	9070962
Mountain muhly	*Muhlenbergia montana*	MOMU	9070957
Needle and thread	*Stipa comata*	STCO	9070977
Forbs/Legumes			
Fringed sage	*Artemisia frigida*	ARFR	9070993
Hairy goldenaster	*Heterotheca villosa*	HEVI	9070992
Purple locoweed	*Oxytropis lambertii*	OXLA	9070989
Spreading goldenbanner	*Thermopsis divericarpa*	THDI	9070990

ACTIVITIES - This year, each of the eight materials was harvested for use in the revegetation of the Bear Lake Road Project. Three forbs, hairy goldenaster, purple locoweed, and goldenbanner all produced good quantities of seed and accounted for 28 pounds of the 30.4 pounds of seed produced. A fourth forb, fringed sage, produced a small quantity of seed. On September 12, 2.4 clean pounds were hand harvested. There were three nights of freezing temperatures recorded in late May. We believe this affected seed formation and set as the plants were just blooming at the time. The four grasses produced a little over 35 clean pounds of seed, with blue grama producing the most at 13 pounds this year. Ten pounds of seed were harvested from needle-and-thread, five pounds of prairie Junegrass and seven pounds of mountain muhly. Purple locoweed continues to be a good producing species. This year, UCEPC harvested 10 clean pounds of seed from the 0.5 acre field. Also productive in volume in 2007 was hairy goldenaster with a little over 11 clean pounds harvested.

On June 26, 2007, Russ Haas, Lonnie Pilkington, Pat Davey, and Steve Parr met at Rocky Mountain National Park and reviewed the Colorado River Power Line Revegetation Project and located plant populations of identified species for targeted seed collection and increase. After a

field session, a review of identified and unidentified species that looked to have merit for seed increase was conducted, and estimates of seed collection efforts and size of production fields were discussed. The revegetation needs were identified for both the Colorado River Power Line Project as well as the future revegetation needs of the Bear Lake Road Project.

No seed was shipped to the park this year.

Production Fields and Goaled Production Quantities
The following table includes actual seeded(s) or transplanted(t) plot size at UCEPC with germplasm received from Rocky Mountain National Park.

Common Name	Scientific Name	Goaled PLS Amt	Proposed Acres	Planted Acres
Grasses				
Blue grama	*Bouteloua gracilis*	12.6	1.0	1.2 (t)
Junegrass	*Koeleria macrantha*	4.5	0.2	0.20 (t)
Mountain muhly	*Muhlenbergia montana*	6.2	0.5	0.5 (s) (t)
Needle and thread	*Hesperostipa comata*	12.9	0.5	0.5 (t)
Forbs/Legumes				
Fringed sage	*Artemisia frigida*	1.7	0.02	0.02(t)
Hairy goldenaster	*Heterotheca villosa*	11.4	1.0-1.5	0.8 (s) (t)
Purple locoweed	*Oxytropis lambertii*	5.9	1.0*	0.5 (s) (t)
Spreading goldenbanner	*Thermopsis divericarpa*	86.5	2.0	2.0 (s)
	Total:	**141.7 lb**	**6.22***	**5.72**

*Purple locoweed was to have been planted in a spaced planting occupying 1 acre. UCEPC, with agreement and assistance from Russ Haas, planted 0.5 acre in solid rows instead. This accounts for the difference in Proposed Acres and Planted Acres.

A second agreement, the Colorado River Power Line Project, was also initiated this year. A total of seven materials were cleaned for this project plus two more for the Bear Lake Road Project. The cleaned seed quantities are listed below.

Antennaria	23 g	Bear Lake Road
Blue wildrye	227 g	
Bottlebrush	493 g	Bear Lake Road
Buckwheat	317 g	
Nodding brome	11.4 lb	
Potentilla	637 g	
Red fescue	20 lb	
Stipa	345 g	

At this time, it has not yet been determined what materials and what size of production fields will be established for this project. Blue wildrye and nodding brome will be utilized, but field sizes will be somewhat dependent on PLS seed quantities.

RESULTS – Seed harvest was conducted for eight Rocky Mountain National Park materials in 2006. Seed production was better than expected for blue grama and mountain muhly, but less than expected for needle and thread and prairie Junegrass. Forb harvests were about as good as might be expected with the exception of a lack of harvestable goldenbanner seed.

