2005 Annual Technical Report

Upper Colorado Environmental Plant Center

Contents
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Fiscal Year 2005

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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 08A207
Project Report-2005
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 4,000 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 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.

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.

RESULTS

The following results are summarized by year:

During 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 10. 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.

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.

Project 08A207
Project Report-2005
By: Steve Parr and Manuel Rosales

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 fallowing table:

Entry No.	Accession No.	No. Plants per Accession	Total bulk 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

CONCLUSION

Manipulation of the breeding block will continue in order to assemble various combinations of breeding materials. A blended composite of the three accessions will be used for a plant materials release in the near future.

Project 08A209
Project Report-2005
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, six miles southeast of Meeker, Colorado. Environmental factors at test site are: 16.19″ of annual precipitation, 6,500 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

Results are listed in Table 1 for relative leaf production by plot and product and are displayed graphically in Figure 1.

Evaluation of
Three Smooth Bromes

Plot #	Relative Production	Vegetative Characteristics of Leaves	Product
1	3	Mixed	'Manchar'
2	2	Curly	'Liso'
3	1	No data	'Lincoln'
4	2	Mixed	'Manchar'
5	2	No data	'Lincoln'
6	1	Curly	'Liso'
7	2	Straight	'Lincoln'
8	2	Curly	'Liso'
9	2	Slightly curled	'Manchar'
10	2	Slightly curled	'Manchar'
11	3	Curly	'Liso'
12	1	Straight	'Lincoln'
13	3	Curly	'Liso'
14	1	Slightly curled	'Manchar'
15	2	Straight	'Lincoln'
16	3	Curly	'Liso'
17	2	Straight	'Lincoln'
18	2	Slightly curled	'Manchar'

1 – Very productive
2 – Productive
3 – Average productivity

CONCLUSIONS

'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'.

'Lincoln' continues to be the most productive smooth brome while 'Liso', since 2003, has become the least productive. 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.

The idea 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 eight years of data, '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 this year so that further studies can be conducted.

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
Maybell Bitterbrush
December – 2005
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 November 2, 2005, 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 2005. Drilled rows (COPMC-T-9801) were **not examined** in 2005, since live plants have not been found. Additional information on methods of planting can be found in progress reports for 1998 and 1999.

Conditions at the site in general appeared to have been good and plants had good growth. Plots at the time of the evaluation were difficult to find due to the abundant plant growth. Needle-and-thread grass *Stipa comata* had good growth and produced abundant seed. The exclosure fence is still in need of repair and does not prevent animals from entering the exclosure. Some soil disturbance from rodent activity was noted.

RESULTS

Tubling plants in rows and plots were examined on November 2, 2005. In addition, the one cache (Replication 1, plot 7) that was found each year from 1999 to 2005 was also evaluated. Soil inside the exclosure was moist to a depth of 20 inches, and was not examined to a greater depth. The average height for plants in **rows** was determined by measuring all plants in the first four rows. The average height for plants in **plots** was determined by measuring all plants where herbicide or no herbicide was used. Many bitterbrush plants inside the exclosure had light browse.

COPMC-T-9801-WL

Drilled plots – (4.5 and 9.0 ft. row spacing)**:**
This study was **not evaluated** in 2005.

COPMC-T-9802-WL

Caching:
Plots for caching and tubling (plug) plants had 36 planting sites per plot. Only one site (Replication 1, plot 7) had plants on November 2, 2005. 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. This cache had plants 20.0 cm tall. At the present time, caching has **not** been

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
Maybell Bitterbrush
December – 2005
By: Dr. Gary L. Noller

successful at this site for re-establishing antelope bitterbrush. Caching plots where plants had not been found were not examined.

Project 08A210 (COPMC-T-9801-WL, COPMC-T-9802-WL, COPMC-T-9803-WL)
Maybell Bitterbrush
December – 2005
By: Dr. Gary L. Noller

Tubling plants in plots:
Height measurements from all plots where **herbicide** was used averaged 37.7 cm, while plots where **no herbicide** was used (only one plant), measured 33.0 cm. 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 (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, and 2005. Planting tubling bitterbrush plants in plots when **herbicide** was used **was** a **successful** method of re-establishing antelope bitterbrush. In 2005, 50.0% 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 (34 of 50 plants, 68.0% were still alive in 2005 when herbicide was used vs: only 1 of the 20 plants, 5.0% was still alive in 2005 when no herbicide was applied).

COPMC-T-9803-WL
Tubling plants in rows:
Eighteen rows of tubling antelope bitterbrush plants (716 planting sites) were examined for survival on November 2, 2005. Plants in rows averaged a height of 35.4 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 (Table 2). In 2005, 75.5% of the plants were found, that were present in 1999. This was a **successful** method of re-establishing antelope bitterbrush on this site.

OBSERVATIONS AND CONCLUSIONS

1. The project was evaluated on November 2, 2005, 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 2005.

5. Survival of antelope bitterbrush tublings on November 2, 2005, in **plots** averaged 12.2% on this site. (23.6% 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**, 50.0% of the plants that were observed in 1999 were found again in 2005.

7. Planting antelope bitterbrush tublings in **rows** was a **successful** method of re-establishing bitterbrush and resulted in a 15.9% survival recorded on November 2, 2005.

8. In **rows**, 75.4% of the plants that were observed in 1999 were found again in 2005.

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 2005).

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 2005. 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

Table 2. A listing of the number of plants found in rows from 1999 to 2005. 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

PROJECT 08I020J
Progress Report - 2005
By: Dr. Gary L. Noller

Irrigated Orchard Transplanted

Woody Species

INTRODUCTION

The project contains 179 accessions of woody tubling plant materials that were planted in fields 14 and 15 at Upper Colorado Environmental Plant Center. The Plant Center is characterized by a growing season of approximately 90 days, an elevation of about 6,500 feet and average annual precipitation of slightly more than 16 inches. The original planting was completed on August 8, 1977. An additional planting of some woody species was done in 1981, and is noted in Appendix II.

This report updates the project through 2005.

OBJECTIVES

To evaluate survival and performance of the plant materials at the Plant Center in Meeker, Colorado.

SPECIES AND ACCESSIONS

Appendix I, table 1 is a listing of species by scientific name, common name, accession number, number planted, and origin. Appendix II is a similar listing of materials planted August 4 – 14, 1981. In 2005, the orchard was examined and accessions were marked that have the potential for retaining. Other accessions could be removed to aid in weed control. The accessions that were marked are noted in Appendices I and II.

PROJECT 08I020J
Progress Report - 2005
By: Dr. Gary L. Noller

APPENDIX I

An alphabetical historic listing (by scientific name) of plants included in the project. Also included are common names, accession numbers, the number of plants planted, the spacing between plants, and the place of orgin. Noted to the left: Accessions on the Plant Center release list, superior performers as of 1988, and accessions identified to potentially retain.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
		√	Acer glabrum	Rocky Mountain Maple	EPC-698 9021435	6	8	CO La Plata Co.
√	√	√	Amelanchier alnifolia	Serviceberry	EPC-154 9021438	22	7	CO Garfield Co.
			A. alnifolia	Serviceberry	EPC-219 9021439	12	7	CO Rio Blanco Co.
			A. alnifolia	Serviceberry	EPC-220 9021440	22	7	CO Rio Blanco Co.
			A. alnifolia	Serviceberry	EPC-223 9021441	6	7	CO Moffat Co.
√		√	A. alnifolia	Serviceberry	EPC-224 9021442	22	7	CO Routt Co.
			A. alnifolia	Serviceberry	EPC-266 9021443	22	7	CO Moffat Co.
			A. alnifolia	Serviceberry	EPC-393 9015830	18	7	CO Rio Blanco Co.
			A. alnifolia	Serviceberry	EPC-470 9021445	23	7	CO La Plata Co.
			A. alnifolia	Serviceberry	EPC-511 9021446	22	7	UT Rich Co.
			A. alnifolia	Serviceberry	EPC-540 9021454	10	7	UT Uintah Co.
			A. alnifolia	Serviceberry	EPC-621 9021447	4	7	CO La Plata Co.
			A. alnifolia	Serviceberry	EPC-623 9021448	2	7	CO La Plata Co.
			A. alnifolia	Serviceberry	EPC-626 9021449	22	7	CO La Plata Co.
			A. alnifolia	Serviceberry	EPC-648 9021450	24	7	CO Moffat Co.
			Artemisia dracunculoides	Green sage	EPC-885 9030887	23	2	CO Rio Blanco Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
			Artemisia frigida	Fringed sagebrush	EPC-432 9006279	20	2	CO Park Co.
			Artemisia frigida	Fringed sagebrush	EPC-589 9006280	20	2	CO Huerfano Co.
			A. frigida	Fringed sagebrush	EPC-619 9024281	23	2	CO Rio Blanco Co.
√	√		A. frigida	Fringed sagebrush	EPC-883 9021471	20	2	CO Rio Blanco Co.
			A. frigida	Fringed sagebrush	EPC-886 9021472	15	2	CO Rio Blanco Co.
			A. frigida	Fringed sagebrush	EPC-900 9021473	21	2	CO Rio Blanco Co.
			Artemisia ludoviciana	Louisiana sagebrush ('Summit')	EPC-328 9021474	19	2	ID Georgetown
			A. ludoviciana	Louisiana sagebrush	EPC-451 9021475	23	2	CO Douglas Co.
			Artemisia nova	Black sagebrush	EPC-296 9024280	20	2	CO Gunnison Co.
			A. nova	Black sagebrush	EPC-332 9021468	20	2	UT Box Elder Co.
			A. nova	Black sagebrush	EPC-896A	20	5	UT Uintah Co.
			Artemisia tridentata	Big sagebrush	EPC-478 9021477	21	5	CO Gunnison Co.
			A. tridentata	Big sagebrush	EPC-896 9021478	20	5	UT Uintah Co.
			Artemisia tripartita	Threetip sagebrush	EPC-439 9021483	20	3	CO Chaffee Co.
			Artemisia spp.	sagebrush	EPC-571 9021469	20	2	UT Uintah Co.
			Artemisia spp.	sagebrush	EPC-603 9024120	20	2	CO Moffat Co.
			Atriplex canescens	Fourwing saltbush	EPC-210 9014673	21	4	CO Rio Blanco Co.
			A. canescens	Fourwing saltbush	EPC-317 9013714	20	4	CO Garfield Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
			A. canescens	Fourwing saltbush	EPC-318 9013715	20	4	CO Rio Blanco Co.
			Atriplex canescens	Fourwing saltbush	EPC-334 9014674	9	4	CO Delta Co.
			A. canescens	Fourwing saltbush	EPC-347 9014675	7	4	CO Rio Blanco Co.
			A. canescens	Fourwing saltbush	EPC-401 9014676	6	4	CO Grand Co.
			A. canescens	Fourwing saltbush	EPC-429 9013716	20	4	CO Garfield Co.
			A. canescens	Fourwing saltbush	EPC-440 9021488	13	4	CO Chaffee Co.
			A. canescens	Fourwing saltbush	EPC-446 9013717	20	4	CO Huerfana Co.
			A. canescens	Fourwing saltbush	EPC-455 9013718	20	4	CO Pueblo Co.
			A. canescens	Fourwing saltbush	EPC-509 9014677	8	4	UT Box Elder Co.
			A. canescens	Fourwing saltbush	EPC-512 9014678	20	4	CO Rio Blanco Co.
			A. canescens	Fourwing saltbush	EPC-517 9013719	3	4	CO Weld Co.
			A. canescens	Fourwing saltbush	EPC-570 9014679	20	4	UT Uintah Co.
			A. canescens	Fourwing saltbush	EPC-598 9014680	16	4	CO Costilla Co.
			A. canescens	Fourwing saltbush	EPC-599 9014681	7	4	CO San Luis Valley
			A. canescens	Fourwing saltbush	EPC-641 9021489	10	4	CO Eagle Co.
			A. canescens	Fourwing saltbush	EPC-666 9013720	20	4	UT Uintah Co.
			A. canescens	Fourwing saltbush	EPC-799 9014682	1	4	CO Moffat Co.
			A. canescens	Fourwing saltbush	EPC-866 9014683	10	4	CO Pueblo Co.
			A. canescens	Fourwing saltbush	EPC-888	20	4	CO

