

2010 Annual Technical Report

Upper Colorado Environmental Plant Center



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2010 Annual Technical Report

Board and Staff of Upper Colorado Environmental Plant Center

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Upper Colorado Environmental Plant Center

Fiscal Year 2010

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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 6500 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 or steve.parr@co.nacdnet.net.

Studies

Antelope Bitterbrush for Fire Tolerance

INTRODUCTION

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

Antelope bitterbrush has a high priority for use in revegetation of surface disturbances related to oil and gas production, pipelines and service roads, wildlife habitat improvement, and rangeland seeding in the Upper Colorado River Basin. The prostrate layering characteristic of certain accessions of antelope bitterbrush is considered beneficial for these purposes, and native shrubs are of great importance for species diversity and community restoration.

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

OBJECTIVES

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

METHODS

Tubling plants of 17 accessions were grown in the greenhouse and transplanted to a dryland site on June 6, 1983. No irrigation was applied after establishment. Plants were planted in rows with 8-foot centers. Table 1 lists the accessions included, their origin and the numbers planted in each of two replications. Each accession was planted in two replications of 15 plants each where adequate planting stock was available. However, these four accessions, 9038520, 9038526, 9030795, and 9038530, were represented by only one replication, and accession 9038527 was represented in each of two replications by 12 plants rather than 15.

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

Project No. 08A073J
Progress Report – 2010
By: Steve Parr

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

1992

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

2005

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

2007

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

2008

Herbicide was again applied to control annual weeds, and pruning of decadent growth was done to improve vigor and appearance of planting. However, no seed was collected according to the seed cleaning records. Hard freezing temperatures were recorded on June 9, 10, 12, 13, and 16 which very likely affected seed set this year.

RESULTS

Accession 9038521 (from Soda Springs, Idaho) was identified as having the best ability to sprout after fire. Both replications (Row 12 and 25) were evaluated on August 16, 1996, (Table 2). In row 12, (north) one of the six plants that were burned was dead on August 16. Three burned plants had abundant regrowth, while the other two had only a small amount of regrowth.

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

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Progress Report – 2010
By: Steve Parr

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

ROW	ACCESSION NUMBER	COLLECTION LOCATION	PLANTED
1	9031619	Colorado, (NPMC)	15
2			0
3	9038525	Six Mile Lake, OR	15
4	9038523	Celilo, OR	15
5	9007977	Rio Blanco County, CO	15
6			0
7	9024076	Eagle, ID	15
8	9038527	Weber County, UT	12
9			0
10			0
11	9024373	Moffat County, CO	15
12	9038521	Soda Springs, ID	15
13	9009355	Inyo County, CA	15
14	9038522	South Pass, WY	15
15	9038531	Moffat County, CO	15
16	9024377	Moffat County, CO	15
17	9038524	Long Valley Jct., UT	15
18	9030795	Colorado (NPMC)	7
19	9038524	Long Valley Jct., UT	15
20	9031619	Colorado (NPMC)	15
21	9038530	College Farm, NM	14
22	9024377	Moffat County, CO	15
23	9024373	Moffat County, CO	15
24	9007977	Rio Blanco County, CO	15
25	9038521	Soda Springs, ID	15
26	9009355	Inyo County, CA	15
27	9038527	Weber County, UT	12
28	9038520	St. Anthony, ID	9
29	9038523	Celilo, OR	15
30	9038525	Six Mile Lake, OR	15
31	9038526	Caribou County, ID	15
32	9038522	South Pass, WY	15
33	9024076	Eagle, ID	15
34	9038531	Moffat County, CO	15

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Notes taken on August 16, 1996, on the plants are presented below in Table 2.

Table 2. A listing of the evaluation information collected on August 16, 1996, for 9038521.

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

2000

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

2007

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

2009

The northern plot still contains 11 live plants. Plant 7, the 7th plant from the northern most plant, has layered and rooting has occurred south and west of the apparent “mother plant”. It is possible that seed also established these plants, but it is not very evident as rooting appears to come directly from the parent plant. Plant 8 also has rooted from layered branches.

There are 13 plants in the southern block, but 4 plants look like they are volunteers based on size. Plant 3, 8, 12 and 13 - north to south- are small plants. Additionally, there were only 11 plants present after the 1996 and 2007 evaluations. However, in 2008, considerable plot clean up, weed control and decadent woody material was removed from the project, and the two “new plants” are likely 3-5 years old.

2010

The plots were evaluated on September 1, 2010. Field notes taken state...”Plants are remaining reasonably healthy in each of the two replications. Southern replication has 12 plants in it, but 2

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most southern are very likely not original plants based on size. Plant 2 from the north in the southern rep looks weak.

Northern replication has 10 plants, and of those, plants 1 and 2 on the northern end are weak. Plants 9 and 10 have had some mechanical damage – probably discing and main stems were broken. Pre-emergent should be applied to these plots.”

This year, 314 grams of seed was collected off of the plots.

CONCLUSION

Year 2010 will represent 27 years of growth for the bitterbrush plants at UCEPC. It is hoped that seed can be collected from the plots this year, and that more intense management will improve plant performance. Seed will be used for further studies, including the determination of fire tolerance of another generation of plants, site adaptability and comparison to other bitterbrush sources that are commercially available.

One plant was lost in each of the northern and southern replications, and volunteers persist in the planting. Any bitterbrush plant not “in line” with the planted plots or otherwise appearing like they may have established from seed as a volunteer, will be removed in 2011.

Willow Planting at a Montane Site

INTRODUCTION

With the increased interest in riparian improvement projects and national programs such as WHIP and EQIP, UCEPC planted multiple willow species in three separate locations during the spring and summer of 2000. Each of the species planted were collected from the Center's willow cutting block, which includes 13 species of native willows. Materials were collected as 24" hardwood cuttings in February and March of 2000 and held in suspended dormancy in a cold storage/bare root facility until the time of planting. Plantings were done at sites of varying elevations and stream characteristics. The montane willow planting done this year was on a primary watershed stream into mixed gravels and cobble sized sediment at an elevation of approximately 7000 feet. The planting contained five replications.

The White River, along with 13 of Colorado's 15 major river drainages and other rivers in the Intermountain west, has had a recent but serious problem with whirling disease. This disease is thought to be one of the causes of native trout population reductions. The disease has been identified as an ailment affecting trout development prior to bone ossification. In essence, there is very little natural recruitment of young trout into adult populations in streams affected with the amoeba spores responsible for transmitting the disease. The whirling disease parasite has a two-host lifecycle that includes trout and a bottom, muddy sediment dwelling tubifex worm. The tubifex worm is found in shallow, sunny stream sites underlain with fine sediments. Efforts to reduce soil sedimentation and water temperatures and increase oxygen water content may prove beneficial to trout recruitment. Both of these stream conditions can be altered with proper selection and establishment of streamside woody riparian species.

The Montane planting was done along a stream which is one of several major tributaries of the White River. This river has historically been home for the now endangered Colorado River Cutthroat trout. In addition, most riparian species, especially the woody component, is very poorly represented along the stream in terms of species diversity and abundance. Woody riparian species suitability is the first phase of a potentially much larger project. The site location for the planting has some typical erosion problems associated with high elevation mountain valley streams. Topography is often responsible for the locations of transmission corridors with humans as well as other animals. In mountainous areas, roads and trails created by livestock and wildlife are very often found along streams. As a result, erosion and stream sediment load can be significant in a stream's ability to function properly.

METHODS

On August 1, 2000, seven accessions representing three native willow species were planted on Cottonwood Creek in the Dean and Rich Parr ranch. These accessions made up three complete

Project 08A214
Final Report – 2010
By: Steve Parr

replications. Two additional replications did not contain two different *S. boothii* accessions. Cuttings were taken in early spring as dormant stock and held in cold storage until their time of planting. Stream conditions included a well saturated stream bed with fine grained sands and some silty sediments for point bars and well vegetated stream banks. Two-foot cuttings were placed in sediment if possible, and as a lesser alternative, into deep soils at water table depth along stream banks. The plot plan is presented below.