SPECIES	DATE	QTY	PROCESS	
Blue grama				
Field Establishment:	August 27, 2003	Approx. 15,000 transplants	Transplanter	1.2 acres
	June 9, 2004	Approx. 4000 transplants	Hand transplant	Interplanted
	August 1, 2005	5500	Hand transplant	Interplanted
Harvest:	October 7, 2004	7 lb bulk	Hand harvest	
	September 2, 2005	10.4 lb bulk	Large combine	
	Aug. 8 and 17, 2006	28.5 lb bulk	Hege and by hand	
	August 29, 2007	13 lb.	Flail-Vac	
Shipments:	October 5, 2005	2549 g and 10.4 lb		
	September 15, 2006	28.5 lb		
Fringed sage				
Field Establishment:	September 4, 2003	600 transplants	Transplanter	0.02 acres
Harvest:	September 10, 2004	3.5 lb bulk	Hand harvest	
	October 18, 2005	1.8 lb bulk	Hege combine	
	September 18, 2006	7.6 lb	Hege combine	
	September 12, 2007	2.4 lb	Hand harvest	
Shipment	October 5, 2005	3.5 lb bulk		
Goldenaster				
Field Establishment:	May 29, 2003	203 PLS g	Planet Junior	0.8 acres
	August 5, 2005	2000 transplants	Hand transplant	Interplanted
Harvest:	September 1, 2005	20.5 lb bulk	Hege combine	
	August 7, 2006	60.6 lb	Hege combine	
	August 8, 2007	11 lb	Flail Vac	
Shipments	October 5, 2005	20.5 lb bulk		
	September 15, 2006	60.6 lb bulk		
Goldenbanner				
Field Establishment:	May 28, 2003	11.7 lb planted	Planet Junior	2.0 acres
Harvest:	July 7, 2004	2.5 lb bulk	Hand harvest	
	July 18-19, 2005	21 lb bulk	Hege and hand	
	July 13, 2006	142 grams bulk	Hand	
	July 12, 2007	7 lb	Combine	
Shipments	October 5, 2005	23.4 lb bulk		
	September 15, 2006	142 grams		

SPECIES	DATE	QTY	PROCESS	
Mountain muhly				
Field Establishment:	May 28, 2003	59 PLS g	Planet Junior	0.5 acres
	August 3, 2005	2500 transplants	Hand transplant	Interplanted
Harvest:	October 21, 2004	29 g	Hand harvest	
	October 17, 2005	443 g	Hand harvest	
	September 19, 2006	20.5 lb	Hege combine	
	September 13, 2007	13 lb	Swather	
Shipment	October 5, 2005	70 g		
Needle and thread				
Field Establishment:	September 4, 2003	600 transplants	Transplanter	0.07 acres*
	September 14, 2004	4000 transplants	Transplanter	0.20 acres
	June 30, 2005	5500 transplants	Transplanter	0.30 acres
Harvest:	June 30, 2005	14 g	Hand harvest	
	June 22, 2006	2.1 lb		
	June 27, 2007	10 lb	Flail Vac	
Shipments	October 5, 2005	1,080 g		
	September 15, 2006	2.1 lb		
Prairie Junegrass				
Field Establishment:	May 29, 2003	28 g	Planet Junior	0.2 acres*
	September 15, 2004	4000 transplants	Transplanter	0.2 acres
Harvest:	July 12, 2006	3.5 lb	Hege combine	
	July 12, 2007	5 lb	Swather	
Shipment	September 15, 2006	3.5 lb		
Purple locoweed				
Field Establishment:	May 28, 2003	203 g	Planet Junior	0.5 acres
	May 2004	100 g	Hoe	Interplanted
	September 15, 2005	45 transplants	Hand transplant	Interplanted
Harvest:	July 14, 2005	5.8 lb bulk	Hege combine	
	July 6, 2006	15 lb bulk	Hege combine	
	July 18, 2007	10 lb	Hand clipped	
Shipments	October 5, 2005	290 g and 5.8 lb		
	September 15, 2006	15 lb		

The table above provides a complete recap of the activities conducted by UCEPC as outlined in the cooperative agreement. Six of the eight contract materials have taken two or more years to establish. Three materials took three years of supplemental planting while three other products

took two years of plug transplanting to establish fully productive fields. In fact, in 2005, over 15,000 transplants were produced and interplanted into five different production fields to increase production for 2006 and beyond. In 2007, approximately 2000 transplants of blue grama and 1000 plugs of mountain muhly were added to the fields for stand improvement.

CONCLUSION – This year signifies the second year of the two year amended agreement. A draft agreement to extend the production of the established materials and to add seed increase fields of rose pussytoes and bottlebrush squirreltail is underway. No formal agreement has been signed at this time. Because the established eight ROMO crops are producing seed, they will likely remain in production unless there is more hard freezing during bloom of the goldenbanner. This species was identified as the most important product for Bear Lake Road revegetation. However, hard freezes in late May at the peak of flowering have occurred the last two years. Goldenbanner produced much less than is expected from a field this size, but the plants in the field look fine with reasonable vigor, height, and color that indicates something else is a major factor limiting seed production.