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
					9013721			La Plata Co.
			Atriplex canescens	Fourwing saltbush	EPC-1155 9013722	3	4	CO Mile High Seed
			A. canescens	Fourwing saltbush	NM-155 9004468	20	4	PMC Los Lunas
			A. canescens	Fourwing saltbush	NM-812 PI-478838	20	4	PMC Los Lunas
			A. canescens	Fourwing saltbush	Los Lunas	10	4	PMC Los Lunas
			A. canescens	Fourwing saltbush	Wytana	18	4	PMC Bridger
			Atriplex confertifolia	Shadscale	EPC-327 9030889	3	4	UT Box Elder Co.
			A. confertifolia	Shadscale	EPC-430 9007780	2	4	CO Mesa Co
			A. confertifolia	Shadscale	EPC-431 9007786	2	4	CO Moffat Co.
			A. confertifolia	Shadscale	EPC-494 9024199	1	4	CO Montrose Co.
			A. confertifolia	Shadscale	EPC-507 9030890	1	4	CO Delta Co.
			A. confertifolia	Shadscale	EPC-569 9037991	2	4	CO Moffat Co.
			Atriplex cuneata	Castle Valley clover	EPC-341 9024209	1	4	CO Rio Blanco Co.
			A. cuneta	Castle Valley clover	EPC-662 9007805	3	4	UT Uintah Co.
			Atriplex nuttallii	Nuttall saltbush	PI-15658 9017389	2	4	PMC Bridger
			Atriplex spp.	saltbush	EPC-84 9024215	18	4	WY Sweetwater Co.
			Atriplex spp.	saltbush	EPC-343 9024211	17	4	CO Rio Blanco Co.
			Atriplex spp.	saltbush	EPC-638 9007806	17	4	CO Mesa Co.
	√	√	Berberis repens	Creeping barberry	EPC-254 9024222	7	4	CO Rio Blanco Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
			Krascheninnikovia lanata	Winterfat	EPC-105 9007848	21	2	CO Gunnison Co.
			K. lanata	Winterfat	EPC-214 9024131	8	2	CO Rio Blanco Co.
			K. lanata	Winterfat	EPC-358 9007849	18	2	CO Rio Arriba Co.
			K. lanata	Winterfat	EPC-392 9030903	13	2	CO Elbert Co.
			K. lanata	Winterfat	EPC-418 9007850	21	2	CO Delta Co.
			K. lanata	Winterfat	EPC-585 9007852	16	2	CO Huerfano Co.
			K. lanata	Winterfat	EPC-795 9024135	18	2	CO Moffat Co.
			K. lanata	Winterfat	EPC-796 9007853	26	2	CO Moffat Co.
			K. lanata	Winterfat	EPC-797 9024136	20	2	CO Moffat Co.
			K. lanata	Winterfat	EPC-887 9007855	20	2	CO Rio Blanco Co.
		√	Cercocarpus intricatus	Littleleaf mountain mahogany	EPC-398 9024230	6	3	CO Rio Blanco Co.
		√	Cercocarpus ledifolius	Curlleaf mountain mahogany	EPC-702 9024235	17	8	UT Cache Co.
			C. ledifolius	Curlleaf mountain mahogany	EPC-764 9024236	15	8	ID Casa Co.
			Cerocarpus montanus	True mountain mahogany	EPC-77 9024241	8	6	CO Huerfano Co.
			C. montanus	True mountain mahogany	EPC-120 9024242	8	6	CO Rio Blanco Co.
			C. montanus	True mountain mahogany	EPC-149 9024243	6	6	CO Delta Co.
			C. montanus	True mountain mahogany	EPC-236 9024245	15	6	CO Larimer Co.
			C. montanus	True mountain mahogany	EPC-355 9024234	18	6	NM Sandoval Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
			Cerocarpus montanus	True mountain mahogany	EPC-420 9024247	10	6	CO Rio Blanco Co.
			C. montanus	True mountain mahogany	EPC-435 9024233	12	6	CO Freemont Co.
			C. montanus	True mountain mahogany	EPC-608 9024251	8	6	CO Garfield Co.
			C. montanus	True mountain mahogany	EPC-744 9024253	7	6	CO Rio Blanco Co.
			Chrysothamnus depressus	Dwarft rabbitbrush	NM-1052 9030897	19	4	PMC Los Lunas
			Chrysothamnus greenei	Greenes rabbitbrush	EPC-425 9024257	19	4	CO Teller Co.
			Chrysothamnus nauseosus	Rubber rabbitbrush	EPC-463 9024258	4	4	CO Archuleta Co.
			C. nauseousus	Rubber rabbitbrush	EPC-506 9024259	23	4	CO Elbert Co.
	√		Chrysothamus parryi	Parry rabbitbrush	EPC-811 9024187	20	4	CO Rio Blanco Co.
			Chrysothamnus viscidiflorus	Low rabbitbrush	EPC-402 9024188	12	4	CO Summit Co.
			Chrysothamnus spp.	rabbitbrush	EPC-303 9024189	7	4	CO Gunnison Co.
			Chrysothamnus spp.	rabbitbrush	EPC-304 9024190	9	4	CO Gunnison Co.
			Chrysothamnus spp.	rabbitbrush	EPC-408 9024191	10	4	CO Grand - Summit
			Chrysothamnus spp.	rabbitbrush	EPC-437 9024192	9	4	CO Gunnison Co.
			Chrysothamnus spp.	rabbitbrush	EPC-438 9024193	12	4	CO Gunnison Co.
			Chrysothamnus spp.	rabbitbrush	EPC-495 9024160	5	4	CO Montrose Co.
			Chrysothamnus spp.	rabbitbrush	EPC-501 9024161	11	4	CO Montezuma Co.
			Chrysothamnus spp.	rabbitbrush	EPC-503 9024162	10	4	CO San Miguel Co.
			Chrysothamnus spp.	rabbitbrush	EPC-537	2	4	CO

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
					9024163			Pueblo Co.
			Cornus stolonifera	Redoiser dogwood	EPC-319 9015836	4	8	CO Garfield Co.
	√	√	C. stolonifera	Redoiser dogwood	EPC-400 9024169	6	8	UT Weber Co.
	√	√	Crataegus spp.	Hawthorn	EPC-232 9015840	8	8	CO Rio Blanco Co.
√	√	√	Crataegus spp.	Hawthorn	EPC-459 9024181	9	8	CO La Plata Co.
			Crataegus spp.	Hawthorn	EPC-609 9024176	4	8	CO Mesa Co.
			Ephedra torreyana	Torrey Ephedra	EPC-394 9024121	15	2	UT Uintah Co.
			Ephedra viridis	Green Ephedra	EPC-56 9024122	24	2	CO Rio Blanco Co.
			E. viridis	Green Ephedra	EPC-58 9024123	22	2	CO Rio Blanco Co.
			E. viridis	Green Ephedra	EPC-68 9024124	20	2	CO Rio Blanco Co.
			E. viridis	Green Ephedra	EPC-645 9024125	22	2	CO Rio Blanco Co.
√		√	Fallugia paradoxa	Apache-plume	EPC-580 9024141	25	4	CO San Luis Valley
		√	Fendlera rupicola	Cliff fendlerbush	EPC-456 9024143	12	4	CO Montezuma Co.
		√	Fraxinus anomala	Singleleaf ash	EPC-155 9024145	6	10	CO Mesa Co.
		√	F. anomala	Singleleaf ash	EPC-615 9024147	6	10	UT Grand Co.
			Grayia spinosa	Spiny hopsage	EPC-80 9024150	20	3	UT Uintah Co.
		√	Holodiscus dumosus	Bush Oceanspray	EPC-436 9024154	8	5	CO Gunnison Co.
		√	H. dumosus	Bush Oceanspray	EPC-579 9024155	5	5	CO San Luis Valley
√			Lonicera involucrata	Bearberry honeysuckle	EPC-217 9024090	2	5	CO Rio Blanco Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
			L. involucrata	Bearberry honeysuckle	EPC-675 9024110	22	5	CO Rio Blanco Co.
		√	L. involucrata	Bearberry honeysuckle	EPC-708 9024111	19	5	CO San Juan Co.
√	√	√	Lonicera utahensis	Utah honeysuckle	EPC-634 9024115	22	5	CO La Plata Co.
√	√	√	L. utahensis	Utah honeysuckle	EPC-635 9030476	22	5	CO La Plata Co.
			L. utahensis	Utah honeysuckle	EPC-660 9024117	20	5	Commercial K-mart
			L. utahensis	Utah honeysuckle	EPC-703 9024118	8	5	Wyoming Freemont Co.
	√	√	Peraphyllum ramosissimum	Squaw-apple	EPC-461 9007948	22	4	CO La Plata Co.
			P. ramosissimum	Squaw-apple	EPC-631 9024285	22	4	CO La Plata Co.
			P. ramosissimum	Squaw-apple	EPC-651 9024286	22	4	CO San Miguel Co.
	√	√	Philadelphus microphyllus	Littleleaf mockorange	EPC-353 9024096	24	4	NM Sandoval Co.
		√	Physocarpus monogynus	Mountain ninebark	EPC-376 9007949	30	5	NM Jemez Mountain
√	√	√	Potentilla fruticosa	Shrubby cinquefoil	EPC-287 9030911	20	2	CO Rio Blanco Co.
			P. fruticosa	Shrubby cinquefoil	EPC-351 9024045	20	2	NM Los Lunas
			P. fruticosa	Shrubby cinquefoil	EPC-445 9024046	17	2	CO Park Co.
			P. fruticosa	Shrubby cinquefoil	EPC-560 9024047	19	2	CO Park Co.
			Prunus virginiana	Chokecherry	EPC-162 9024058	7	10	CO Moffat Co.
		√	P. virginiana	Chokecherry	EPC-174 9024059	7	10	CO Garfield Co.
			Prunus virginiana	Chokecherry	EPC-222 9030912	6	10	CO Rio Blanco Co.

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
√	√	√	P. virginiana	Chokecherry	EPC-229 9024060	6	10	CO Rio Blanco Co.
			P. virginiana	Chokecherry	EPC-268 9024061	6	10	CO Moffat Co.
			P. virginiana	Chokecherry	EPC-565 9024062	6	10	CO San Luis Valley
			P. virginiana	Chokecherry	EPC-632 9024064	6	10	CO La Plata Co.
			Purshia tridentata	Antelope bitterbrush	EPC-82 9024086	11	4	CO Rio Blanco Co.
			P. tridentata	Antelope bitterbrush	EPC-132 9007977	20	4	CO Rio Blanco Co.
			P. tridentata	Antelope bitterbrush	EPC-146 9024078	13	4	CO Rio Blanco Co.
	√		P. tridentata	Antelope bitterbrush	EPC-163 9024069	18	4	CO Routt Co.
			P. tridentata	Antelope bitterbrush	EPC-527 9024071	10	4	UT Rich Co.
			P. tridentata	Antelope bitterbrush	EPC-620 9024072	13	4	CO La Plata Co.
			P. tridentata	Antelope bitterbrush	EPC-679 9024073	5	4	CO Rio Blanco Co.
			P. tridentata	Antelope bitterbrush	EPC-692 9015848	24	4	CO Moffat Co.
√	√	√	Rhamnus smithii	Buckthorn	EPC-469 9024308	30	6	CO Archuleta Co.
	√	√	Rhus glabra cismontana	Rocky Mountain smooth sumac	EPC-348 9024277	6	4	NM Sundoval Co.
√	√	√	Rhus trilobata	Skunkbush sumac	EPC-227 9007990	26	4	CO Eagle Co.
			R. trilobata	Skunkbush sumac	EPC-655 9024269	12	4	CO El Paso Co.
	√	√	R. trilobata	Skunkbush sumac	EPC-664 9007993	21	4	UT Uintah Co.
√	√	√	Ribes aureum	Golden currant	EPC-337 9030913	25	4	CO Rio Blanco Co.
	√	√	Ribes cereum	Wax currant	EPC-372	22	3	NM

Release List	Superior	May Retain	Scientific Name	Common Name	Accession Number	Number Planted	Spacing Between Plants (Feet)	Orgin
					9024288			Sandoval Co.
	√	√	R. cereum	Wax currant	EPC-529 9024289	22	3	CO Chaffee Co.
			R. cereum	Wax currant	EPC-562 9024290	22	3	CO San Luis Valley
			Ribes spp.	Currant gooseberry	EPC-228 9024292	17	3	CO Rio Blanco Co.
			Ribes spp.	Currant gooseberry	EPC-336 9024296	13	3	CO Garfield Co.
			Ribes spp.	Currant gooseberry	EPC-395 9024297	1	3	CO Rio Blanco Co.
			Ribes spp.	Currant gooseberry	EPC-658 9024298	13	3	CO Jefferson Co.
			Ribes spp.	Currant gooseberry	EPC-746 9024321	2	3	CO San Miguel Co.
√	√	√	Sheperdia argentea	Silver buffaloberry	EPC-476 9008027	45	6	CO San Miguel Co.
			S. argentea	Silver buffaloberry	EPC-668 9008573	50	6	UT Gunnison Co.
			Symphoricarpos oreophilus	Mountain snowberry	EPC-96 9040100	2	3	CO Gunnison Co.
			S. oreophilus	Mountain snowberry	EPC-216 9080033	10	3	CO Garfield Co.
			S. oreophilus	Mountain snowberry	EPC-221 9038103	1	3	CO Rio Blanco Co.
			S. oreophilus	Mountain snowberry	EPC-413 9008034	1	3	CO Gunnison Co.
			Symphoricarpos spp.	Snowberry	EPC-271 9040103	1	3	CO Rio Blanco Co.
		√	Symphoricarpos spp.	Snowberry	EPC-779 9040106	21	3	CO San Miguel Co.

PROJECT 08I020J
Progress Report - 2005
By: Dr. Gary L. Noller

APPENDIX II

A listing of the scientifc names, accession numbers, number of plants planted, location and spacing of rows, and plants within a row. The plants were planted August 4 - 14, 1981. Noted to the left: Better performing accessions through 1987 and accessions to potentially retain.