Replication I

Downstream-----Upstream

<u>Accession 1</u>	<u>Accession 2</u>	<u>Accession 3</u>	<u>Accession 4</u>	<u>Acc. 5</u>	<u>Acc. 6</u>	<u>Acc. 7</u>
lutea 835	booths 827	bebbs 824	booths 825	lutea 819	lutea 834	booths 826

Replication II

lutea 834	booths 827	bebbs 824	booths 825	booths 826	lutea 835	lutea 819
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Replication III

booths 827	bebbs 824	booths 826	lutea 819	booth 825	lutea 834	lutea 835
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Replication IV

bebbs 824	lutea 834	lutea 835	booths 826	lutea 819
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Replication V

bebbs 824	lutea 834	booths 826	lutea 819	lutea 835
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Replication I was planted on the south bank of the stream starting west of the old log shop and moving upstream beyond the shop where an old mobile bin auger (semi-permanent landmark) is located. Replication II was planted on the north side of the stream starting from the same place as Rep. I, but ending behind the shop. Replications III, IV, and V were all planted upstream in sequence with the first willow of 826 and 835 in Replication V being tagged for reference. More tags will be added at a later date as necessary. Each replication had four willow cuttings two feet in length with the exception of the Bebb’s willows which were from 6” to 18” long; most being rejected cuttings from other projects.

A second, smaller planting was done upstream around a dug out spring by another old building. Moving clockwise from just east of where the spring overflow enters the stream, the following accessions were planted. East of spring flow; lutea 819: north of spring flow; lutea 834: northwest corner of spring pond; bebbs 824: north and northeast of spring pond; lutea 834.

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In all, there are 144 plots in this planting which will be monitored for five years. Survival, new growth and vigor data will be recorded to determine species/site suitability, and to provide confidence in recommendations for area buffer projects.

RESULTS

This planting was never officially evaluated for a number of reasons until this year, ten years after planting. The willow cutting stock that was used was from “leftover materials” from the cutting block for other projects, but also because the level of herbaceous growth made doing a formal evaluation one of precise timing...evaluate prior to herbaceous green up or growth but after willows had leafed out for identification. This simply was not accomplished. During informal spot checks during the years, it was noted that some of the planted stock did, indeed, take root and establish. On August 27, 2010, three willows were found from the original planting. Two of the three were of the same species, but it was not determined which species were represented even from field notes.

CONCLUSION

Regardless, the results have been less than impressive for this planting. Heavy competition from herbaceous cover on the stream banks blocking sunlight may have been more of a limiting factor than moisture from the water table. In fact, many of the cuttings were planted at the edge of the channel/streambank interface where the cuttings could be stuck in the ground. Spring runoff and other high flow events may have also taken a toll on establishment and survival of the cuttings. Well vegetated streams with limited bare ground or deposition areas are difficult to establish these three willow species from dormant cuttings.

Project: 08S0192
Project Report-2010
By: Terri Blanke

San Luis Columbia Needlegrass

INTRODUCTION

Columbia needlegrass *Achnatherum nelsonii* is a cool-season, erect, fine-stemmed, perennial bunchgrass. Its adaptable area ranges from dry plains and meadows up to sub-alpine parks and open woods. The Colorado specimen's range of elevation is from 5500 to 9500 feet where there is more than 15 inches of annual precipitation. Columbia needlegrass is a fair to good forage grass for cattle, horses, and sheep. Upper Colorado Environmental Plant Center's (UCEPC) Advisory Committee had identified Columbia needlegrass as an important species for revegetation of disturbed land associated with roadsides, coal mined lands, and oil shale lands.

Columbia needlegrass *Achnatherum nelsonii* was collected from the San Luis Valley, Colorado, by Glen Niner in 1976. Very little was known about Columbia needlegrass seed production, field performance, or forage production. In order to test these qualities, seed supply was needed.

UCEPC began studying *Achnatherum nelsonii* 27 years ago.

OBJECTIVE

Pre-cultivar release with seed increase and technology development for seed harvest and cleaning of accession 9040137

METHODS

A total of 18 accessions of Columbia needlegrass were evaluated at UCEPC from 1981 - 1983. Project number 08I057H identified the best overall performers based on results from three studies. Additional information on germination, forage yields, and re-growth results from the initial evaluation can be found in progress report September 30, 1983, project 08I057H.

Five top performing accessions were selected for seed increase from 1984 to 1987. The accessions selected had some characteristic that separated them from the average performers in the initial evaluation trial. Those blocks provided an opportunity to evaluate seed production and provide a seed supply for expanded field trials. Information for this project can be found in Project No. 08S075Z, 1984 – 1988. From those evaluations, Columbia needlegrass accession 9040137 from the San Luis Valley, Colorado, was selected for a large-scale seed increase project.

Field 2A was summer fallowed and free of noxious weeds. On August 28, 1989, a 0.94-acre field was seeded with accession number 9040137. The field established poorly and was reseeded on June 6, 1990. For plot size, field prep, seeding rates, irrigation, fertilizer application, and seed production records, see Project report 08S192, 1990 – 1995.

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Project Report-2010
By: Terri Blanke

In addition, accession number 9040137 was made available to cooperators for off-site field plantings.

The Columbia needlegrass Field 2A, produced seed for ten years. Due to contamination from an unknown source, the field was removed in 2000.

In efforts to retain viable seed for accession number 9040137, on August 27, 2008, UCEPC staff seeded four twenty-foot rows in field 20 to provide material for further evaluations as well as a breeders and/or a foundation block. Columbia needlegrass seed, previously produced in Field 2A, 1998-99, was used to plant the new plot.

RESULTS

Columbia needlegrass, accession 9040137, has been a consistent performer since the initial evaluation in 1983. Accession 9040137 was grown strictly under dryland conditions and only a few plants had established in 1985. This could have been the cause for lower seed production in 1985-1986. The following three years, 1987-1989, accession 9040137 was the second and first highest seed producer. Tests conducted in 1988 showed no difference in laboratory germination rates or field germination rates. However, it was noted that indications from UCEPC plots and comments from North Dakota growers warranted concern about invading grass species. That factor, along with deterioration of production capability may limit the life of a seed production field to less than five years. (Project Report-December 30, 1988, Sam E. Stranathan and Helen Cahn.)

The large-scale seed increase of Columbia needlegrass, accession 9040137, began in 1989. Field 2A was seeded with 1.47 lb of seed and at a rate of 30-40 seeds per foot, ¼ inch deep. Because of poor establishment it was seeded again on June 6, 1990, with 1.10 lb of seed. Irrigation was applied only once in 1989 and three times 1990. The planting received fertilizer at a rate of 30 lb per acre in the fall. This field produced seed for the next ten years. A table in UCEPC's 2009 Annual Technical Report, study 08S0192 shows the seed amounts produced by Field 2A during those years.

On August 27, 2008, UCEPC staff planted four twenty-foot rows in Field 20 with Columbia needlegrass accession 9040137. Seed from Field 2A, lot 98 and 99, was used in the planting. Only a few plants established and on August 24, 2009, the block was reseeded heavily with 2 lb from the same lots. The field received supplemental irrigation to help with establishment.

In 2010, the Columbia needlegrass plot had established. The crop was irrigated, weeded and fertilized. Two hand collections made in August provided 53 grams.

OFF-SITE PLANTINGS

Columbia needlegrass *Achnatherum nelsonii* has been implemented in many off-site plantings during the last 15 years. The following is a list of those projects with a brief history of the performance of Columbia needlegrass.

Project: 08S0192
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By: Terri Blanke

1986-2002 Soda Lake-Pinedale, Wyoming Field Evaluation Planting (FEP)

The mean was based off of a seven year average. Columbia needlegrass had a 5.7 Vigor where 1=excellent and 9=poor. Seven year annual average stand percent basal cover - 11.6%. The four year means of yield lb to the acre - 173.8 (below average performance)

2006- 2010 UCEPC Demonstration Planting

Project COPMC-F-0603-RA was designed to establish grasses and forbs of plant materials releases and experimental species for training, educational, and demonstration purposes. Seed from lot 1997 was used to establish the planting and Columbia needlegrass had 100% cover as of 2009. A small amount of seed was produced in 2010.