This year, a cooperative effort with Colorado State University Extension entomologist Bob Hammon was conducted to locate some alkali bees near the goldenbanner field to insure the presence of suitable pollinators. Over 10,000 bees were transported from Grand Junction to Meeker in bee boards and those placed in a constructed plywood box for protection. Unfortunately, the freezes disrupted the enhanced pollination efforts since the blossoms fell off shortly after the freezing temperatures. Analysis of bee survival has not been conducted to determine if bees will be placed at UCEPC in 2008.

If funding for the project continues or an additional amendment is made to extend the agreement, seed field establishment will be conducted in 2008 for rose pussytoes and bottlebrush squirreltail.

UPPER COLORADO ENVIRONMENTAL PLANT CENTER
WEATHER SUMMARY FOR 2007

Prepared by Dr. Gary L. Noller

PRECIPITATION

In general, 2007 was quite similar to 2006. In 2007, 17.41 inches of precipitation was measured at the plant center (Table 1). That exceeds the longtime average of 16.19 inches by 7.5 percent. 2007 was the third consecutive year that the longtime average was exceeded (Table 1). The total precipitation for 2007 was nearly the same as received in 2006 (17.36, Table 1). There were four months (August – 2.35 inches, September – 3.49, October – 2.58, and December – 2.52) with substantially above average precipitation. During these four months, 62.8 percent of the precipitation for the year was recorded. In addition, five months (March – 0.69, April – 0.59, June - 0.20, July - 0.93, and November – 0.43) were dry. In this five month period, only 16.3 percent of the precipitation for the year was received.

SNOW

Snowfall in 2007 measured 78.0 inches (Table 2) and was close to the amount received in 2006 (80.0 inches). However, snow represented only 28.9 percent of the total precipitation for the year, when considering the times, only snow was recorded and not when snow and rain occurred together in the same event.

GROWING SEASON

In 2007, the frost-free growing season measured 107 days. This represents the period from June 9 to September 25. Again, this was very close to the 106 day growing season in 2006. Precipitation during this important period measured 5.55 inches and represents only 31.9 percent of the total for the year.

TEMPERATURES

Temperatures in 2007 were in general mild without extremes of heat or cold. Lows below 0°F were recorded on 21 recording dates and a high failed to reach 32°F or above on 18 recording dates (Table 2). A maximum temperature of 85°F, or above, was recorded on 49 recording dates. The highest average monthly maximum temperature (90.3°F) was recorded in July and the lowest average monthly minimum (-1.6°F) was recorded in January.

Table 1. Monthly and Total Yearly Precipitation in Inches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Longtime Avg. Over 50 Yrs.	**1.15**	**1.00**	**1.50**	**1.56**	**1.45**	**1.06**	**1.51**	**1.82**	**1.43**	**1.49**	**1.10**	**1.12**	**16.19**
1976 *	0.47	0.74	1.37	1.25	1.44	1.43	2.03	1.18	1.14	0.37	0.11	0.17	**11.70**
1977 *	0.37	0.49	0.74	0.70	1.11	0.25	1.76	3.04	0.66	0.82	0.74	0.63	**11.31**
1978 +	1.58	0.82	1.69	1.77	1.32	0.30	0.44	0.72	1.25	0.14	1.31	1.47	**12.81**
1979 +	0.82	0.89	0.97	1.19	3.25	0.49	0.54	1.05	0.34	1.20	1.15	0.24	**12.13**
1980 +	1.63	1.75	1.74	0.67	2.36	0.01	2.22	1.53	0.38	1.58	0.63	0.13	**14.63**
1981 +	0.24	0.46	1.56	0.27	3.15	1.58	3.50	0.99	0.61	4.47	0.79	1.40	**19.02**
1982 +	0.78	0.32	0.56	0.59	1.79	0.04	1.64	2.81	2.91	1.81	0.97	0.62	**14.84**
1983 +	0.50	1.32	0.84	0.98	2.29	2.52	1.83	1.05	0.75	1.83	1.90	3.00	**18.81**
1984 +	0.70	0.24	1.62	2.00	0.93	4.22	2.20	3.24	1.65	2.78	0.34	0.71	**20.63**
1985 +	1.13	0.45	1.49	2.80	1.70	1.65	1.77	0.48	1.39	3.10	2.27	0.83	**19.06**
1986 +	0.65	1.76	1.48	1.44	0.73	1.16	3.45	1.99	2.36	1.70	1.65	0.57	**18.94**
1987 +	0.67	1.10	1.51	0.76	2.63	0.90	1.72	3.22	0.50	1.15	1.31	1.20	**16.67**
1988 +	1.31	0.82	1.26	1.23	1.45	0.50	0.79	3.39	2.52	0.17	1.69	0.99	**16.12**
1989 +	1.24	1.75	0.96	1.10	0.54	0.91	1.16	1.49	1.50	0.66	0.62	0.39	**12.32**
1990 +	0.28	1.27	0.46	1.28	1.29	0.93	1.29	0.41	2.18	2.12	0.82	0.55	**12.88**
1991 +	1.28	0.35	1.98	1.48	0.75	1.16	3.54	2.13	1.30	2.25	1.65	0.70	**18.57**
1992 +	0.52	1.09	1.45	1.37	3.03	1.10	3.28	1.21	1.20	0.57	2.85	0.73	**18.40**
1993 +	1.27	1.07	1.91	2.32	2.11	1.08	0.31	1.14	0.52	1.63	1.31	0.50	**15.17**
1994 +	0.32	0.62	0.66	1.50	0.82	0.89	0.41	1.08	1.64	1.65	1.55	0.75	**11.89**
1995 +	0.83	0.84	0.99	2.87	5.72	2.40	1.68	1.29	2.11	2.17	0.95	0.94	**22.79**
1996 +	1.98	2.01	0.57	1.36	1.46	1.12	0.86	0.86	2.13	2.21	2.34	1.38	**18.28**
1997 +	2.04	0.72	0.34	3.04	1.82	1.05	1.02	2.93	5.42	2.37	0.76	0.61	**22.12**
1998 +	0.79	1.20	1.87	1.65	0.45	3.58	1.79	0.64	0.87	1.63	1.03	0.92	**16.42**
1999 +	0.99	0.73	0.59	3.57	2.24	1.09	2.60	1.49	0.89	0.70	0.50	1.08	**16.47**