FIELD 14

Better Perf.	May Retain	Species	Accession Number	Number Planted	Spacing Between Plants
					16.5 ft. X 16.5 ft.
		Row 1.			
		Symphoricarpos oreophilus	EPC-216 908033	10	5 ft. *
		Symphoricarpos spp.	EPC-221 9038103	10	5 ft.
√		Symphoricarpos spp.	EPC-710 9038106	6	5 ft.
		Symphoricarpos oreophilus	EPC-413 908034	5	5 ft.
		Symphoricarpos spp.	EPC-1055 9040109	5	5 ft.
		Symphoricarpos oreophilus	EPC-81 9040099	4	5 ft.
		Symphoricarpos spp.	EPC-105 9040110	4	5 ft.
		Symphoricarpos spp.	EPC-271 9040103	4	5 ft.
√		Shepherida argentea	EPC-233 9038098	10	6 ft. *
		S. argentea	EPC-665 908028	10	6 ft.

Field 15

Better Perf.	May Retain	Species	Accession Number	Number Planted	Spacing Between Plants
					16.5 ft.(North) X 18 ft (South)
		Row 1.			
		Atriplex nuttallii	EPC-1090 9024213	9	4 ft.
		A. canescens	EPC-428 907803	3	4 ft.
		A. confertifolia	EPC-327 9030889	7	4 ft.*
		A. confertifolia	EPC-569 9037991	32	4 ft.
		A. confertifolia	EPC-430 907780	11	4 ft.
		A. confertifolia	EPC-876 9024202	3	4 ft.
		A. confertifolia	EPC-215 9037990	2	4 ft.
		A. confertifolia	EPC-340 9024196	2	4 ft.
		A. confertifolia	EPC-1150 9024206	1	4 ft.
		Row 2.			16 ft. X 16 ft.
	√	Ceanothus velutinus	EPC-1121 9024228	44	5 ft.*
	√	C. velutinus	EPC-243 9024226	24	5 ft.
		Arctostaphylos uva-ursi	EPC-938 9021463	10	5 ft.

Field 15

Better Perf.	May Retain	Species	Accession Number	Number Planted	Spacing Between Plants
					16 ft. X 16 ft.
		Row 3.			
	√	Berberis haematocarpa	EPC-1097 9024220	10	4 ft. *
√	√	B. ferdleri	EPC-365 9024219	10	4 ft.
√		B. repens	EPC-91 9024221	10	4 ft.
√		B. repens	EPC-1122 9024225	8	4 ft.
√		Rhamnus cathartica	EPC-1177 9024309	10	6 ft.
	√	Juniperus utahensis	EPC-701 9024200	5	6 ft.
√	√	J. utahensis	EPC-208 9024313	4	6 ft.
	√	J. utahensis	EPC-209 9024314	3	6 ft.
	√	J. communis	EPC-275 9024158	4	6 ft.
	√	J. communis	EPC-881 9024312	4	6 ft.

* one space separates accesions.

Field 15

Better Perf.	May Retain	Species	Accession Number	Number Planted	Spacing Between Plants
		Row 4.			16 ft. (South) X 10 ft. (North)
		Rosa spp.	EPC-172 9024333	10	4 ft.*
		R. woodsii	EPC-593 9030916	10	4 ft.
		Rosa spp.	EPC-630 9024337	10	4 ft.
		R. woodsii	EPC-859 9024328	10	4 ft.
		Rosa spp.	EPC-778 9024339	10	4 ft.
		R. woodsii	EPC-405 9024327	10	4 ft.
		Rosa spp.	EPC-126 9024332	10	4 ft.
		R. woodsii	EPC-1065 9030915	10	4 ft.
		R. woodsii	EPC-94 9024324	10	4 ft.
		R. woodsii	EPC-299 9024326	10	4 ft.
√		Rosa spp.	EPC-894 9024340	4	4 ft.
		R. woodsii (Note: 212 is planted on east end of row 3)	EPC-212 9024325	9	4 ft.
√		Rosa spp.	EPC-622 9024336	7	4 ft.

Project 08S078Z
Report-2005
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, juice red to 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 unfertile. The shrub is relative slow growing, long lived and can reproduce by seed or root sprouts. Vegetative reproduction by sprouting is most common. 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 with 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 on 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 the Plant Center. 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 on the reports for these years. Seed collected from the project since 1993 is listed in the following table.

Project 08S078Z
Report-2005
By: Manuel Rosales and Gary Noller

Serviceberry seed collected at UCEPC from accession 9021438:

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

Serviceberries *Amelanchier spp* intergrade and hybridize 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 as a preparation for release. Colorado State University identified the accession as *Amelanchier utahensis.* Further identification will be needed before releasing the accession to make sure of its identity.

Project 08S213
Report - 2005
By: Steve Parr & Manuel Rosales

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 from 5,200 to 8,500 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. Project 08I114 was removed in 1994 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 a 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 - 2005
By: Steve Parr & Manuel Rosales

METHODS

In 1993, a 0.10 acre increase field for accession 9043501 was established by seed at 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 UCEPC Field 25, Projects 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.

RESULTS

No appreciable seed has been harvested to date from either the breeder or foundation fields. Seed production records are provided from the initiation of the seed increase project in field 4. Because seed production has been poor for this product, alternative management practices will be investigated over several years. In 2004, a new planting was conducted. Four rows or 0.13 acre were planted with a hand pushed Planet Junior on July 29, 2004 and it is progressing well. Additional treatments for 2005 include a spring burn and an herbicide treatment to open up spaces between established plants.

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

Year	Acres	Harvest Date	Field No.	Cleaned Weight	
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	
1997	0.02	Field plowed	Hqts.	No harvest	
1997	0.10	7/21	4	2.96	lb
1997	0.20	7/21	4	5.32	lb
1998	0.10	8/4	4	4.00	lb
1998	0.20	8/4	4	9.00	lb
1999	0.10	7/15	4	22.00	g
1999	0.20	7/15	4	32.00	g
2000	0.10	No harvest	--	--	
2000	0.20	7/7	4	6.00	g
2001	0.20	7/9	4	174.00	g
2001	0.10	7/9	4	227.00	g
2002	0.10	7/11	4	7.00	g
2002	0.20	7/11	4	23.00	g
2003	0.10	7/9	4	1.69	lb
2003	0.20	7/9	4	0.60	lb
2004	0.10	7/9	4	19.00	g
2004	0.20	7/9	4	146.00	g
2004	0.10	New planting	4	No harvest--	
2005	0.10	New planting	4	No harvest	
2005	0.10(B)	7/13	4	1.4 l	lb
2005	0.20(F)	7/13	4	302	g

Project 08S213
Report - 2005
By: Steve Parr & Manuel Rosales

In the 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 the herbicide Round-Up, and an east block about 120 x 18 ft was burned with a torch. The purpose of the **herbicide treatment** is to get spaced plants at about 3 x 3 ft in contrast to an existing crowded solid row of plants. It is our hope that this might induce better seed production. 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). 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 spend a lot of energy in spring growth. We will monitor the space plants in 2006 to see if they show any difference in seed set. The **burned area** showed a more vigorous re-growth after the burning, and also had much less decadent plant material. However, no difference in seed set was observed between unburned and burned plants. Burned plants did, however, look greener and healthier.

Project COPMC-F-0501-CR
Report-2005
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 4 rows per plot (2 ft between rows). 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.

The following table lists the 49 entries for the study:

	Rhizomatous Grasses			
Entry #	**Cultivar/Release or accession #**	**Common Name**	**Scientific Name**	**Seed Source**
1	Rush	Intermediate wheatgrass	*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**	Little bluestem	*Schizachyrium scoparium*	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 grama	*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 hoffmannii*	Aberdeen, ID
42	Vavilov	Siberian wheatgrass	*Agropyron fragile*	Aberdeen, ID
	Rye Grasses			
43	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

The study was evaluated 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. Plots will be monitor and evaluated in summer of 2006 and following years depending upon plant establishment.

Project COPMC-F-0501-CR
Report-2005
By: Manuel Rosales

The evaluation for 2005 is summarized in the following table:

Average plant stand for 49 grasses at Land's End Field Evaluation Planting-2005

		Avg. stand*
Rhizomatous Grasses		
Bannock	Thickspike wheatgrass	1.75
Manska	Intermediate wheatgrass	2.00
Rosana	Western wheatgrass	2.00
Rush	Intermediate wheatgrass	2.00
Schwendimar	Thickspike wheatgrass	2.00
TH-2 Intermediate	Intermediate wheatgrass	2.00
Sodar	Streambank wheatgrass	2.25
Critana	Thickspike wheatgrass	2.50
Arriba	Western wheatgrass	3.25
Volga	Mammoth wildrye	4.25
Viva**	Galleta grass	4.33
Bunch Grasses		
Columbia bunch	Bluebunch wheatgrass	2.00
P-7	Bluebunch wheatgrass	2.00
San Luis	Slender wheatgrass	2.00
Vavilov	Siberian wheatgrass	2.00
Whitmar	Beardless wheatgrass	2.00
Anatone	Bluebunch wheatgrass	2.25
Hycrest	Crested wheatgrass	2.25
Nordan	Crested wheatgrass	2.25
Expedition	Snake River wheatgrass	2.50
Goldar	Bluebunch wheatgrass	2.50
Pryor	Slender wheatgrass	2.50
Secar	Snake River wheatgrass	2.50
Newhy	Hybrid wheatgrass	2.75
Ephraim	Crested wheatgrass	3.00
Pueblo	Bottlebrush squirreltail	3.00
Douglas	Crested wheatgrass	3.25
Tusas	Bottlebrush squirreltail	3.75
Wapiti (Buford)	Bottlebrush squirreltail	3.75
Niner	Sideoats grama	4.00
Rimrock	Indian ricegrass	4.00
Paloma	Indian ricegrass	4.25
9092261-Northwest	Junegrass	4.33
Badlands	Blue grama	4.50
Lodorm	Green needlegrass	4.50
White River	Indian ricegrass	4.50
Vaughn	Sideoats grama	4.75
Bad River**	Little bluestem	NE
Covar**	Sheep fescue	NE
Alma**	Blue grama	NE
High Plains**	Bluegrass	NE
Salado**	Alkali sacaton	NE

Ryes Grasses		
L-45	Basin wildrye Cross	1.25
Bozoisky	Russian wildrye	1.50
Trailhead	Basin wildrye	1.75
L-46	Basin wildrye/creeping cross	2.25
Magnar	Basin wildrye/creeping cross	2.25
Mankota	Russian wildrye	3.75
Salina	Wildrye	3.75

*** Plant stand: 1 = Excellent; & 5= Poor/No Establishment**
****NE = Not evaluated**

Project COPMC-F-0505-PA
Report-2005
By: Manuel Rosales

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 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, xeroscaping, 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 dryland.

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

Project COPMC-F-0505-PA
Report-2005
By: Manuel Rosales

The following table lists the 65 entries for the demonstrational planting:

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
	Single Grass Species			
1	Cheyenne	Indian grass	*Sorghastrum nutans*	Arkansas Valley Seed Co
2	9005439	Switchgrass	*Panicum virgatum*	Bridger, PMC
3	Dacotah	Switchgrass	*Panicum virgatum*	Bismarck, PMC
4	Kaw	Big Bluestem	*Andropogon gerardii*	Arkansas Valley Seed Co
5	Bonilla	Big Bluestem	*Andropogon gerardii*	Bismarck, PMC
6	Pawnee	Big Bluestem	*Andropogon gerardii*	Arkansas Valley Seed Co?
7	Lodorm	Green needlegrass	*Nassella viridula*	Bismarck, PMC
8	Aldous	Little bluestem	*Schizachyrium scoparium*	Arkansas Valley Seed Co
9	Camper	Little bluestem	*Schizachyrium scoparium*	Arkansas Valley Seed Co
10	Pastura	Little bluestem	*Schizachyrium scoparium*	Arkansas Valley Seed Co
11	Niner	Sideoats grama	*Bouteloua curtipendula*	Los Lunas, PMC
12	BSOG-02B	Sideoats grama	*Bouteloua curtipendula*	
13	El Reno	Sideoats grama	*Bouteloua curtipendula*	Manhattan, PMC
14	Hachita	Sideoats grama	*Bouteloua curtipendula*	Los Lunas, PMC
15	Bad river	Sideoats grama	*Bouteloua curtipendula*	Bismarck, PMC
16	Lovington	Sideoats grama	*Bouteloua curtipendula*	Los Lunas, PMC
17	Texoca	Buffalo grass	*Buchloe dactyloides*	Arkansas Valley Seed Co
18	Viva	Galleta grass	*Pleuraphis jamesii*	Los Lunas, PMC
19	9092261	Prairie Junegrass	*Koeleria macrantha*	Meeker, PMC
20	Covar	Sheep fescue	*Festuca ovina*	Arkansas Valley Seed Co
21	Redondo	Arizona fescue	*Festuca arizonica*	Meeker, PMC
22	Sherman	Big bluegrass	*Poa secunda*	Arkansas Valley Seed Co
23	Rimrock	Indian ricegrass	*Achnatherum hymenoides*	Bridger, PMC
24	Paloma	Indian ricegrass	*Achnatherum hymenoides*	Los Lunas, PMC
25	Tusas	Squirreltail	*Elymus elymoides*	Los Lunas, PMC
26	San Luis	Slender wheatgrass	*Elymus trachycaulus*	Meeker, PMC
27	Pryor	Slender wheatgrass	*Elymus trachycaulus*	Bridger, PMC
28	Volga	Mammoth wildrye	*Leymus racemosus*	Meeker, PMC
29	UNIDENTIFIED	Needle & thread	*Hesperostipa comata*	Arkansas Valley Seed Co
30	Climax	Timothy	*Phleum pratense*	Arkansas Valley Seed Co
31	Paiute	Orchard grass	*Dactylis glomerata*	Aberdeen, PMC
32	Renegade	Orchard grass	*Dactylis glomerata*	Arkansas Valley Seed Co.
33	Salado	Alkali sacaton	*Sporobolus airoides*	Los Lunas, PMC
34	Fawn	Tall fescue	*Festuca arundinacea*	Arkansas Valley Seed Co.
35	Trailhead	Basin wildrye	*Leymus cinereus*	Bridger, PMC
36	Magnar	Basin wildrye	*Leymus cinereus*	Aberdeen, PMC
37	Garnet	Mountain brome	*Bromus marginatus*	Meeker, PMC
38	UNIDENTIFIED	Nodding brome	*Bromus anomalus*	Arkansas Valley Seed Co.
39	Regar	Meadow brome	*Bromus erectus*	Aberdeen, PMC
40	Manchar	Smooth brome	*Bromus inermis*	Arkansas Valley Seed Co.
41	Critana	Streambank wheatgrass	*Elymus lanceolatus*	Bridger, PMC