2005-2010 South Park, Colorado, Field Evaluation Planting

Project COPMC-F-0601-CR was planted to determine which selected materials will establish and persist in peat rich soils once irrigated and now dryland. South Park, Colorado's, elevation is near 9000 feet. Seed from lot 1998 was used in this planting and replicated four times. Results were taken for plant stand and vigor where 1=poor and 5=excellent. Columbia needlegrass has had an average of 2.8 for vigor and the average stand after four years is 5.5%.

2007-2010 Snowmass, Colorado, Field Evaluation Planting

Project COPMC-F-0801-RA was initiated to determine suitability of grasses for high altitude revegetation. This site is located near 7800 feet. Each entry was replicated four times and evaluated for plant stand where four complete rows = 100% and vigor where 1=excellent, 5=poor. In year 2009, the Columbia needlegrass was at 17% stand and 2.5 for vigor. In 2010, UCEPC learned horses had grazed the entire planting. An evaluation was completed in September but, results were based on re-growth. Accession 9040137 still had 19% stand and 2 for vigor.

2009-2013 Piceance Basin Evaluation Planting

Project COPMC-F-0805-CR was planted in the fall of 2008. The goal of this project is to identify practices and products that result in successful well pad revegetation. The principle objective is to identify which conservation plant materials will establish and persist on abandoned well pads, and secondarily, to compare how new releases and experimental products compare to current seed mix and source recommendations by NRCS and BLM field offices. No evaluation results could be taken due to the heavy infestation from invasives. UCEPC plans to retreat the site with herbicide and in 2012, reseed.

CONCLUSION

UCEPC will continue to increase seed from Columbia needlegrass *Achnatherum nelsonii* accession 9040137. Information will continue to be collected from off-site plantings. From these evaluations, UCEPC will determine if this accession is suitable for a release.

PROJECT 08S213

Report - 2010

By: Steve Parr

Seed Increase of 9043501 Salina Wildrye *Leymus salinus*

INTRODUCTION

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

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

The Soil Conservation Service range site manual lists *Leymus salinus* as a component of shale sites in Utah, often associated with Pinyon-Juniper or mountain brush in 15-inch precipitation zones. Colorado range sites with *Leymus salinus* are described as clayey slopes, clayey salt desert, and semi-desert loams above 12 inches of precipitation.

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

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

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

An Advanced Evaluation for *Leymus salinus*, 08A158, 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.

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

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

METHODS

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

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

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

An additional field, 1 acre, was planted August 11, 2009. This large scale field was planted to determine whether the accession lends itself to large scale commercial production. The seeding utilized three pounds of seed that consisted of a blend of 2003 and 2005 breeders seed and 2008 foundation seed from Field 4. Seed production is anticipated for 2011.

RESULTS

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

Table 1. Seed Production Records of Two Salina Wildrye Fields at UCEPC. Accession 9043501 Project 08S213.

Year	Acres	Harvest Date	Field No.	Cleaned Weight
1996	0.02	7/22	Hqts.	154.00 g
1996	0.10(B)	7/22	4	631.00 g
1996	0.20(F)	Planted	4	No harvest
1997	0.02	Field plowed	Hqts.	No harvest

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Year	Acres	Harvest Date	Field No.	Cleaned Weight	
1997	0.10(B)	7/21	4	2.96	lb
1997	0.20(F)	7/21	4	5.32	lb
1998	0.10(B)	8/4	4	4.00	lb
1998	0.20(F)	8/4	4	9.00	lb
1999	0.10(B)	7/15	4	22.00	g
1999	0.20(F)	7/15	4	32.00	g
2000	0.10(B)	No harvest	4	--	
2000	0.20(F)	7/7	4	6.00	g
2001	0.20(F)	7/9	4	174.00	g
2001	0.10(B)	7/9	4	227.00	g
2002	0.10(B)	7/11	4	7.00	g
2002	0.20(F)	7/11	4	23.00	g
2003	0.10(B)	7/9	4	1.69	lb
2003	0.20	7/9	4	0.60	lb
2004	0.10(B)	7/9	4	19.00	g
2004	0.20(F)	7/9	4	146.00	g
2004	0.13	New planting	4	No harvest	
2005	0.13	New planting	4	No harvest	
2005	0.10(B)	7/13	4	1.40	lb
2005	0.20(F)	7/13	4	302.00	g
2006	0.10 (B)	7/12	4	2.00	g
2006	0.30 (F)	7/13	4	7.00	g
2006	0.13(F-2)	7/13	4	76.00	g
2007	0.10 (B)	7/13	4	296.00	g
2007	0.30(F-2)	7/11	4	5.50	lb
2008	0.10 (B)	7/28	4	1.17	lb
2008	0.30 (F)	7/28	4	1.27	lb
2009	0.10 (B)	7/17	4	0.00	
2009	0.30 (F)	7/20	4	1.00	lb
2010	0.10 (B)	7/9	4	437.00	g
2010	0.30 (F)	7/9	4	2.60	lb

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

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

Evaluations for 2005

On June 7, 2005, the herbicide section was evaluated. Glyphosate worked very well leaving

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spaced grass bunches at about 3 x 3 ft as expected, however, no seed set difference was observed between the treated and untreated plants, perhaps because the treatment was done when the plants had already spent a lot of energy in spring growth. The burned area showed a more vigorous re-growth after the burning, and also did an excellent job of getting rid of dead plant material. However, no difference in seed set was observed between unburned and burned plants. Burned plants did however, look greener and healthier.

Evaluations for 2006

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

Evaluations for 2007

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

2008

A disappointing seed harvest was realized with both the Breeder and Foundation portions of the salina wildrye project this year. The low seed yield is preventing the release of an otherwise very much needed conservation plant for the central Rocky Mountains and Colorado Plateau. Because of the unknown yield information on this product, a new spaced planting project, COPMC-T-0802-RA, was initiated this year to determine optimal spacing for seed yield. Plans are to again spray out sections of the foundation field to improve seed yield in 2009 and beyond.

2009

There were harvests for both the Breeder and Foundation fields in 2009, but production was very poor. Between both fields, only one pound of seed was cleaned from the effort. A separate study, COPMC-T-0802-RA, Space Planting of Salina Wildrye, is being conducted to determine optimal spacing for seed production. Three separate seed lots were utilized to plant a one-acre seed increase field for Mesa Verde National Park August 11, 2009. Breeder seed from 2003, 2005, and foundation seed from 2008 were the three seed lots used to plant the one-acre increase plot.

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By: Steve Parr

2010

There were again harvests of both the Breeder and Foundation fields of salina, but very limited seed was obtained. The northern row of the two-row planting of the Breeder field was removed in order to stimulate greater seed production, but this was not realized in 2010. The one-acre field established for Mesa Verde of this accession was not harvested as there was not adequate seed production to warrant a harvest, and Mesa Verde decided not to pay for production of the salina wildrye seed.

CONCLUSION

Unquestionably, the younger seed field with less crowded plants, and possibly greater vigor, produce substantially more seed than the older portion of the field. Whether the improved production is a result of a younger field, less crowding among individual plants and roots, or a combination of both, will be investigated with the design of the above referenced salina wildrye study. Adequate, consistent seed production is the biggest obstacle to overcome before getting this product on the market. As an important species in the Rocky Mountain west, continued efforts will be directed toward its development and eventual release.

Project COPMC-F-0505-PA

Report-2010

By: Christine Taliga

Boulder County Open Space Demo

OBJECTIVE

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

INTRODUCTION

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

EXPERIMENTAL DESIGN

This is a non-replicated planting.

MATERIALS & METHODS

A total of 65 entries were seeded on March 7-9, 2005: Fifty-seven single grass species (41 native & 16 non-native), six grass-mixtures, and one legume (planted at two seeding rates). The seeder was a 16-row FLEX-II Truax. Rows were spaced about 7.5 inches apart. The plot size is 20 x 100 ft with 32 rows per plot (2000 square feet). The rate of seeding was based on the recommended Pure Live Seed rate/acre per species. Small and fluffy seeded grasses were enhanced with number-1 rice hulls to provide a better flow through the drill. The site is located on Boulder County land north of Denver. The planting will be maintained as dry-land.