* From the National Oceanic and Atmospheric Administrations Climatic Summary of the United States.

\+ From the weather instruments located at the UCEPC.

Note: Some precipitation was not recorded in Oct. 2003.

Table 1. Monthly and Total Yearly Precipitation in Inches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Longtime Avg. Over 50 Yrs.	**1.15**	**1.00**	**1.50**	**1.56**	**1.45**	**1.06**	**1.51**	**1.82**	**1.43**	**1.49**	**1.10**	**1.12**	**16.19**
2000 +	0.84	0.99	1.98	0.69	1.32	0.78	0.54	2.98	2.38	0.90	1.30	0.74	**15.44**
2001 +	0.49	1.03	0.45	0.53	1.53	0.79	0.78	1.56	0.92	1.57	0.91	0.70	**11.26**
2002 +	0.92	0.18	0.96	0.41	0.09	0.81	1.31	1.19	1.93	1.77	0.81	0.63	**11.01**
2003 +	0.72	1.41	0.98	1.30	1.71	1.77	0.52	0.65	1.31	0.04	0.77	1.37	**12.55**
2004 +	0.21	0.50	0.53	2.23	0.97	1.05	1.29	1.17	1.99	1.09	1.58	0.62	**13.23**
2005 +	1.61	0.97	1.26	1.76	1.51	3.55	0.58	1.83	1.74	2.56	1.60	0.93	**19.90**
2006 +	0.87	1.05	1.70	0.76	0.49	0.03	1.63	3.00	2.86	3.49	0.79	0.69	**17.36**
2007	1.08	1.16	0.69	0.59	1.39	0.20	0.93	2.35	3.49	2.58	0.43	2.52	**17.41**

* From the National Oceanic and Atmospheric Administrations Climatic Summary of the United States.

\+ From the weather instruments located at the UCEPC.

Note: Some precipitation was not recorded in Oct. 2003.

Table 2. Weather Data

2007	Precip.	% of Total	Snow Inches	Recording Dates * With Precip.	Below 0ºF	High Less Than 32ºF	High 85ºF or Above	Avg. Min. Temp. Fah.	Avg. Max. Temp. Fah.
Jan	1.08	6.2	19.5	5	9	7	0	-1.6	34.6
Feb	1.16	6.7	12.0	11	3	2	0	11.6	43.6
Mar	0.69	4.0	2.5	10	2	2	0	22.6	55.0
Apr	0.59	3.4	2.5	9	0	0	0	24.1	60.4
May	1.39	8.0	0.0	9	0	0	0	33.5	69.8
Jun	0.20	1.1	0.0	4	0	0	10	42.7	82.4
Jul	0.93	5.3	0.0	9	0	0	20	52.6	90.3
Aug	2.35	13.5	0.0	9	0	0	17	51.2	86.3
Sep	3.49	20.0	0.0	8	0	0	2	39.8	75.6
Oct	2.58	14.8	8.0	9	0	0	0	28.1	65.2
Nov	0.43	2.5	6.0	2	1	0	0	18.1	56.4
Dec	2.52	14.5	27.5	13	6	7	0	6.8	35.6
Total	17.41	-	78.0	98	21	18	49	-	-

* Weather instruments are not read on weekends.

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