Project COPMC-F-0505-PA
Report-2005
By: Manuel Rosales

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Seed Source
42	Bannock	Streambank wheatgrass	*Elymus lanceolatus*	Aberdeen, PMC
43	Goldar	Bluebunch wheatgrass	*Pseudoroegneria spicata*	Aberdeen, PMC
44	Anatone	Bluebunch wheatgrass	*Pseudoroegneria spicata*	Aberdeen, PMC
45	Luna	Pubescent wheatgrass	*Thinopyrum intermedium*	Meeker, PMC
46	Rush	Intermediate wheatgrass	*Thinopyrum intermedium*	Aberdeen, PMC
47	Arriba	Western wheatgrass	*Pascopyrum smithii*	Meeker, PMC
48	Rosana	Western wheatgrass	*Pascopyrum smithii*	Bridger, PMC
49	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	Aberdeen, PMC
50	UNIDENTIFIED?	Tufted hairgrass	*Deschampsia caespitosa*	Arkansas Valley Seed Co.
51	Jose	Tall wheatgrass	*Thinopyrum ponticum*	Los Lunas, PMC
52	Mandan	Canada wildrye	*Elymus canadensis*	Bismarck, PMC
53	Bozoisky-select	Russian wildrye	*Psathyrostachys juncea*	Bridger, PMC
54	Newhy	Hybrid wheatgrass	*Elymus hoffmannii*	Aberdeen, PMC
55	Douglas	Crested wheatgrass	*Agropyron cristatum*	Aberdeen, PMC
56	Hycrest	Hybrid wheatgrass	*Agropyron cristatum X desertorum*	Aberdeen, PMC
57	Ephraim	Crested wheatgrass	*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-@14.2lb/ac	Medic	*Medicago spp.*	CSU Ext. Service
65	Medic @29.1lb/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	
Buffalo grass	Pubescent wheatgrass	Canada bluegrass	Tetraploid PER	
Blue gramma	Intermediate wheatgrass	Chewing fescue	Orchard grass-Renegade	
Big bluestem			Intermediate wheatgrass-Oahe	
Arizona fescue-Sherman-				

RESULTS

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 on November 8, 2005.

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Plant Stand*
Single Grass Species				
1	Cheyenne	Indian grass	*Sorghastrum nutans*	1
2	9005439	Switchgrass	*Panicum virgatum*	2
3	Dacotah	Switchgrass	*Panicum virgatum*	3
4	Kaw	Big Bluestem	*Andropogon gerardii*	3
5	Bonilla	Big Bluestem	*Andropogon gerardii*	2
6	Pawnee	Big Bluestem	*Andropogon gerardii*	2
7	Lodorm	Green needlegrass	*Nassella viridula*	4
8	Aldous	Little bluestem	*Schizachyrium scoparium*	1
9	Camper	Little bluestem	*Schizachyrium scoparium*	1
10	Pastura	Little bluestem	*Schizachyrium scoparium*	1
11	Niner	Sideoats grama	*Bouteloua curtipendula*	1
12	BSOG-02B	Sideoats grama	*Bouteloua curtipendula*	1
13	El Reno	Sideoats grama	*Bouteloua curtipendula*	1
14	Hachita	Sideoats grama	*Bouteloua curtipendula*	1
15	Bad river	Sideoats grama	*Bouteloua curtipendula*	2

Project COPMC-F-0505-PA
Report-2005
By: Manuel Rosales

Entry #	Cultivar/Release or Accession #	Common Name	Scientific Name	Plant Stand*
16	Lovington	Sideoats grama	*Bouteloua curtipendula*	2
17	Texoca	Buffalo grass	*Buchloe dactyloides*	3
18	Viva	Galleta grass	*Pleuraphis jamesii*	0
19	9092261	Prairie Junegrass	*Koeleria macrantha*	1
20	Covar	Sheep fescue	*Festuca ovina*	1
21	Redondo	Arizona fescue	*Festuca arizonica*	2
22	Sherman	Big bluegrass	*Poa secunda*	1
23	Rimrock	Indian ricegrass	*Achnatherum hymenoides*	2
24	Paloma	Indian ricegrass	*Achnatherum hymenoides*	4
25	Tusas	Squirreltail	*Elymus elymoides*	3
26	San Luis	Slender wheatgrass	*Elymus trachycaulus*	4
27	Pryor	Slender wheatgrass	*Elymus trachycaulus*	4
28	Volga	Mammoth wildrye	*Leymus racemosus*	1
29	UNIDENTIFIED	Needle & thread	*Hesperostipa comata*	2
30	Climax	Timothy	*Phleum pratense*	1
31	Paiute	Orchard grass	*Dactylis glomerata*	5
32	Renegade	Orchard grass	*Dactylis glomerata*	5
33	Salado	Alkali sacaton	*Sporobolus airoides*	1
34	Fawn	Tall fescue	*Festuca arundinacea*	5
35	Trailhead	Basin wildrye	*Leymus cinereus*	2
36	Magnar	Basin wildrye	*Leymus cinereus*	3
37	Garnet	Mountain brome	*Bromus marginatus*	5
38	UNIDENTIFIED?	Nodding brome	*Bromus anomalus*	5
39	Regar	Meadow brome	*Bromus erectus*	5
40	Manchar	Smooth brome	*Bromus inermis*	4
41	Critana	Streambank wheatgrass	*Elymus lanceolatus*	4
42	Bannock	Streambank wheatgrass	*Elymus lanceolatus*	4
43	Goldar	Bluebunch wheatgrass	*Pseudoroegneria spicata*	4
44	Anatone	Bluebunch wheatgrass	*Pseudoroegneria spicata*	4
45	Luna	Pubescent wheatgrass	*Thinopyrum intermedium*	4
46	Rush	Intermediate wheatgrass	*Thinopyrum intermedium*	4
47	Arriba	Western wheatgrass	*Pascopyrum smithii*	4
48	Rosana	Western wheatgrass	*Pascopyrum smithii*	4
49	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	3
50	UNIDENTIFIED?	Tufted hairgrass	*Deschampsia caespitosa*	0
51	Jose	Tall wheatgrass	*Thinopyrum ponticum*	4
52	Mandan	Canada wildrye	*Elymus canadensis*	4
53	Bozoisky-select	Russian wildrye	*Psathyrostachys juncea*	1
54	Newhy	Hybrid wheatgrass	*Elymus hoffmannii*	4
55	Douglas	Crested wheatgrass	*Agropyron cristatum*	4
56	Hycrest	Crested wheatgrass	*Agropyron cristatum X desertorum*	4
57	Ephraim	Crested wheatgrass	*Agropyron cristatum*	3

Project COPMC-F-0505-PA
Report-2005
By: Manuel Rosales

Grass Mixtures				
Entry #	**Cultivar/Release or Accession #**	**Common Name**	**Scientific Name**	**Plant Stand***
58	Rocky Mountain. Native mix	Mix-1* See entries below		4
59	Aggressive dryland mix	Mix-2* See entries below		4
60	Low grow mix	Mix-3* See entries below		4
61	Dryland mix	Mix-4*-See entries below		5
62	Boulder NRCS-mix-Regular	Mix-5*-See entries below		4
63	Boulder NRCS-mix-heavy	Mix-6*-See entries below		4
Legume				
64	Medic @14.2 lb/ac	Medic	*Medicago spp.*	2
65	Medic @29.1 lb/ac	Medic	*Medicago spp*	3

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

Project COPMC-F-0506-RA
Project Report – 2005
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 *Koleria macrantha* have been displaced. Low growing species, such as blue grama *Bouteloua gracilis* and fringed sage *Artemesia 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 two different times – an early 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.

Project COPMC-F-0506-RA
Project Report – 2005
By: Dr. Joe Brummer and Steve Parr

METHODS

The methods used in the study include the use of four different herbicides, two 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 (16 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, and November 2-3, 2005, 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

Native Mixture	**Average PLS of Native Mixture is 74%**				
Grasses	Variety	% in Mix	Seeding Rate lb/acre	Grams Per Rep	PLS lb/acre
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%**				
Grasses	Variety	% in Mix	Seeding Rate lb/acre	Grams Per Rep	PLS lb/acre
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 4 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

Although formal evaluations will not start until 2006, 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.

Project COPMC-F-0507-RA
Project Report – 2005
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 *Koleria macrantha* have been displaced. Low growing species, such as blue grama *Bouteloua gracilis,* and fringed sage *Artemesia 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 two different times – an early 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, two 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 – 2005
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 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, and November 2-3, 2005, 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.

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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%**				
Grasses	Variety	% in Mix	Seeding Rate lb/acre	Grams Per Rep	PLS lb/acre
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 4 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

Although formal evaluations will not start until 2006, 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.

Project COPMC-F-0508-CR
Report-2005
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 seed 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	*Artemesia frigida*	CO-9021471	Forb
Lewis flax	*Linum perenne*	Appar	Forb
Lewis flax	*Linum perenne*	Maple Grove	Forb
Louisiana sage	*Artemesia ludoviciana*	Summit	Forb
Maximilian 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
Report-2005
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-Land's 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 will be monitored and evaluated during 2006 and data will be analyzed statistically.

Project COPMC-F-0601-CR
Report-2005
By: Manuel Rosales

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 fen. This type of peatland is only found in high-elevation sites above 8,000 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

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 seed 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. The following table lists the 28 entries for the study:

Common Name	Scientific Name	Release Name or Accession No.
Natives		
Arizona fescue	*Festuca arizonica*	Redondo
Bluebunch wheatgrass	*Pseudoroegnaria spicata spp.spicata*	Anatone
Bluebunch wheatgrass	*Pseudoroegnaria 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	*Achnaterum nelsonii*	9024804
Columbia needlegrass	*Achnaterum nelsonii*	9040137
Indian ricegrass	*Achnaterum hymenoides*	Paloma
Indian ricegrass	*Achnaterum hymenoides*	Rimrock

Common Name	Scientific Name	Release Name or Accession No.
Mountain brome	*Bromus marginatus*	Garnet
Prairie junegrass	*Koelaria comata*	909226
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 crstatum*	Douglas
Crested wheatgrass	*Agropyrum crstatum*	Nordan
Crested-desorturum hybrid	*Agropyrum crstatum x A. desorturum*	Hycrest
Intermediate wheatgrass	*Elytrigia intermedia*	Rush
Meadow brome	*Bromus biebersteinii*	Regar
Pubescent wheatgrass	*Elytrigia 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 9,000 feet. The planting site is on 63-Ranch State Wildlife Area. Planting site is enclosed in a fenced area.

Plots will be evaluated for stand establishment summer of 2006

RESULTS

The study will be monitored and evaluated during 2006 and data will be analyzed statistically.

Project COPMC-P-0301-RA
Report - 2005
By: Manuel Rosales

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

OBJECTIVE

To find a selection that is adapted to heavy 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 the United States in all 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 2,000 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 to 2004. On July 29, 2004, the advanced study was planted at UCEPC with a hand pushed belt seeder. 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. Nine accessions, and three cultivars used as standards for comparison were planted.

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 x 12 ft) = 240 sq ft, 181.5 plots/acre
Rows/Plot = Four (3 ft centers)
Number of entries = 12
Alley width = 10 ft

Accessions/Cultivar	Collection Site
9024664	Moffat, 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	

RESULTS

On September 14, 2004, about 50 days after planting, most plots were showing some sign of germination.