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

Table 1. List of 65 entries for the demonstrational planting

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

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

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

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

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

RESULTS, ACCOMPLISHMENTS & OBSERVATIONS

Growing Season of 2005

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

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

Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
VNS	Nodding brome	<i>Bromus anomalus</i>	5
Regar	Meadow brome	<i>Bromus erectus</i>	5
Garnet	Mountain brome	<i>Bromus marginatus</i>	5
Paiute	Orchardgrass	<i>Dactylis glomerata</i>	5
Renegade	Orchardgrass	<i>Dactylis glomerata</i>	5
Fawn	Tall fescue	<i>Festuca arundinacea</i>	5
Paloma	Indian ricegrass	<i>Achnatherum hymenoides</i>	4
Douglas	Crested wheatgrass	<i>Agropyron cristatum</i>	4
Hycrest	Crested wheatgrass	<i>Agropyron cristatum X desorturum</i>	4
Manchar	Smooth brome	<i>Bromus inermis</i>	4
Mandan	Canada wildrye	<i>Elymus canadensis</i>	4

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Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
Newhy	Hybrid wheatgrass	<i>Elymus hoffmanii</i>	4
Critana	Streambank wheatgrass	<i>Elymus lanceolatus</i>	4
Bannock	Streambank wheatgrass	<i>Elymus lanceolatus</i>	4
San Luis	Slender wheatgrass	<i>Elymus trachycaulus</i>	4
Pryor	Slender wheatgrass	<i>Elymus trachycaulus</i>	4
Lodorm	Green needlegrass	<i>Nasella viridula</i>	4
Arriba	Western wheatgrass	<i>Pascopyrum smithii</i>	4
Rosana	Western wheatgrass	<i>Pascopyrum smithii</i>	4
Goldar	Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	4
Anatone	Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	4
Rush	Intermediate wheatgrass	<i>Thinopyrum intermedium</i>	4
Luna	Pubescent wheatgrass	<i>Thinopyrum intermedium</i>	4
Jose	Tall wheatgrass	<i>Thinopyrum ponticum</i>	4
Ephraim	Crested wheatgrass	<i>Agropyron cristatum</i>	3
Kaw	Big Bluestem	<i>Andropogon gerardii</i>	3
Texoca	Buffalograss	<i>Buchloe dactyloides</i>	3
Tusas	Squirreltail	<i>Elymus elymoides</i>	3
Sodar	Streambank wheatgrass	<i>Elymus lanceolatus</i>	3
Magnar	Basin wildrye	<i>Leymus cinereus</i>	3
Dacotah	Switchgrass	<i>Panicum virgatum</i>	3
Rimrock	Indian ricegrass	<i>Achnatherum hymenoides</i>	2
Bonilla	Big Bluestem	<i>Andropogon gerardii</i>	2
Pawnee	Big Bluestem	<i>Andropogon gerardii</i>	2
Bad river	Sideoats grama	<i>Bouteloua curtipendula</i>	2
Lovington	Sideoats grama	<i>Bouteloua curtipendula</i>	2
Redondo	Arizona fescue	<i>Festuca arizonica</i>	2
VNS	Needle & thread	<i>Hesperostipa comata</i>	2
Trailhead	Basin wildrye	<i>Leymus cinereus</i>	2
9005439	Switchgrass	<i>Panicum virgatum</i>	2
Niner	Sideoats grama	<i>Bouteloua curtipendula</i>	1
BSOG-02B	Sideoats grama	<i>Bouteloua curtipendula</i>	1
El Reno	Sideoats grama	<i>Bouteloua curtipendula</i>	1
Hachita	Sideoats grama	<i>Bouteloua curtipendula</i>	1
Covar	Sheep fescue	<i>Festuca ovina</i>	1

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Cultivar/Release or accession #	Common Name	Scientific Name	Plant Stand*
9092261	Prairie Junegrass	<i>Koeleria macrantha</i>	1
Volga	Mammoth wildrye	<i>Leymus racemosus</i>	1
Climax	Timothy	<i>Phleum pratense</i>	1
Sherman	Big bluegrass	<i>Poa secunda</i>	1
Bozoisky-select	Russian wildrye	<i>Psathyrostachys juncea</i>	1
Aldous	Little bluestem	<i>Schyzachyrium scoparium</i>	1
Camper	Little bluestem	<i>Schyzachyrium scoparium</i>	1
Pastura	Little bluestem	<i>Schyzachyrium scoparium</i>	1
Cheyenne	Indiangrass	<i>Sorghastrum nutans</i>	1
Salado	Alkali sacaton	<i>Sporobolus airoides</i>	1
VNS	Tufted hairgrass	<i>Deschampsia caespitosa</i>	0
Viva	Galleta grass	<i>Pleuraphis jamesii</i>	0
Dry-land mix.	Mix-4* See entries inTable-1		5
Aggressive dry-land mix			4
	Mix-2* See entries inTable-1		
Rocky Mountain Native mix			4
	Mix-1* See entries inTable-1		
Low grow mix			4
	Mix-3*- See entries inTable-1		
Boulder NRCS-mix-Regular			4
	Mix-5*- See entries inTable-1		
Boulder NRCS-mix-heavy			4
	Mix-6*- See entries inTable-1		
Medic @ 29.1 lb/ac	Medic	<i>Medicago spp.</i>	3
Medic-@ 14.2 lb/ac	Medic	<i>Medicago spp.</i>	2

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

Project COPMC-F-0505-PA

Report-2010

By: Christine Taliga

Growing Season of 2006

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

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

Growing Season of 2007

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

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

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

Project COPMC-F-0505-PA

Report-2010

By: Christine Taliga

General observations for growing season of 2007

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

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

Growing Season of 2008

The plots were not evaluated this year; however, they were maintained by controlling the weeds. Pat Davey sprayed the broadleaved weeds with 2,4-D at the rate of 1½ pounds per acre. Boulder County Parks & Open Space mowed the weeds in late summer. A site visit is planned for late spring of early summer of 2009 to take notes on the species that have survived in the last three years.

An assessment was conducted by Pat Davey, Natural Resources Conservation Service Plant Materials Specialist, on May 12, 2008, the results of which are noted in Table 3.

Growing Season of 2009

The plots were evaluated by Herman Garcia, Natural Resources Conservation Service State Rangeland Management Specialist and Pat Davey, Natural Resources Conservation Service, September 22, 2009, the results of the evaluations are noted in Table 3. A site visit is planned for late spring early summer of 2010 to evaluate the plots.

Table 3. Plant stand evaluation for 65 entries 2005, 2008, 2009, and 2010. * Plant stand: 0 = Poor or no establishment; and 5 = Excellent establishment

Entry #	Cultivar/Release or Accession #	Plant evaluation conducted on 11/8/05	Plant evaluation conducted on 5/12/08	Plant evaluation conducted on 9/22/09	Plant evaluation conducted on 7/30/2010
1	Cheyenne	1	0	0	0
2	9005439	2	0	1	1
3	Dacotah	3	0	.1	1
4	Kaw	3	0	.1	1
5	Bonilla	2	0	.1	1
6	Pawnee	2	0	.5	1
7	Lodorm	4	3+	4	4
8	Aldous	1	0	0	0
9	Camper	1	0	.5	1
10	Pastura	1+	0	1	1
11	Niner	1	1	1	1
12	BSOG-02B	1	0	.5	1
13	El Reno	1	1	1	1