During the summer of 2005, one year after planting, it was looking pretty good. Data collected during year 2005 is presented in the following table.

Accessions/Cultivar	Percent Plant Stand[1]	Plant Vigor[2]	Plant Height in cm[3]	Seed weight Lb/ac	Collection Site
9024664	91.7	4.3	61.0	5.0	Moffat, CO
9024716	86.7	3.3	54.2	5.4	Colorado Springs, CO
9024818	41.7	3.0	46.5	1.8	unknown
9024715	85.0	4.0	59.5	13.4	Colorado Springs, CO
9024741	85.0	3.3	40.6	12.9	Pagosa, CO
9024661	76.7	3.3	53.8	14.4	Delta, CO
9024739	76.7	3.7	50.4	24.0	Pagosa, CO
9024735	88.3	3.3	45.0	2.9	Grand Junction, CO
9024749	68.3	3.0	51.9	5.6	Durango, CO
Nezpar	90.0	4.0	62.1	5.3	Whitebird, ID
Paloma	43.3	3.0	48.3	3.0	Pueblo, CO
Rimrock	93.3	3.3	50.0	1.1	Bridger, MT

Note: All data is the average of three replications

1. Visual estimate
2. Plant vigor 1 = Weak; 5 = Very Vigorous
3. Height measurement in centimeters to top of seed panicle

We will continue data collection for at least three more years to determine if there is any significant difference between the entries being evaluated.

Project COPMC-S-0201-WL
Project Report-2005
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 4,000 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.

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.

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.

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.

Project COPMC-S-0201-WL
Project Report-2005
By: Steve Parr

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.

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

Project COPMC-S-0401-CR
Project Report 2005
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 result in revegetation projects achieving less than they are capable.

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 and Results

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 will be attempted in 2005, as time and resources allow. 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* sup-species. Again, after consultation with Dennis Zachman, we opted to use the same source material rather than mixing subspecies or waiting for a good collection opportunity for the *elymoides* sub-species.

Project COPMC-S-0401-CR
Project Report 2005
By Steve Parr

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.

In light of the difficulties encountered with Utah sweetvetch collections, planned activities for 2005 included the establishment of Sandberg's bluegrass and a spaced planting of the single collection of Utah sweetvetch. These two materials were seeded in 2005. A good stand of Utah sweetvetch was noted on September 28, 2005. However, the Sandberg's bluegrass was not strongly evident. Spring 2006 will determine the planting success of the Sandberg's, and if necessary, it will be replanted.

Seed harvest in the three fields planted in 2004 is anticipated 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 2007 and 2008 for contracted seed increase.

The table below outlines the accomplishments of UCEPC in 2004 and 2005.

SPECIES	UCEPC FIELD #	ACREAGE	PLANTING DATE	HARVEST DATE	YIELD
Bluebunch	6	0.87	Aug.13, 2004		
Bottlebrush	17	0.80	Aug. 13, 2004		
Western	7A	0.80	Aug. 13, 2004		
Sandberg's bluegrass	12	1.00	Aug. 8, 2005		
Utah sweetvetch	12	1.00	Sept. 15, 2005		

CONCLUSION

After attempting to collect seed for five years, seed from minimal prior collections was used to establish plantings for each of the identified project species. Additional collections may be necessary to supplement the existing collections and to ensure that "source seed" is on hand for future testing or development. 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.

Project COPMC-S-0402-WL
Project Report 2005
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% 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.

Project COPMC-S-0402-WL
Project Report 2005
By Steve Parr

METHODS

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.

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

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. In 2005, an additional material was planted in UCEPC Field 3A. Approximately 1,800 "Conetainer" type transplants of *Senecio multilobatus* were planted the first of July in the same manner the other materials were planted.

RESULTS

On November 2, 2004, 43 clean grams of UP yarrow were hand collected. This represents the first field produced seed by UCEPC for this project. Each field should produce some seed in 2005.

Species	Accession	Year Established	Acreage	Harvest Amount	Harvest Date
Junegrass	9092273	6/18/2004	0.27 acre	-0-	NA
				15 lb	7/26/2005
					2006
Muttongrass	9092272	6/17/2004	0.27 acre	-0-	NA
				2 lb	6/8/2005
					2006
Senecio		7/1/2005	0.13 acre	-0-	NA
					2006
Yarrow	9092271	6/16/2004	0.20 acre	43 grams	11/2/2004
				17.5 lb	8/6/2005
					2006

CONCLUSION

UCEPC will continue to produce seed through 2006 of the fields established in 2004. It is anticipated that additional materials as well as the size of the established fields will be expanded to increase the amount of seed produced and delivered to UP growers. Currently, however, there is no formal agreement between UCEPC and the PLP. In 2002, UCEPC received a $50,000 contribution from the UP committee for the initiation of work on the project. The initial funding has supported the activities of UCEPC to date and will cover some of the expenses in 2006. Work total for 2006 is $11,983 for production and maintenance of the four established species and will be the same for 2007. There is $2,085 remaining in the balance from which to draw funds for 2006. If additional materials are planted or if the field sizes are increased, the reimbursement will change accordingly. However, a formal agreement should be approved this year that specifies the scope of work by UCEPC for the UP project.

Project COPMC-T-0502-RA
Project Report-2005
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 tested a class release. Garnet Germplasm was selected for its head smut *Ustilago bullata* resistance; longevity and ease of establishment and good production of both forage and seed. (The term "Germplasm" denotes the materials are not a cultivar, but a pre-cultivar release recognized by the Association of Official Seed Certifying Agencies.)

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 and production of Garnet Germplasm has been halted at the 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 spores 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 bearing 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 COPMC-T-0502-RA
Project Report-2005
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, 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 by 20 feet in length. Each plot consists of four rows spaced at three foot centers. All the data to be collected will be done 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 seed 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.

RESULTS

Excellent stands were established in all plots seeded in May 24, 2005. In June 14, 2005, all plots had 90-100 percent germination. In September 26, 2005, all plots were growing well, with an average height of 4-6 inches. More data will be collected during the 2006 growing season.

Project No. COPMC-T-0503-RA
Project Report-2005
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 4,000 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 a final planting is planned for spring 2006. The **plot size** is six feet wide by 20 feet long with two rows per plot (drilled seed). 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 seed 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 not irrigated nor fertilized.

RESULTS

On October 18, 2005, the late summer planting was just barely breaking the surface crust. Plantings will be monitored and evaluated during 2006 and analyzed statistically to determine best time of planting.

Project No. COPMC-T-0504-RA
Project Report-2005
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 tested class release. Garnet Germplasm was selected for its head smut *Ustilago bullata* resistance, longevity and ease of establishment and good production of both forage and seed. (The term "Germplasm" denotes that the materials are not a cultivar, but a pre-cultivar release recognized by the Association of Official Seed Certifying Agencies.)

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 and production of Garnet Germplasm has been halted at 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 spores 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 bearing 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-2005
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 fallowing 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 done from the two middle rows to eliminate border 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 seed 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.

RESULTS

Data collection will start during the 2006 growing season.

Seed Production - 2005
Upper Colorado Envronmental Plant Center
by Dr. Gary L. Noller

INTRODUCTION

The following plant materials had seed harvested in 2005. 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		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	--	--
				2000	0.01	No harvest	--	--
				2001	0.01	No harvest	--	--
				2002	0.01	No harvest	--	--
				2003	0.01	7/16	25	256.00 g
				2004	0.01	No harvest	--	--
				2005	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	--	--
				2000	0.18	6 rows not plowed	--	--
				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

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				2004	1.10	New planting	6	--	
				2005	0.18	7/8	6	33.00 lb	
				2005	1.10	7/8/2006 (Has smut)	6	37.00 lb	
Bottlebrush Squirreltail Wapiti - selected class	Elymus elymoides		9040187	2005	1.00	New planting	18		
Slender Wheatgrass 'San Luis'	*Elymus trachycaulus*		483079	2004	1.00	New planting	3	--	
				2005	1.00	7/22	3	204.00 lb	
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	--	
				1998	1.66	8/26	11	353.00 lb	
				1999	0.66	Removed 1993 planting	11	121.50 lb	
				2000	0.66	No harvest	--	--	
				2001	0.66	8/16	11	24.50 lb	
				2002	0.66	Field plowed	--	--	
				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	
Arizona fescue 'Redondo' Foundation	*Festuca arizonica*	08S214	469218	1994	1.00	--	6	--	
				1995	1.00	8/7	6	191.50 lb	
				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	--	--	
				2004	1.00	No harvest	--	--	
				2005	0.18	7/28	6	9.00 lb	Reduced to .18 ac
				2005	1.00	No harvest	18		New planting

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight		
Praire junegrass	*Koleria 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	
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		
				1997	0.02	Field plowed	Hqts.	No harvest		
				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	--	--		
				2000	0.20	7/7	4	6.00	g	Foundation
				2001	0.20	7/9	4	174.00	g	Foundation
				2001	0.10	7/9	4	227.00	g	Breeders
				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	Breeders
				2004	0.20	7/9	4	146.00	g	Foundation
				2004	0.10	New planting	4	--		Foundation
				2005	0.10	7/13	4	1.40	lb	Breeders
				2005	0.30	7/13/2006 New planting-not harvested	4	302.00	g	Foundation

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
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
				1999	1.00	8/26	4	87.00 lb
				1999	0.80	10/6	6A	New planting
				2000	0.80	No harvest	--	--
				2000	1.00	Field plowed	--	--
				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	--	--
				2004	1.30	New planting	4	--
				2005	1.30	8/27	4	35.00 lb
FORBS								
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	--	--
				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	--
				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	--

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight		
Utah sweetvetch	Hedysarum boreale		9024375	2005	1.00	New planting	1			
Timp'										
Rocky Mtn penstemon	*Penstemon strictus*		9004712	2004	0.10	New planting	8	--		
'Bandera'				2005	0.10	No harvest	8	--		
Foundation										
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	--	--		
				2002	0.25	No harvest	--	--		
				2003	0.25	7/10 - 8/13	3	2.64	lb	
				2004	0.25	No harvest	3			
				2005	0.25	No harvest	3	--		
Mountain mahogany	*Cercocarpus montanus*	08S035Z	477976	1979	0.02	--	--	--		
'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	
				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	Not all harvested
				1999	0.02	No harvest	--	--		

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				2000	0.02	No harvest	--	--	
				2001	0.02	No harvest	--	--	
				2002	0.02	No harvest	--	--	
				2003	0.02	No harvest	--	--	
				2004	0.02	No harvest	--	--	
				2005	0.02	No harvest	17		
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
				1997	0.30	11/25	21	428.00	g
				1998	0.30	12/9	21	19.00	g Heavy shatter
				1999	0.30	10/26	21	2.18	lb Heavy shatter
				2000	0.30	10/16	21	5.00	lb
				2001	0.30	No harvest	--	--	
				2002	0.30	10/16-10/17	21	2.60	lb
				2003	0.30	No harvest	--	--	
				2004	0.30	10/15	21	0.93	lb
				2005	0.30	No harvest	21		Brush beat and disced
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

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				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	--	--	
				1998	0.01	No harvest	--	--	
				1999	0.01	8/6	21	27.00 g	
				2000	0.01	7/18	21	153.00 g	
				2001	0.01	7/19	21	159.00 g	
				2002	0.01	No harvest	--	--	
				2003	0.01	No harvest	--	--	
				2004	0.01	No harvest	--	--	
				2005	0.01	No harvest	21		
Chokecherry	*Prunes virginiana*	08S235	9024060	1997	0.01	8/15	18	11.90 lb	Not processed
			EPC229	1998	0.01	8/25-8/27	18	115.00 lb	Not processed
				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	--	--	
				2005	0.01	No harvest	18		

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Silver buffaloberry	*Shepherdia argentea*	08S235	9008027	1998	0.01	9/1	18	13.00 g
			EPC476	1999	0.01	No harvest	--	--
				2000	0.01	No harvest	--	--
				2001	0.01	No harvest	--	--
				2002	0.01	No harvest	--	--
				2003	0.01	8/10	18	238.00 g
				2004	0.01	No harvest	--	--
				2005	0.01	No harvest	18	
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	--	--
				2003	0.25	No harvest	--	--
				2004	0.25	No harvest	--	--
				2005	0.25	No harvest	3	

Live Plant Production - 2005

Upper Colorado Environmental Plant Center

By Dr. Gary L. Noller

INTRODUCTION

No live plant shipments were provided by Upper Colorado Environmental Plant Center (UCEPC) in 2005, except for materials that were grown for **special contracts**.

Project 08S208
Annual Report – December 2005
By: Steve Parr

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 materials through 2005. Eight species, including seven shrubs and one tree, were to be delivered in September, 2005.

Contract Species with Deliverable Targets

Common Name	Scientific Name	Accession Number	Quantity
Chokecherry	*Prunus virginiana*	9070995	175
Douglas fir	*Pseudotsuga menziesii*	9070997	100
Fourwing saltbush	*Atriplex canescens*	9024878	100
Gambel oak	*Quercus gambelii*	9024895	875
Mountain mahogany	*Cercocarpos montanus*	9024874	260
Snowberry	*Symphoricarpos oreophilus*	9024898	675
Utah serviceberry	*Amelanchier utahensis*	9024869	875
Woods' rose	*Rosa woodsii*	9070996	175
			3235

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.

ACTIVITIES - UCEPC initiated production on the above species in 2003 with anticipated delivery of September 2005. 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.

RESUTLS – Production of Gambel oak and chokecherry exceeded production targets. However, all other materials were either not produced in adequate numbers or were not of large enough stature for successful transplanting.

The table below identifies the targeted numbers of container grown materials delivered to the park on September 28, 2005. Because UCEPC was 672 plants short of the agreement, additional materials will be produced in 2006 to make up for the shortfall. In addition, two small production agreements were made directly between Mesa Verde National Park and UCEPC to produce most of the same species with the same delivery date. Production of approximately 330 additional shrubs will be conducted in 2006 to complete these agreements. Present inventory

(11/15/05) consists of 628 containerized shrubs for 2006 delivery. Germination of several species continues.

On May 5, 2005, a shipment of 20 species of Mesa Verde collected seed was sent to the park. A second shipment of seed was made to James Ranch Landscaping on October 20, 2005. This seed was field produced by UCEPC in a previous agreement. Mesa Verde personnel also picked up 900 container grown shrubs from UCEPC on September 1, 2005, as partial completion of the two production contracts with Mesa Verde.

Common Name	**Scientific Name**	**Targeted Quantity**	**Delivered Quantity**	**Shortfall**	**Adjusted Numbers**
Chokecherry	*Prunus virginiana*	175	266		91
Douglas fir	*Pseudotsuga menziesii*	100	0		100
Fourwing saltbush	*Atriplex canescens*	100	35		65
Gambel oak	*Quercus gambelii*	875	1130		255
Mountain mahogany	*Cercocarpus montanus*	260	237		23
Mountain snowberry	*Symphoricarpos oreophilus*	675	285		390
Utah serviceberry	*Amelanchier utahensis*	875	477		398
Woods' rose	*Rosa woodsii*	175	133		42
Total:		**3235**	**2563**	**672**	

Delivered numbers greater than targeted

SUMMARY – Production of containerized materials will continue into 2006 to make up for materials not delivered by UCEPC in 2005. Utah serviceberry and mountain snowberry are far short of their target numbers and efforts will be focused on producing these target numbers. There has been interest expressed by Mesa Verde for an additional two party agreement for the production of containerized plant materials in 2006, but no agreement is in place at this time.

Project 08S232
Annual Report – December 2005
By: Dr. Gary L. Noller

DINOSAUR NATIONAL MONUMENT
PLANT MATERIALS AGREEMENT

INTRODUCTION - This report covers the activities conducted by Upper Colorado Environmental Plant Center, for the Dinosaur National Monument Plant Materials Agreement in 2005. 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. Personnel from Dinosaur National Monument came to the plant center in 2005 and a decision was made to remove the original eight rows of bluebunch wheatgrass after the 2005 harvest. Seed was harvested from all seed fields in 2005.

TARGETED SPECIES OF GRASS

Common Name	**Number**	**Scientific Name (Old)**
Alkali sacaton	9070954	*Sporobolus airoides*
Basin wildrye	9070951	*Leymus cinereus* *(Elymus cinereus)*
Bluebunch wheatgrass	9070952	*Psuedoroegneria spicata ssp. spicata* *(Agropyron spicatum)*
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 2005.

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.

Table 1 lists the seed from Dinosaur National Monument stored at the plant center. The following updates the seed fields through 2005.

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 0.69 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 lb 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 lb of clean seed. The original 8 rows of this planting were removed after 2005 harvest due to off types.

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 2.4 lb of clean seed. Harvested July 17, 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 lb 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 2004 (July 16 and September 10) produced 8.0 lb clean seed. Harvested August 9, 2005, produced 2.0 lb of clean seed.

SEED SHIPMENTS

No seed was provided to Dinosaur in 2005.

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 involves 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.

7. Dinosaur personnel came to the plant center in 2005 and a decision was made to remove the original eight rows of bluebunch wheatgrass after harvest.

8. Seed crops were harvested from all seed production fields in 2005.

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

Common Name	Year	Bulk	PLS
Alkali sacaton	1999 harvest	99 g	no test
	2000 2-harvests	2.40 lb	0.70 lb
	2001 " "	13.00 lb	1.50 lb
	2002 " "	6.20 lb	4.50 lb
	2003 harvest	6.00 lb	2.40 lb
	2004 2-harvests	8.00 lb	2.26 lb
	2005 harvest	2.0 lb	---
Basin wildrye	1997 (park collected)	10.69 lb	8.6 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	31.1 lb
	2005 "	37.0 lb	---
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 g	215 g
	2003 (both plantings)	32.00 lb	25.9 lb
	2004 (both plantings)	25.50 lb	21.62 lb
	2005 (both plantings)	13.0 lb	---
Indian ricegrass	1997 (park collected)	8 g	no test
	1999 harvest	1.24 lb	0.80 lb
	2000 "	0.97 lb	0.30 lb
	2001 "	0.95 lb	0.50 lb
	2002 "	3.60 lb	1.15 lb
	2003 "	8.00 lb	3.60 lb
	2004 "	10.00 lb	12.0 lb
	2005 "	12.0 lb	---

Project 08S239
Annual Report – December 2005
By: Steve Parr

BRYCE CANYON NATIONAL PARK
COOPERATIVE AGREEMENT

Project 08S239
Annual Report 2005

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC) signed an Interagency Agreement with Bryce Canyon National Park, USDA Natural Resources Conservation Service, and NPS Denver Service Center in January 2004. The agreement called for the production of two materials in 2004; nodding brome, *Bromus anomalus*, and slender wheatgrass, *Elymus trachycaulus*. Only slender wheatgrass was produced in 2005, as altered with Amendment 1. It will be produced again in 2006. A second amendment, also signed in 2005, calls for the production of 7,000 grass seedlings and 100 shrub seedlings for additional revegetation needs.

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 2007.

ACTIVITIES – For the first time in six years, our area experienced average or above average precipitation. Bryce slender wheatgrass produced a significant amount of seed in 2005. We estimated 700 pounds of harvested product. However, for reasons unknown, a substantial amount of water was found in one of the two bins in which the seed was stored. One bin was nearly a total loss. The second bin was fine, producing 189 pounds of clean seed from the 0.5 acre planted August 12, 1998, 0.8 of an acre that was planted September 5, 2000, and 1.2 acres that were planted August 13, 2004. After harvest, the 0.5 acre planting from 1998 was removed. Also removed was the 0.5 acre nodding brome field. Russ Haas, National Plant Materials Technical Liaison, viewed the fields in early July and concurred with UCEPC that the nodding brome field should be removed prior to harvest. The one half-acre nodding brome field was planted August 29, 2001, and produced one year longer than was expected.

One seed shipment, 103 bulk pounds (60 PLS) of slender wheatgrass, was sent to Bryce Canyon on August 4, 2005. The new 1.2 acres of slender wheatgrass and the 0.8 acre planted in 2000 will be in production for 2006. In addition, 7,000 grass plugs and 100 native shrubs will be produced in 2006.

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.

Species	Collected Weight	Clean Weight
Antelope Bitterbrush	34.4 g	19 g
Black Sagebrush	104.0 g	7 g
Indian Ricegrass	169.7 g	54 g
Long Flowered Rabbitbrush	1.1 g	Too small of quantity to clean
Needle and Thread	576.9 g	238 g
Parry's Rabbitbrush	4.4 g	< 1 g
Yellow Rabbitbrush	0.9 g	Too small of quantity to

clean

The targeted production quantities for the above species were identified by the amendment. Slender wheatgrass, which is being field produced, will constitute the largest production effort at 3,500 plugs. Needle and thread as well as Indian ricegrass will each be produced at half the amount of slender wheatgrass at 1,750 each for a total of 7,000 grass plugs. Approximately 40 black sage, 40 antelope bitterbrush, and 20 rabbitbrush plants were identified for large container production. The shrub production may be altered depending on germination of the three separate rabbitbrush species.

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	Not available	2005

Total Seed Inventory

96 bulk pounds of nodding brome	2004 seed lot
74 bulk pounds of slender wheatgrass	2004 seed lot
189 bulk pounds of slender wheatgrass	2005 seed lot

DISCUSSION – Two amendments between UCEPC and Bryce Canyon are directing activities for field production of slender wheatgrass through 2006 and containerized production of three grass species, and a minimum of three shrub species for park uses. The grass plugs will be delivered in 2006 with the shrub containers targeted for delivery in 2007.

Project 08S240
Annual Report 2005
By: Steve Parr

GRAND TETON NATIONAL PARK
COOPERATIVE AGREEMENT

Project 08S240
Annual Report 2005

INTRODUCTION - This report covers the activities related to the cooperative agreement between Upper Colorado Environmental Plant Center and Grand Teton National Park. The fully executed agreement, Interagency Agreement 1211-01-002, was formally signed in September of 2001. The agreement called for the production of five grass species through fiscal year 2005 for revegetation uses within Grand Teton National Park. Seed collection of one species, prairie Junegrass, was unsuccessful. A substitute species, showy goldeneye, was collected by park personnel and planted for increase instead.

ACTIVITIES - Upper Colorado Environmental Plant Center (UCEPC) had established a 1.1-acre field of basin wildrye on October 5, 1999. In addition, four other species were targeted for seed increase. Blue wildrye, bluebunch wheatgrass, slender wheatgrass, and prairie Junegrass were targeted for seed increase by UCEPC for revegetation purposes for several highway projects within Grand Teton National Park. On July 25, 2001, a meeting was held at Jackson Hole, Wyoming between Grand Teton Park personnel, UCEPC staff, Wyoming Department of Transportation, and Bridger-Teton National Forest staff to coordinate seed collection, species selection, and general increase efforts for the area in close proximity to Jackson Hole.

Collection efforts in Grand Teton were to focus on three species, prairie Junegrass, slender wheatgrass, and blue wildrye. Grand Teton seed previously produced by UCEPC was to have been used if possible for the increase effort. Seed test results on bluebunch wheatgrass and slender wheatgrass seed held in inventory at UCEPC were to determine whether seed of those two species could be used from inventory rather than from collection. Seed was sent to Colorado State University Seed Laboratory for analysis in March of 2001.

Test results indicated no germination for slender wheatgrass, 32%, and 26% germination for two lots of bluebunch wheatgrass. As a result of the seed tests, slender wheatgrass was also targeted for collection, but bluebunch produced in 1992 was used to establish a 1-acre field on August 29, 2001. A good to fair stand, (70%-80%), was noted in October, but vigor was less than two plantings of different species on either side, blue wildrye and nodding brome, for other project partners. Seed production was expected from both the bluebunch field and the basin wildrye field in 2002.

From seed collection efforts by park personnel, good collections of slender wheatgrass and blue wildrye were obtained. In addition, collections of Utah sweetvetch and upland Carex were also sent to UCEPC for cleaning. Discussions about producing Utah sweetvetch as an additional species occurred, so it was also tested. The Carex was cleaned only and was to be used directly for park projects. The prairie Junegrass collection was again, more difficult than the other products. As a result of two years of poor seed fill for the species, discussions of a substitute species, pinegrass, were made between Stephen Haynes, Russ Haas, and UCEPC. Collection of pinegrass did occur during the summer of 2002, but the seed was used within the park. During 2003, 1.16 clean pounds of showy goldeneye seed resulted from collections by park personnel. This material was used to establish a 0.3-acre field in 2004.

Listed below are the species by accession, the clean weights of collected seed, and the PLS quantities of each product tested.

Blue wildrye	9070983	14 lb	8.4 PLS lb
Prairie Junegrass	9070986	41 g	no test
Showy goldeneye	not accessioned	1.16 lb	no test
Slender wheatgrass	9070982	12.5 lb	11.3 PLS lb

Two additional non-contract materials were collected by park employees and cleaned by UCEPC during a previous year, and timber oatgrass was collected by park employees in 2004 and sent to UCEPC for cleaning.

Carex species	not accessioned	5.93 lb	no test
Timber oatgrass	not accessioned	0.62 lb	no test
Utah sweetvetch	not accessioned	0.82 lb	184 PLS g

The seed collections of slender wheatgrass and blue wildrye resulted in establishment of 1-acre fields of each product in July 2002, and a collection of showy goldeneye in 2003 allowed seeding of 0.3 acres on July 28, 2004.

Common Name	**Scientific Name**	**Acreage**	**Quantities**
Basin wildrye	*Elymus cinereus*	1.1	1000 lb
Blue wildrye	*Elymus glaucus*	1.0	600 lb
Bluebunch wheatgrass	*Pseudoroegneria spicata*	1.0	400 lb
Showy goldeneye	*Viguiera multiflora**	0.3	NA
Slender wheatgrass	*Elymus trachycaulus*	1.0	1200 lb

*Inadequate seed from collections have resulted in selection of an alternate species for 2004 establishment.