Project COPMC-F-0505-PA

Report-2010

By: Christine Taliga

Entry #	Cultivar/Release or Accession #	Plant evaluation conducted on 11/8/05	Plant evaluation conducted on 5/12/08	Plant evaluation conducted on 9/22/09	Plant evaluation conducted on 7/30/2010
14	Hachita	1	1	1	1
15	Bad River	2	1	1	2
16	Lovington	2	1	1	2
17	Texoca	3	3	5	5
18	Viva	0	0	1	1
19	9092261	1	2	3	1
20	Covar	1	2	2	4
21	Redondo	2	1	.5	1
22	Sherman	1	2	2	2
23	Rimrock	2	1	2	2
24	Paloma	4	3	5	3
25	Tusas	3	3	3	3
26	San Luis	4	4	4	3
27	Pryor	4	4	5	4
28	Volga	1	1	2	1
29	Variety Not Specified (Needle and Thread)	2	4	5	4
30	Climax	1	0	0	0
31	Paiute	5	2+	2	3
32	Renegade	5+	2	1	2
33	Salado	1-	0	1	1
34	Fawn	5	1	1	1
35	Trailhead	2	4	5	3
36	Magnar	3	4	5	4
37	Garnet	5	3	2	2
38	VNS (Nodding Brome)	5	1	1	1
39	Regar	5	4+	5	5
40	Manchar	4+	4+	5	4
41	Critana	4	5	5	5
42	Bannock	4	5	5	4
43	Goldar	4	5	5	4
44	Anatone	4	5	5	5
45	Luna	4+	5	5	5
46	Rush	4	5	5	5
47	Arriba	4	5	5	5
48	Rosana	4	5	5	5
49	Sodar	3	4+	5	5
50	VNS (<i>Deschampsia caespitosa</i>)	0	0	1	0
51	Jose	4	5	5	5

Entry #	Cultivar/Release or Accession #	Plant evaluation conducted on 11/8/05	Plant evaluation conducted on 5/12/08	Plant evaluation conducted on 9/22/09	Plant evaluation conducted on 7/30/2010
52	Mandan	4	3+	3	3
53	Bozoisky-select	1+	4+	5	5
54	Newhy	4+	5	5	5
55	Douglas	4	5	5	5
56	Hycrest	4+	5	5	5
57	Ephraim	3	5	5	5
58	Rocky Mountain. Native mix	4	4+	5	4
59	Aggressive dryland mix	4	5	5	5
60	Low grow mix	4	5	5	5
61	Dryland mix	5	5	5	5
62	Boulder NRCS-mix-Regular	4+	5	5	5
63	Boulder NRCS-mix-heavy	4+	5	5	5
64	Medic-@ 14.2 lb/ac	2	1	0	0
65	Medic @ 29.1 lb/ac	3		0	0

Growing Season of 2010

The plots were evaluated by Christine Taliga, NRCS Plant Materials Specialist with Sylvia Hickenlooper, NRCS Soil Conservationist, Longmont Field Office and Sharon Bokan, Small Acreage Coordinator, CSU Extension Service, on August 5, 2010. The results of the evaluations are noted in Table 3. A CSU Extension and Pawnee Buttes Seed Company Grass Tour was conducted August 12, 2010.

This site has proven to be a valuable demonstration site and will be utilized in 2011 for a grass identification workshop.

Plans are underway to add additional demonstration plots to this site potentially including a pollinator plot and additional mixed species plots.

Project COPMC-F-0601-CR

Report-2010

By: Christine Taliga

South Park Field Evaluation Planting

OBJECTIVE

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

INTRODUCTION

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

EXPERIMENTAL DESIGN

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

MATERIALS & METHODS

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

Table 1. South Park Field Evaluation Planting. UCEPC

Common Name	Scientific Name	Release Name or Accession No.
Natives		
Arizona fescue	<i>Festuca arizonica</i>	Redondo
Bluebunch wheatgrass	<i>Pseudoroegneria spicata spp.spicata</i>	Anatone
Bluebunch wheatgrass	<i>Pseudoroegneria spicata spp.spicata</i>	Goldar
Blue grama	<i>Bouteloua gracilis</i>	Bad River
Bottlebrush squirreltail	<i>Elymus elymoides spp. brevifolius</i>	Pueblo

Project COPMC-F-0601-CR

Report-2010

By: Christine Taliga

Common Name	Scientific Name	Release Name or Accession No.
Bottlebrush squirreltail	<i>Elymus elymoides</i>	Tusas
Bottlebrush squirreltail	<i>Elymus elymoides</i> spp.brevifolius	Wapiti
Columbia needlegrass	<i>Achnatherum nelsonii</i>	9024804
Columbia needlegrass	<i>Achnatherum nelsonii</i>	9040137
Indian ricegrass	<i>Achnatherum hymenoides</i>	Paloma
Indian ricegrass	<i>Achnatherum hymenoides</i>	Rimrock
Mountain brome	<i>Bromus marginatus</i>	Garnet
Bluegrass	<i>Koeleria macrantha</i>	9092261
Sandberg bluegrass	<i>Poa secunda</i>	High plains
Streambank wheatgrass	<i>Elymus lanceolatus</i>	Sodar
Western wheatgrass	<i>Pascopyrum smithii</i>	Arriba
Western wheatgrass	<i>Pascopyrum smithii</i>	Rosana
Introduced or Manipulated		
Basin wildrye-hybrid	<i>Leymus cineris</i>	Continental
Crested wheatgrass	<i>Agropyrum cristatum</i>	Douglas
Crested wheatgrass	<i>Agropyrum cristatum</i>	Nordan
Crested-desertorum hybrid	<i>Agropyrum cristatum</i> x <i>A. desertorum</i>	Hycrest
Intermediate wheatgrass	<i>Thinopyrum intermedia</i>	Rush
Meadow brome	<i>Bromus biebersteinii</i>	Regar
Pubescent wheatgrass	<i>Thinopyrum intermedia</i>	Luna
Russian wildrye	<i>Psathyrostachys juncea</i>	Bozoisky
Siberian wheatgrass	<i>Agropyrum fragile</i> spp. <i>sibiricum</i>	Vavilov
Smooth brome	<i>Bromus inermis</i>	Liso
Wheatgrass-hybrid	<i>Elymus hoffmanni</i>	Newhy

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

RESULTS

Results for Year-2006

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

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

Natives			
Common Name	Release Name or Accession No.	% Plant Stand Average¹	Plant Vigor Average¹
Blue grama	Bad River	32.0	3.5
Bluebunch wheatgrass	Anatone	18.2	3.5
Indian ricegrass	Rimrock	14.5	3.5
Western wheatgrass	Rosana	12.5	3.2
Bluebunch wheatgrass	Goldar	10.5	3.7
Indian ricegrass	Paloma	7.2	3.5
Western wheatgrass	Arriba	5.5	2.7
Bottlebrush squirreltail	Pueblo	2.7	2.2
Columbia needlegrass	9024804	2.5	2.3
Mountain brome	Garnet	2.0	3.2
Columbia needlegrass	9040137	1.7	2.3
Sandberg bluegrass	High plains	1.2	2.0
Bluegrass	9092261	1.0	2.6
Streambank wheatgrass	Sodar	0.7	2.5
Bottlebrush squirreltail	Wapiti	0.5	2.0
Arizona fescue	Redondo	0.25	2.0
Bottlebrush squirreltail	Tusas	0.25	2.0
Introduced or Manipulated			
Smooth brome	Liso	23.0	2.7
Meadow brome	Regar	17.7	3.2
Russian wildrye	Bozoisky	14.5	3.7
Basin wildrye-hybrid	Continental	12.5	3.7
Crested wheatgrass	Nordan	11.5	3.7
Intermediate wheatgrass	Rush	8.7	3.7
Crested-desertorum hybrid	Hycrest	7.7	3.2
Pubescent wheatgrass	Luna	7.5	3.2
Siberian wheatgrass	Vavilov	7.2	3.2
Crested wheatgrass	Douglas	5.0	2.5
Wheatgrass-hybrid	Newhy	1.5	2.6

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

Project COPMC-F-0601-CR

Report-2010

By: Christine Taliga

Results for Year-2007

The plots were evaluated on July 31, 2007. Plant stand and vigor for the 28 entries are presented in tables 3 and 4.

Results for Year 2008

The plots were evaluated in July 8, 2008, for the third year of establishment. Most of the species are performing well. The study results are noted in Tables 3 and 4.