Correspondence between Steve Parr, UCEPC Manager, and Kelly McCloskey, Grand Teton Ecologist, identified a remedy for production shortcomings both in terms of fields not being established on schedule for targeted materials and for the loss of production of bluebunch wheatgrass in 2005. As discussed with Kelly, the bluebunch wheatgrass field was very infected with downy brome. The infestation was so great, that it was viewed as a total production loss. There simply was no solution to harvest a reasonably good crop without significant contamination.

Two options for “credit production” were presented to Kelly for consideration. One option would have enabled UCEPC to use the herbicide “Plateau” on an experimental basis to control cheatgrass in the bluebunch field and the slender wheatgrass field. We would have harvested 1.1 acres of basin wildrye and, if the herbicide trial was effective, harvest 0.45 acres each of the two treated fields for total harvest of 2 acres.

The second option was for UCEPC to plant 1 acre of slender wheatgrass in 2005 and harvest it in 2006. This was the option that was selected. On August 23, 1 acre of slender wheatgrass was planted in UCEPC Field 18.

Two separate seed shipments were made to Grand Teton National Park. On May 11, seed of basin wildrye, slender wheatgrass, and blue wildrye was shipped. The second shipment was made on October 19, 2005 and included the above species and bluebunch wheatgrass.

RESULTS

Species	Basin wildrye	
Field Establishment	October 5, 1999	1.1 acre
Production	2000	no harvest
	2001	13 lb
	2002	53 lb
	2003	225 lb
	2004	60 lb
	2005	136 lb
Species	Bluebunch wheatgrass	
Field Establishment	August 29, 2001	1.0 acre
Production	2002	no harvest
	2003	71.0 lb
	2004	65 lb
	2005	No harvest
Species	Blue wildrye	
Field Establishment	July 19, 2002	1.0 acre
Production	2003	25 lb
	2004	107 lb
	2005	70 lb
Species	Showy goldeneye	
Field Establishment	July 28, 2004	0.3 acre
Production	2005	No harvest
Species	Slender wheatgrass	
Field Establishment	July 15, 2002	1.0 acre
Production	2003	227 lb
	2004	405 lb
	2005	293 lb
Field Establishment	August 23, 2005	1.0 acre

Project 08S240
Annual Report 2005

SUMMARY - In fiscal year 2001, a formal agreement between Grand Teton National Park and Upper Colorado Environmental Plant Center was initiated. The agreement called for the production of five grass species through fiscal year 2005. Because of poor germination, seed of only one of the contracted species was viable enough to establish a field in 2001. Two other materials were collected in 2001 as a result of seed tests. Blue wildrye and slender wheatgrass were planted in 2002 and bluebunch wheatgrass and basin wildrye were already in production, making a total of five materials in production. Dry conditions in the park prevented good collections of prairie Junegrass, the fifth species called for in the agreement, so in 2002 pinegrass was collected by park personnel as a substitute species. However, this material was used for other park purposes. In 2003, a collection of showy goldeneye was provided to UCEPC from the park and this material was cleaned and planted in 2004. The agreement ended in 2005. However, UCEPC will produce slender wheatgrass seed in 2006 to make up for the loss of production of bluebunch wheatgrass in 2005.

Project COPMC-S-0107-CR
Annual Report 2005
By: Steve Parr

LASSEN VOLCANIC NATIONAL PARK
COOPERATIVE AGREEMENT

INTRODUCTION - This report covers the activities of the Upper Colorado Environmental Plant Center (UCEPC) as they relate to Interagency Project IA9000-01-004 for the production of seed materials for Lassen Volcanic National Park. The original agreement called for the establishment and production of a single material, blue wildrye, through fiscal year 2003. This agreement was signed into effect in June of 2001. A second material, California brome, was later added to the agreement through an amendment signed into effect in September of 2001. This amendment added the production of California brome through fiscal year 2003 for Lassen. A second amendment, signed in November of 2002, allowed for the transfer of funds for the cleaning of wild collections of seed from Lassen Volcanic National Park in 2002. In 2003, a third amendment was signed that calls for the production of established materials through 2004. Finally, a fourth amendment was signed in August 2004 that extends the production of both materials through 2005.

ACTIVITIES - The two collections that were established for seed increase fields were given the following accession numbers for identification and tracking purposes:

Blue wildrye	*Elymus glaucus*	9070984
California brome	*Bromus carinatus*	9070985

Blue wildrye was collected during the 2000 growing season by Bitterroot Restoration and was shipped to UCEPC for planting during 2001. A message following the shipment from Bitterroot indicated the seed had been cleaned and treated with a 5% bleach solution for five minutes to help reduce the mold, which was detected on the seed after collection and prior to shipment. Upon
receipt, UCEPC prepared to plant the seed, but on the date of planting discovered the seed to be too “fluffy” for proper distribution. As a result, UCEPC further cleaned the seed and sent a sample to the Colorado State Seed Laboratory for analysis of purity, germination, off type seeds, and to see if they could determine damage by the worms (larvae) which Bitterroot had detected prior to UCEPC planting. The seed test results were completed on July 27, 2001 and no worms were noted.

On September 4, 2001, 1 acre of Lassen Volcanic National Park blue wildrye was planted. A very good stand was noted in October.

The California brome was collected during the 2000 and 2001 growing seasons and samples of each collection were sent to the Colorado Seed Laboratory in the fall of 2001. The reports were completed on October 19, 2001. The collection from 2000, while having the best germination, had a very high percent of other crop seed, at nearly 3%. Since the collections occurred in Lassen, conversations with Russ Haas indicated it would be all right to plant the brome with the blue wildrye seed in it without concern of crop contamination from that species. The other two lots, LAV02 and LAV03, had a high amount of visible head smut. As a result, only a small amount of LAV03 seed was planted, along with the entire LAV01 seed lot. Each material was treated with Vitavax for head smut control.

On November 16, 2001, 4.8 rows of LAV01 California brome were planted. An additional 65 feet of LAV03 seed was planted in the southeast portion of row 5. Both materials were treated for head smut control at 2 grams per pound of seed treated. A planting rate of 36 PLS seeds per foot of row was achieved with the Planet Junior seeding of the 4.8 rows. A hoe was used to plant the last 65 feet.

Because of the limited amount of California brome which was available for planting, it was determined that seed collected from Lassen Volcanic National Park be used to supplement the 2001 planting if possible. An e-mail from Russ Haas on June 4, 2002, to Sara Koenig, Plant Ecologist for Lassen, asked for her input. It was suggested that if collection opportunities looked grim within the park, that seed harvested from the established stand at UCEPC could be used to boost the planting. Sara indicated that Lassen personnel or Bitterroot Growers would try to collect California brome seed from within the park to add to the planting. Irrigation and hand weeding were conducted as necessary during the season. An application of herbicide was also applied for broadleaf weed control as a post-harvest treatment. No other field activities were conducted in 2002.

We received a request from Sara on September 23, 2002 for a shipment of seed for a project they were working on. On September 27, 2002, seed of two species, both UCEPC produced materials and wild collected seed, were shipped to Sara at the park. Included with this shipment was a Distribution and Delivery Record and an explanation of the materials shipped. This shipment also included the 2002 UCEPC production of blue wildrye and California brome, which is customarily shipped the following year. Because of the need for seed, however, it was determined that a tetrazolium test would have to suffice for planting purposes as time would not allow a full germination test to be useful for planning seed distribution. Tetrazolium tests were conducted for both produced materials and results were completed by October 2, 2002 (seed test results included).

Bitterroot Growers had collected approximately 5 pounds of California brome, which they sent to UCEPC for field increase. This seed was tested by the Colorado Seed Laboratory for purity and germination and was completed on November 27, 2002. As indicated, this seed was to be used to increase the production field size to 1 acre as per the agreement. From a conservative position, it was felt that no seed from this lot should be shipped without first establishing the remainder of the field at UCEPC.

May 29, 2003, an additional 0.7 acres of California brome was planted in field 2, next to the existing planting. The total planted acreage is 0.88, or twenty-six 480-foot rows. Seed collected from the park the previous year was used for the field addition, and all but the four southern most rows were treated with Vitavax for head smut control.

During the growing season in 2004, no smut was noted in the section of the brome field that was planted in 2001, even the portion that was planted with smutted seed. However, the portion of the field not treated with Vitavax was completely smutted, and as a result, was not harvested. The remaining portion of the field that was treated did have some incidence of smut, but was estimated to have less than 20% smut infection.

On July 27, 2004, four rows or 0.13 acres of California brome was planted with seed produced in 2003. The 2003 seed did not have noticeable head smut, but was also treated with Vitavax prior to planting.

Several evaluations during the 2005 growing season showed that the far southern rows that were not treated for head smut reduction were extremely smutted. The other two plantings that were done in late May and late July both had some head smut. Head smut infection was estimated at 20%. The planting done in November had very little head smut, but it did have some. It is estimated that the head smut infection in this planting was less than 5%.

In 2005, 83 clean pounds of blue wildrye seed were produced. Lassen California brome produced 134 clean pounds of seed. Both materials were down in production this year, and it is the opinion of UCEPC that both materials were in decline and should be removed. UCEPC contacted Russ Haas, National Plant Materials Technical Liaison, to confirm that there would be no extension to the agreement and no desire by Lassen Volcanic to have UCEPC produce seed of these products in 2006. Russ indicated the agreement was over and for us to remove the two fields.

On September 14, 2005, a single seed shipment was made to Lassen Volcanic National Park. Two materials, 32 pounds (20 PLS) of California brome and 60 pounds (33.4 PLS) of blue wildrye were sent for park revegetation needs. On October 28, UCEPC received 52 pounds of blue wildrye and 23 pounds of California brome from Lassen that had not been used as planned. These products were added to the current inventory which is identified in the table below.

Lassen Volcanic National Park Seed Inventory

Year Produced	Blue Wildrye	California Brome
2003	166 lb	33 lb
2004	278 lb	191 lb
2005	83 lb	134 lb
Total	527 lb	358 lb

Project COPMC-S-0107-CR
Annual Report 2005

A summary of UCEPC activities that have been conducted to meet the terms of the cooperative agreement with Lassen Volcanic National Park is provided in tabular form below.

RESULTS

Species	Blue wildrye	*Elymus glaucus*
Seeded	1 acre with Planet Junior	September 4, 2001
Harvested	10.4 lb	July 18, 2002
Shipped	10.4 lb	September 27, 2002
Harvested	205 lb	July 21, 2003
Shipped	40 lb	September 11, 2003
Harvested	285 lb	July 15, 2004
Shipped	4.6 lb	October 8, 2004
Harvested	83 lb	July 19, 2005
Shipped	60 lb	September 14, 2005
Returned	52 lb	October 28, 2005
Species	California brome	*Bromus carinatus*
Seeded	0.18 acres with Planet Junior and 65 feet of southeast part of row 5 with a hoe.	November 16, 2001
Harvested	1.4 lb	July 11, 2002
Shipped	1.4 lb	September 27, 2002
Seeded	0.69 acres (but 0.13 acre not treated with Vitavax)	May 29, 2003
Harvested	64 lb	June 30, 2003
Shipped	30 lb	September 11, 2003
Harvested	200 lb	July 2, 2004
Seeded	0.13 acres making total California brome field 1 acre	July 27, 2004
Shipped	2.2 lb	October 8, 2004
Harvested	134 lb	July 6, 2005
Shipped	32 lb	September 14, 2005
Returned	23 lb	October 28, 2005

Project COPMC-S-0107-CR
Annual Report 2005

SUMMARY - During the first year of Interagency Agreement 9000-01-004, two species were tested by the Colorado Seed Laboratory, and identified for purity, germination, off type seeds, and dormancy. This information provided a basis for the selection of seed lots for the establishment of seed production fields at UCEPC. Seed lot selections were made and successfully planted in 2001 for seed increase for future revegetation uses at Lassen Volcanic National Park. Seed planted in 2001 was harvested, cleaned, tested via tetrazolium methods, and returned to the park for use on a project in 2002.

In 2003, seed harvested in June and July was cleaned on September 8 and 9 and shipped September 11, 2003. This rapid turnaround was possible because of a speedy seed test conducted by the Colorado State Seed Laboratory. The Seed Lab tested for purity and live seed from a tetrazolium test and reported the results a day after receiving the seed. These products were received by the Lab on September 10 and reported out on September 11! The seed was then prepared and shipped on September 11 for park uses. In 2004, only a small amount of seed was requested, and this was supplied from the 2003 seed lot.

The incidence of head smut in California brome from Lassen Volcanic continues to be puzzling. To date three different planting dates and five different plantings have been conducted with the Lassen California brome. A November planting with treated seed, even when used on visually smutted seed, has produced very few infected seed heads. A May planting produced severely smutted heads in untreated seed and some incidence in treated seed (<20%). A planting done in late July with treated seed also had about 20% head smut infection. Smut infection reduced production by nearly 40% in the California brome (the six untreated rows represent 20% of the total planted and 20% of the remaining rows). Even so, the field produced 399.4 clean pounds of seed which includes a 1.4 pounds year the year after planting the first few rows. Blue wildrye produced 583.4 pounds of clean seed including 10.4 pounds the year after establishment. Together, 982.8 pounds of clean seed have been produced by UCEPC for Lassen Volcanic National Park revegetation needs. UCEPC will maintain on inventory the remaining seed until requested or until 2008.