Results for Year 2009

The plots were evaluated in 2009 by Herman Garcia, State Rangeland Management Specialist, USDA Natural Resources Conservation Service and Joe Brummer, Ph.D., Extension Forage Specialist Colorado State University. Table 3 and 4 represent a comparison of the plant establishment and vigor results from 2007 to 2009.

Results for Year 2010

The plots were evaluated in 2010 by Christine Taliga, NRCS Plant Materials Specialist, USDA and Joe Brummer, Ph.D., Extension Forage Specialist, Colorado State University on September 20, 2010. Table 3 and 4 represent a comparison of the plant establishment and vigor results from 2007 to 2010. During evaluation it was noted that native western wheatgrass was present throughout the plots and was indistinguishable from some of the planted plots in particular 'Arriba' and 'Rosana' western wheatgrass. 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. Out of the selected native plant materials evaluated in this study western wheatgrass and bluebunch wheatgrass have performed well at this site, as well as the 'Bad River' blue grama. Given the considerable re-establishment of the sites' native western wheatgrass, this species is a very important component of re-vegetating previously drained peatlands that will no longer be irrigated. From the non-native and manipulated plant materials, Russian wildrye and crested wheatgrass as well as meadow brome and basin wildrye 'Continental', were the best performers.

Project COPMC-F-0601-CR

Report-2010

By: Christine Taliga

Table 3. Plant Establishment for South Park Field Evaluation Planting.

Native Species						
Common Name	Release or Accession No.	Percent Plant Stand¹				
		2007	2008	2009	2010	Average
Western wheatgrass	Rosana	35.2	65	77.5	Indistinguishable from native ww	59.23
Bluebunch wheatgrass	Anatone	33.7	37.5	33.75	30	33.7375
Blue grama	Bad River	20	39	41.25	27	31.8125
Western wheatgrass	Arriba	9	34	43	Indistinguishable from native ww	28.66667
Bluebunch wheatgrass	Goldar	14.7	16.8	21.75	9	15.5625
Arizona fescue	Redondo	3.2	14.8	17.5	17.25	13.1875
Columbia needlegrass	9040137	3.7	7.5	8.25	8.75	7.05
Sandberg bluegrass	High Plains	6	8.5	9.25	3.75	6.875
Columbia needlegrass	9024804	2	5.5	7	7.5	5.5
Indian ricegrass	Rimrock	10.7	2.5	6	0.75	4.9875
Bluegrass	9092261	2.5	3.7	6.5	5	4.425
Streambank wheatgrass	Sodar	1.3	2	3	1.25	2.516
Bottlebrush squirreltail	Pueblo	5	1.8	1.5	1.75	2.5125
Mountain brome	Garnet	2.7	2.8	1	1.5	2
Bottlebrush squirreltail	Tusas	1	1	0.25	1	0.8125
Indian ricegrass	Paloma	0.5	0.5	0.25	0.25	0.375
Bottlebrush squirreltail	Wapiti	0.5	0.3	1.25	0	0.5125

1. Percent plant stand is a visual estimate per plot basis; four complete rows within the plot are equal to 100 percent establishment. Arriba and Rosana were indistinguishable from native Western Wheatgrass with solid stands of western wheatgrass present.

Table 3. Continued

Introduced or Manipulated Species						
Common Name	Release or Accession No.	Percent Plant Stand ¹				
		2007	2008	2009	2010	Average
Russian wildrye	Bozoisky	30.2	37	51.25	48.75	41.8
Crested wheatgrass	Nordan	41.2	40	44.25	40.75	41.55
Meadow brome	Regar	31	27	35.5	38.75	33.0625
Basin wildrye-hybrid	Continental	11	37	40	38.25	31.5625
Crested wheatgrass	Douglas	32.7	35.8	32.5	21.75	30.6875
Siberian wheatgrass	Vavilov	29	47	23.25	23.25	30.625
Crested-desertorum hybrid	Hycrest	26.2	27.3	24.25	23.75	25.375
Smooth brome	Liso	20	6.5	12.25	12.25	12.75
Intermediate wheatgrass	Rush	11.2	10.3	14.5	9.75	11.4375
Wheatgrass-hybrid	Newhy	12.2	7.5	9	12.5	10.3
Pubescent wheatgrass	Luna	11.2	10	9.25	6.25	9.175

1. Percent plant stand is a visual estimate per plot basis; four complete rows within the plot are equal to 100 percent establishment.

Table 4. Plant Vigor for South Park Field Evaluation Planting

Native Species						
Common Name	Release or Accession	Plant Vigor ¹				
		2007	2008	2009	2010	Average
Arizona fescue	Redondo	3.2	2	4.75	3.75	3.4250
Columbia needlegrass	9024804	3.2	3	3.5	2.75	3.1125
Western wheatgrass	Arriba	2.7	2.8	3.5	Indistinguishable from native ww	3.0000
Bluebunch wheatgrass	Anatone	2.5	2.3	3.75	3.25	2.9500
Blue grama	Bad River	3	2	3.75	2.75	2.8750
Bluebunch wheatgrass	Goldar	2.2	2.5	4.5	2	2.8000
Columbia needlegrass	9040137	2.7	2.5	3	3	2.8000
Mountain brome	Garnet	3	3	2.75	2	2.6875
Western wheatgrass	Rosana	2.5	1.8	3.75	Indistinguishable from native ww	2.6833
Streambank wheatgrass	Sodar	4.2	2.5	2.25	1.75	2.6750
Bluegrass	9092261	1.5	1.5	3.75	2.75	2.3750
Indian ricegrass	Rimrock	2	2.3	3.5	0.75	2.1375
Sandberg bluegrass	High Plains	2.5	1.5	3.25	1	2.0625
Bottlebrush squirreltail	Pueblo	1.5	3	1	2	1.8750
Bottlebrush squirreltail	Tusas	3	1.5	0.5	1.25	1.5625
Indian ricegrass	Paloma	1.5	2	0.5	0.5	1.1250
Bottlebrush squirreltail	Wapiti	1.8	1	1.5	0	1.0750

1. Plant Vigor is a visual estimate per plot basis. 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor; 5 = very poor.

Table 4. Continued

Introduced or Manipulated Species						
Common Name	Release or Accession	Plant Vigor ¹				Average
		2007	2008	2009	2010	
Basin wildrye-hybrid	Continental	2.5	2	4.75	4.5	3.44
Russian wildrye	Bozoisky	2	1.5	5	4.75	3.31
Meadow brome	Regar	2.2	2.3	5	3.75	3.31
Wheatgrass-hybrid	Newhy	3.2	3.3	3	3.25	3.19
Crested wheatgrass	Nordan	1.7	2	4.5	4	3.05
Smooth brome	Liso	3	3.5	1.75	2.25	2.63
Siberian wheatgrass	Vavilov	1.7	2.3	3	3.25	2.56
Intermediate wheatgrass	Rush	3	2.3	2.5	2.25	2.51
Crested wheatgrass	Douglas	2.7	2.8	2.5	2	2.50
Pubescent wheatgrass	Luna	3.2	3.3	1.75	1.5	2.44

1. Plant Vigor is a visual estimate per plot basis. 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor; 5 = very poor.

Windbreak Demonstration Planting

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) is located in an area that experiences strong winds throughout the year. To protect the field at UCEPC from prevailing winds, a windbreak is being planted with multiple benefits in mind. In addition to providing protection from the wind, the windbreak will serve educational, demonstrational, as well as aesthetic purposes. Additionally, the windbreak will serve as a source of released and experimental woody plant materials.

OBJECTIVE

To demonstrate the use of different woody species for windbreak purposes and to provide a source for plant release materials at UCEPC.

EXPERIMENTAL DESIGN

This is a non-replicated planting.

METHODS

A multiple-row windbreak with five to eight rows of woody plant materials will be planted along the west side perimeter of the Center. Three rows of evergreen trees, two rows of deciduous trees and two to three rows of shrubs will be planted during 2006-2012. Native woody species will be planted where possible, following the Natural Resources Conservation Services guidelines for establishing a windbreak/shelterbelt. The planting will be irrigated as needed until the plants get well establish. Plant materials for the windbreak will be acquired through Colorado State Forest Service tree program and/or UCEPC woody collections.

RESULTS

Growing Season of 2006

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

Project COPMC-F-0602-WI

Report-2010

By: Heather Plumb

On July 10, 2006, the trees were evaluated for survivability. All 60 trees were alive and growing well.

Growing Season of 2007

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

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

On September 12, 2007, the plants in the windbreak were evaluated for survival. All transplants planted during the growing season of 2007 were alive.

Growing Season of 2008

The windbreak demonstrational planting continues to grow in height as well as in number of plant entries. Ten more spruce trees were added to the spruce row bringing the total to 124 Colorado spruce trees. More additions include four shrubs species, with five plants each, received from Bismarck Plant Materials Center for an inter-center observational planting. These shrubs were added to the designated shrub-row of the windbreak. The four shrubs include American black currant *Ribes americanum*, black chokeberry *Photinia melanocarpa*, fireberry hawthorn *Crataegus chysocarpa*, and a plum *Prunus* spp. There are now a total of forty shrubs in the windbreak.

A drip irrigation system was installed in the windbreak on August 8, 2008. The emitters put out about a half a gallon of water per hour. All trees and shrubs will be irrigated with the system as needed.

Growing Season of 2009

In the spring of 2009, the honeysuckles and the Bismarck shrubs were all evaluated, photographed and heights were recorded. After the evaluation, the honeysuckles were pruned to help promote new growth for the upcoming year. Roundup herbicide was sprayed around the shrub perimeters to help with weedy species infestations. At the time of the evaluation it was observed by UCEPC staff that wildlife browsing had occurred on all shrub plants. In July, the honeysuckles were tagged according to the color of berries produced by the plant. Two colors of berries were observed; red and orange. Not all honeysuckles had berries on them and will be monitored next year to see if berries are produced and what color they are. Throughout the spring and summer the windbreak was irrigated periodically by UCEPC staff. Roundup herbicide was applied around the perimeters of the windbreak to help prevent weed infestations.

During the fall, forty-one 10 to 12 foot Colorado blue spruces were added to the windbreak to create a second row of evergreen trees. The forty-one trees were provided by a local nursery. The trees were staked down and watered to help insure proper root establishment.

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By: Heather Plumb**

In the fall of 2009, UCEPC staff fenced 11 honeysuckles to help prevent further wildlife browsing and help catch snow for additional winter moisture.

Growing Season 2010

In the spring of 2010, the Utah honeysuckles and Bismarck shrubs were evaluated, photographed, and measured for heights. More specific information on these materials can be found in COPMC-S-0103-UR Aphid Resistant Utah Honeysuckle report and the COPMC-P-0803-WI Observational Planting of Bismarck Shrubs report. The evergreens; Colorado blue spruce, are growing steadily and are healthy.

On June 11, 2010, Johnnie Barton applied 2,4-D and glyphosate around the entire windbreak perimeter with the exception of directly around the plants. This sensitive area was hand weeded. Over the course of the summer growing season the windbreak was sprayed with herbicide whenever weed control was needed.

On September 7, 2010, Terri Blanke and Heather Plumb laid out where 20 golden currants were going to be added to the windbreak. On September 8, 2010, summer help planted the golden currants next to the observational Bismarck shrubs. After planting, water was added to the newly planted shrubs.

During the fall of 2010, dogwood and cottonwood poles were planted in the windbreak. Lines were laid out to make sure the rows of materials would remain straight. On October 9, 2010, summer help planted 15 redosier dogwoods on 12-foot centers. On October 13, 2010, in between the already planted spruces, 22 cottonwood poles that were cut from Grand Junction in the spring of 2010 were planted on 4-foot centers. A 30-inch hole was augured out and the poles were placed in as deep as they would go, water was added in the hole, backfilled, and a berm was left around the poles to help catch water.

CONCLUSION

The established plants in the windbreak are performing well and are steadily growing. Further development of the windbreak is planned for the upcoming growing season and monitoring of new plants will be done periodically throughout next year.

Additional shrubs and deciduous and evergreen trees need to be planted to add to the species diversity of the windbreak. Potential species to be added to the windbreak over the next few years include Douglas fir, aspen, Gambel oak, pinyon pine, silver buffaloberry, chokecherry, and serviceberry.

Grass and Forb Observational Planting

INTRODUCTION

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

OBJECTIVE

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

METHODS

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

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

Table 1. Grass and Forb Observational Planting. UCEPC

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

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By: Steve Parr

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

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By: Steve Parr

Entry #	Release Name/Accession	Common Name	Scientific Name	Seed Source
38	Vavilov	Siberian wheatgrass	<i>Agropyron fragile</i>	Aberdeen, PMC
39	Whitmar	Beardless wheatgrass	<i>Pseudoroegneria spicata</i>	Pullman, PMC
40	Covar	Sheep fescue	<i>Festuca ovina</i>	Pullman, PMC
Other PMCs Warm Season Grass Species				
41	9005439	Switchgrass	<i>Panicum virgatum</i>	Bridger, PMC
42	Dacotah	Switchgrass	<i>Panicum virgatum</i>	Bismarck, PMC
43	Bison	Big bluestem	<i>Andropogon gerardii</i>	Bismarck, PMC
44	Bad river	Blue grama	<i>Bouteloua gracilis</i>	Bismarck, PMC
45	Salado	Alkali sacaton	<i>Sporobolus airoides</i>	Los Lunas, PMC
46	Pierre	Sideoats grama	<i>Bouteloua curtipendula</i>	Bismarck, PMC
47	Vaughn	Sideoats grama	<i>Bouteloua curtipendula</i>	Los Lunas, PMC
48	Badlands	Little bluestem	<i>Schizachyrium scoparium</i>	Bismarck, PMC
49	Alma	Blue grama	<i>Bouteloua gracilis</i>	Los Lunas, PMC
50	Viva	Galleta grass	<i>Pleuraphis jamesii</i>	Los Lunas, PMC
Other PMCs Forb species				
51	Great Northern Germplasm	Common yarrow	<i>Achillea millefolium</i>	Bridger, PMC
52	San Juan Germplasm	Penstemon	<i>Penstemon angustifolius</i>	Los Lunas, PMC
53	Richfield Germplasm	Eaton's penstemon	<i>Penstemon eatonii</i>	Bridger, PMC
54	Maple Grove Germplasm	Lewis flax	<i>Linum lewisii</i>	Aberdeen, PMC
55	Appar	Blue flax	<i>Linum perenne</i>	Aberdeen, PMC
56	Bismarck Germplasm	Violet prairie clover	<i>Dalea purpurea</i>	Bismarck, PMC
57	Antelope Germplasm	White prairie clover	<i>Dalea candida</i>	Bridger, PMC
58	Stillwater Germplasm	Prairie coneflower	<i>Ratibida columnifera</i>	Bridger, PMC
59	Bismarck Germplasm	Narrow-leaved purple coneflower	<i>Echinacea angustifolia</i>	Bismarck, PMC
60	Medicine Creek Germplasm	Maximilian sunflower	<i>Helianthus maximiliani</i>	Bismarck, PMC
61		Canada milkvetch*	<i>Astragalus canadensis</i>	Pullman, PMC

*Added on Nov. 20, 2007

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By: Steve Parr

RESULTS

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

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

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

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

2008

The demonstrational planting was evaluated in September 4, 2008, for plant establishment. Most of all species are doing well, including the warm season grasses.

2009

Of the 61 entries evaluated last year for percent stand, only two UCEPC cool season grasses were less than 85 percent stand, Peru Creek and Thurber's fescue. Three forbs, Timp, a senecio and a buckwheat, were less than 85 percent. On the other hand, four warm season grasses, Bad River, Alma, Pierre, and Vaughn all had 95 percent cover or better, and four "other Center" forbs had 95 percent or better stands. Yarrow, Eaton's penstemon, prairie clover and maximillian sunflower were all doing well. However, in 2009, stand was not evaluated. There were some additional efforts to improve stands to 100 percent in several plots, including Peru Creek, Maple Grove, buckwheats, prairie clovers, and a new addition, wild iris, from South Park.