The conditions and deliverables of this agreement are considered by UCEPC to have been successfully completed.

Project COPMC-S-0307CR
Annual Report 2005
By: Manuel Rosales

GREAT SAND DUNES NATIONAL MONUMENT AND PRESERVE COOPERATIVE AGREEMENT

Project COPMC-S-0307CR
Annual Report 2005

INTRODUCTION - This report covers the activities of Upper Colorado Environmental Plant Center (UCEPC) as they relate to Interagency Project IA1211-03-001 for the production of seed materials for Great Sand Dunes National Monument and Preserve. This agreement was signed into effect in February of 2003, and calls for the production of two materials (Blue grama and Indian ricegrass) through 2005 for revegetation uses within the monument. In addition, an amendment to the above interagency agreement was signed in 2004. The amendment stipulates that UCEPC will establish two-tenths of an acre seed increase of ring muhly (*Muhlenbergia torreyi)*

ACTIVITIES – As per agreement, the three native grass species were planted in July 2004. The Blue grama and ring muhly had to be replanted in July 2005 due to unsuccessful establishment of both plantings. The blue grama was damaged by frost heaving (lifting and lateral movement of soil due to freezing) and ring mulhly failed to establish a good stand. Both species replanted in 2005 had good germination and established a good stand (see attached pictures). Hopefully they can survive the winter and some seed can be secure this year 2006.

The following table summarizes the project to date.

Species	**Scientific Name**	**Accession Number***	**Establishment Acres**	**Target Production**	**Planting Date****
Blue grama	*Bouteloua gracilis*	9070998	1.0	54 lb	7/23/04
Indian ricegrass	*Achnatherum hymenoides*	9070999	0.5	26 lb	7/27/04
Ring muhly	*Muhlenbergia torreyi*		0.2	***	7/30/04

* Assigned accession numbers for germplasm tracking through time
** Blue grama and ring muhly were replanted in July 5 and July 6, 2005, respectively.
*** Undetermined

RESULTS – The Indian ricegrass planted in July 2004 was harvested on August 12, 2005. The resulting clean seed (bulk weight) from this harvest was 2.6 pounds.

The blue grama and ring muhly replanted on July 2005 are progressing well. (see attached pictures)

Blue grama (Picture taken by Rosales-September 25, 2005)

Ring Muhly (Picture taken by Rosales-September 25, 2005)

Project COPMC-S-0308-CR
Annual Report - December 2005
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 April 22, 2003. This agreement involves the collection and seed production of eight species; four forbs and four grasses, that will be used in the revegetation of the Bear Lake Road reconstruction 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 1,500 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.

Bear Lake Road Revegetation 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 golden aster	*Heterotheca villosa*	HEVI	9070992
Purple loco weed	*Oxytropis lambertii*	OXLA	9070989
Spreading golden bean	*Thermopsis divericarpa*	THDI	9070990

ACTIVITIES - This year, seven of eight materials were harvested for use in the revegetation of the Bear Lake Road construction project. Three forbs, hairy golden aster, purple locoweed, and golden spreading bean, all produced at or near their productive potential based on three years of observation. Fringed sage produced about half of what it produced in 2004, but remains healthy. The four grasses have produced little seed, with blue grama producing a little more than ten pounds this year. Small quantities of seed were harvested from mountain muhly and needle-and-thread in its first production year. Prairie Junegrass was established by plugs in 2004 and did not produce seed in 2005. The experimental plot (25' x 35') of mountain muhly, established in 1997, produced a small amount of seed again this year.

The production of containerized stock was conducted for a second year to improve the stands of previously planted fields. On June 30, approximately 5,500 plugs of needle-and-thread were transplanted with a modified Holland single row transplanter. In August, an additional 5,500 blue grama, 2,500 mountain muhly, 2,000 golden aster, and 45 purple locoweed plugs were hand transplanted in areas with thin stands. All of this effort should improve production in each of these fields in the future.

A seed germination trial was conducted for fringed sage to determine if:

a) UCEPC results matched third party seed test results and

b) purity results matched third party seed test findings

The conclusion of our findings resulted in Colorado State Seed Laboratory retesting the fringed sage and issuing a second report that agreed closely with our test.

There was very little seed production in 2004 which resulted in a very low inventory from which to use seed for the revegetation work in 2005. As a result, it was necessary to use the 2005 harvested seed for revegetation in the fall of 2005. Rocky Mountain National Park requested that UCEPC clean all the harvested products and have them tested via the tetrazolium method in order to expedite the delivery of the seed to the park for planting. The seed was cleaned near the end of September and delivered to Rocky Mountain National Park on October 5, 2005.

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	*Stipa comata*	12.9	0.5	0.5 (t)
Forbs/Legumes				
Fringed sage	*Artemisia frigida*	1.7	0.02	0.02(t)
Hairy golden aster	*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 golden bean	*Thermopsis divericarpa*	86.5	2.0	2.0 (s)
	Total:	141.7lb	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 acres in solid rows instead. This accounts for the difference in Proposed Acres and Planted Acres.

RESULTS – Seed harvest, although limited, was conducted for seven Rocky Mountain National Park materials in 2005. Seed production was quite disappointing for the grass species, but was perhaps as good as might be expected from the forb fields. Production of containerized plant materials through the greenhouse was again conducted to improve field stands of five species.

SPECIES	**Blue grama**			
Field Establishment	August 27, 2003	Approx. 15,000 transplants	Transplanter	1.2 acres
	June 9, 2004	Approx. 4,000 transplants	Hand transplant	Interplanted
	August 1, 2005	5,500	Hand transplant	Interplanted
Harvest	October 7, 2004	7 lb bulk	Hand harvest	
	September 2, 2005	10.4 lb bulk	Large combine	
Shipment	October 5, 2005	2,549 g and 10.4 lb		
SPECIES	**Fringed sage**			
Field Establishment	September 4, 2003	600 transplants	Transplanter	0.02 acres
Harvest	September 10, 2004	3.5 lb bulk	Hand harvest	
Harvest	October 18, 2005	1.8 lb bulk	Hege combine	
Shipment	October 5, 2005	3.5 lb bulk		
SPECIES	**Golden aster**			
Field Establishment	May 29, 2003	203 PLS g	Planet Junior	0.8 acres
	August 5, 2005	2,000 transplants	Hand transplant	Interplanted
Harvest	September 1, 2005	20.5 lb bulk	Hege combine	
Shipment	October 5, 2005	20.5 lb bulk		
SPECIES	**Mountain muhly**			
Field Establishment	May 28, 2003	59 PLS g	Planet Junior	0.5 acres
	August 3, 2005	2,500 transplants	Hand transplant	Interplanted
Harvest	October 21, 2004	29 g	Hand harvest	
Harvest	October 17, 2005	443 g	Hand harvest	
Shipment	October 5, 2005	70 g		
SPECIES	**Needle and thread**			
Field Establishment	September 4, 2003	600 transplants	Transplanter	.07 acres*
	September 14, 2004	4,000 transplants	Transplanter	0.20 acres
	June 30, 2005	5,500 transplants	Transplanter	0.30 acres
Harvest	June 30, 2005	14 g	Hand harvest	
Shipment	October 5, 2005	1,080 g		
SPECIES	**Prairie Junegrass**			
Field Establishment	May 29, 2003	28 g	Planet Junior	0.2 acres*
	September 15, 2004	4,000 transplants	Transplanter	0.2 acres
Harvest	No harvest to date			
SPECIES	**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	
Shipment	October 5, 2005	290 g and 5.8 lb		
SPECIES	**Golden Banner**			

Field Establishment	May 28, 2003	11.7 lb planted	Planet Junior	2.0 acres
Harvest	July 7, 2004	2.5 lb bulk	Hand harvest	
Harvest	July 18-19, 2005	21 lb bulk	Hege and hand	
Shipment	October 5, 2005	23.4 lb bulk		

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.

One seed shipment was made on October 5, 2005, for the Bear Lake Road reconstruction project. Over 70 pounds of clean seed was shipped to Rocky Mountain National Park for use in revegetation.

CONCLUSION – This year signifies the final year of the three year agreement. Overall, the project results to date have been very disappointing to both Rocky Mountain National Park and UCEPC. A number of factors have culminated in results that are far short of what was hoped for. These factors are discussed below.

- **Species Selection -** The most significant reason for low seed production was the choice of the species selected for increase. Of the eight species chosen for seed production, seven are not available commercially other than from small independent collections. No commercial varieties exist for any product other than blue grama. This is more often than not an indicator that the materials are not easy to work with and generally do not yield seed amounts equal to resource inputs when compared to other species. Seven of eight species are experimental.

- **Seed Quantity/Quality –** The amount of good seed provided to UCEPC to establish production fields was less than optimal for a project with a short turnaround time from collection to revegetation. Target seeding rates were reduced by 50% for golden aster and purple locoweed in order to “stretch” the seed to plant as much ground as reasonable.

- **Drought –** The limited amount of seed collected for field establishment was directly related to the drought conditions of 2002. However, the drought was well underway in 2000 and continued through 2004. Moreover, two of the driest years on record and the four driest years in a row at UCEPC were from 2001through 2004. Cool season plants do not perform well in those conditions. Plants and production fields were not at their optimum. However, irrigation was applied to all of the crops to improve plant vigor.

- **Turnaround Time –** The condensed length of the project allowed for virtually no buffer or wiggle room in terms of collection, establishment or production in order to satisfy the needed seed for revegetation.

- **Plant Production/Management –** Species with low seedling vigor are slow to establish and develop, and do not yield appreciable amounts of seed. In addition, those same species are much more difficult to manage because they remain small with little vigor for an extended period of time. Plants with low vigor allow for weed encroachment and competition. Herbicide use is also a touchy, if not completely experimental proposition, especially when growing forbs. UCEPC's control of weeds was not as good as it should have been for field establishment of directly seeded materials. Three fields were established by transplants because of the limited amount of seed collected during the drought year of 2002. For the first time, UCEPC used a transplanter to establish fields with greenhouse produced plugs. The transplants were not well suited for the transplanter, and only limited success for field establishment was realized. In 2004, a seasonal employee inadvertently removed the established needle and thread grass field with cultivation equipment. This is totally without excuse and should never have occurred under any circumstances.

The inexperience and poor results with the transplanter and transplants, the accidental removal of a production field, and the lack of good weed control on seeded fields by UCEPC led us to produce over 25,000 transplants at no additional cost to the agreement to improve the stands in the transplanted and directly seeded fields. These augmentation activities have been reported annually in the Rocky Mountain National Park Cooperative Agreement report and through periodic correspondence and visitations by Russ Haas.

In retrospect, all parties are responsible for the terms of the agreement and the ensuing results. A project requiring revegetation that depends on experimental materials to provide the bulk of the seed is at best, a very risky proposition, even under ideal circumstances. To do so for a project with a tight production window and under known drought conditions before collections were even initiated was simply stacking the odds at a level that was, and has been, insurmountable.

On a brighter note, the production fields are now established. There is some field improvement work that can be done, but on a limited basis. However, even on a good year, total clean seed production from all materials may not be 100 pounds. Hopefully our experience with these materials will help in planning Phase II or other projects where these same collections are considered. The cooperative agreement for Phase I is completed.

UPPER COLORADO ENVIRONMENTAL PLANT CENTER

WEATHER SUMMARY FOR 2005

Prepared by Dr. Gary L. Noller

PRECIPITATION

In 2005, precipitation measured 19.90 inches, 22.9 percent above our longtime average of 16.19 inches (Table 1). This was the first year since 1999 that we exceeded our longtime average. Five months (January, June, September, October, and November) were considered wet (Table 2). During these five months 11.06 inches of precipitation were recorded, 55.6 percent of the total for the year. June was the third wettest (3.55 inches) since 1976 (1984 with 4.22 inches and 1998 with 3.58 inches). July was the only month in 2005 considered dry with only 0.58 inch, which is 55.6 percent below the normal precipitation of 1.51 inches.

SNOW

Snowfall in 2005 measured 73.0 inches (Table 2). However, snow represented only 25.6 percent of the total precipitation for the year, when considering the times snow was recorded and not when snow and rain occurred together.

GROWING SEASON

In 2005, the frost-free growing season measured 94 days. This represents the period from June 13 to September 19. Precipitation during this important period measured 4.19 inches and represents only 21.1 percent of the total for the year. This period includes July which was a dry period within the growing season.

TEMPERATURES

Temperatures in 2005 were, in general, mild without extremes of heat or cold. Lows below 0°F (Fahrenheit) were recorded on 14 recording dates and highs failed to reach 32°F, or above, on only 12 recording dates (Table 2). A maximum temperature of 85°F or above was recorded on only 30 recording dates. The highest average monthly maximum temperature (89.6°F) was recorded in July and the lowest average monthly minimum (5.1°F) was recorded in December.

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**

* 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.

Bottlebrush squirreltail
Wapiti

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