Seed was harvested from five different plots in 2009. Both Wapiti, 207 grams, and Pueblo, 359 grams, bottlebrush squirreltails were harvested, a Sandberg bluegrass (Radio Tower source) 51 grams, Indian ricegrass (9024739) 177 grams, and Columbia needlegrass (9040137) 25 grams all produced adequate seed for collecting.

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By: Steve Parr

2010

One product, Sandberg bluegrass (Radio Tower source), was collected on July 20 after most seed had shattered. A total of 7 grams were cleaned. A thorough evaluation was done on each entry in the demonstration planting. Unless otherwise noted, each plot was rated as “Good” relative to stand and vigor. Only “Excellent” or “Fair” plots will be discussed here with recommended actions for the field season in 2011.

UCEPC Grass Releases

San Luis slender wheatgrass	Fair
Pueblo bottlebrush	Excellent
Wapiti	Fair (replant)
Garnet	Fair
Redondo	Excellent
Peru Creek	Poor (remove)
All other grass plots	Good

UCEPC Grass Experimentals

Columbia needlegrass (9040137)	Excellent
Junegrass/Poa/Sherman	Remove
Thurber’s fescue	Poor (remove)

UCEPC Forbs

Summit	Excellent
Bandera	Excellent
Senecio biglovii	Fair (replant)
Fringed sage	Excellent
Sulphur buckwheat (9024921)	Poor (replant or remove)

Other PMC Grasses

Cool Season grasses	Good
Warm Season Grasses	
Switchgrass (9005439)	Excellent
Salado	Excellent
Pierre	Heavy seed production
Vaughn	Very green
Alma	Very green
Viva	Poor (3 plants) replant or remove

Other PMC Forbs

Bismarck violet prairie clover	Remove
Antelope white prairie clover	Remove
Stillwater prairie clover	Excellent
Purple coneflower	Fair
Medicine Creek	Good stand, no seed

CONCLUSION

Efforts will continue to establish complete stands of materials for education, demonstration, and training opportunities. As materials come on board, additions will be made to the planting while other, ill-suited products will be removed.

Harvey Gap Demonstrational Planting

INTRODUCTION

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

OBJECTIVE

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

METHODS

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

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

Table 1. Sweeney's Demonstrational Planting.

Plot # (south- north)	Release/ Accession	Common Name	Scientific Name
1	Arriba	Western wheatgrass	<i>Pascopyrum smithii</i>
2	Sodar	Streambank wheatgrass	<i>Elymus lanceolatus</i>
3	Hycrest	Crested wheatgrass	<i>Agropyron cristatum</i>
4	Whitmar	Beardless Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>
5	San Luis	Slender wheatgrass	<i>Elymus trachycaulus</i>
6	Luna	Pubescent wheatgrass	<i>Thinopyrum intermedium</i>
7	Pueblo	Squirreltail	<i>Elymus elymoides</i>

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By: Heather Plumb

Plot # (south- north)	Release/ Accession	Common Name	Scientific Name
8	Newhy	Hybrid wheatgrass	<i>Elymus hoffmannii</i>
9	Lodorm	Green needlegrass	<i>Nassella viridula</i>
10	Covar	Sheep fescue	<i>Festuca ovina</i>
11	NW Colorado	Prairie Junegrass	<i>Poa spp.</i>
12	Pueblo	Squirreltail	<i>Elymus elymoides</i>
13	Paloma	Indian ricegrass	<i>Achnatherum hymenoides</i>
14	Paiute	Orchard grass	<i>Dactylis glomerata</i>
15	Bozoisky	Russian wildrye	<i>Psathyrostachys juncea</i>
16	Trailhead	Basin wildrye	<i>Leymus cinereus</i>
17	Mandan	Canada wildrye	<i>Elymus canadensis</i>
18	Bad River	Blue grama	<i>Bouteloua gracilis</i>
19	Niner	Sideoats grama	<i>Bouteloua curtipendula</i>
20	Pastura	Little bluestem	<i>Schizachyrium scoparium</i>

RESULTS

2007

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

Larry Sweeny reported that no measurable precipitation occurred during the months of May, June and July. Some monsoonal rains occurred in late July and early August, however, they were not recorded

On September 25, 2007, the plots were visited again to make a determination on re-seeding the plots. At this date it appeared that Covar-sheep fescue, NW Colorado –Poa (prairie Junegrass), Paloma-Indian ricegrass and Bozoisky-Russian wildrye were the plots that had a good plant stand (35% - 40% for all of them except NW-Colorado that had 90% plant stand). A decision was made to re-seed in order to have a better demonstrational planting. On October 26, 2007, the plots were re-seeded except for NW Colorado Prairie Junegrass (Poa). The plots were re-planted

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Report-2010

By: Heather Plumb

with hand -Planet Jr. - seeders. The warm season plots were replaced with native perennial forbs as follow:

Plot-18 Appar-Prairie flax *Linum perenne*

Plot-19 Timp-Utah sweetvetch *Hedysarum boreale*

Plot-20 Bandera-Rocky Mountain penstemon *Penstemon strictus*

Also plot-12 Pueblo-squirreltail was replaced with Wapiti-squirreltail.

After finishing the re-seeding, all the plots with no signs of germination were sprayed with a 3% solution of glyphosate (Round-up) to kill the existing cheatgrass and other indigenous grass plants.

Plot #	Variety/ Accession	Species
1	Arriba*	Western Wheatgrass
2	Sodar*	Streambank Wheatgrass
3	Hycrest*	Crested Wheatgrass
4	Whitmar*	Bluebunch Wheatgrass
5	San Luis*	Slender Wheatgrass
6	Luna*	Pubescent Wheatgrass
7	Pueblo*	Squirreltail
8	Newhy*	Hybrid Wheatgrass
9	Lodorm*	Green Needle Grass
10	Covar	Sheep Fescue
11	Poa	Poa ampla
12	Wapiti	Squirreltail
13	Paloma	Indian Ricegrass
14	Pauite	Orchard Grass
15	Bozoisky	Russian Wildrye
16	Trailhead	Basin Wildrye
17	Mandan	Canada Wildrye
18	Appar	Lewis Flax
19	Timp	Utah Sweetvetch
20	Bandera	Penstemon

* Entries replanted on Nov. 19, 2008, with hand-pushed Planet Jr. drill

2008

On May 28, 2008, the plots were visited by Terri Blanke and Heather Plumb from the UCEPC. The plots were weeded at this time and field notes were taken to record the plots that were showing signs of establishment. On July 18, Terri Blanke and Manuel Rosales visited the plots to weed and make an evaluation for the season. Good performers were Wapiti, Paiute, Mandan, Timp, Bandera, Covar, Junegrass, and Bozoisky. Poor performers appeared to be all wheatgrass species with the exception of a forb, a squirreltail and a needlegrass. The poor performers were re-seeded on November 19, 2008, to help with re-establishment.

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By: Heather Plumb

2009

On May 29, 2009, UCEPC staff members weeded and sprayed the demonstration plot for redstem filaree and other weeds. The re-seeded materials from the previous year were observed to have good emergence. The site was visited again on September 11, 2009, and was weeded, sprayed with 2,4-D along the borders and all standing plant materials were cut down. The cut down materials were left within the plot. Pre-emergent, Pendulum, was spread out over the entire plot on October 9, 2009, to help ensure no seed left by the cut materials would germinate and to help prevent future weeds from coming up next year.

New wooden signs for the plot were provided to Larry Sweeny to help visitors with identification of materials.

2010

On May 5, 2010, Steve Parr, Heather Plumb, and Terri Blanke cleaned the plot, took pictures and installed the wooden name tag stakes. The forbs were weeded by hand and the rest of the plot was sprayed using an herbicide mixture of Banvel and 2,4-D. The pre-emergent from the year prior didn't seem to have had an effect on the annual weeds. Perhaps the amount spread on the plot was not sufficient enough to stop weeds from germinating this spring.

On July, 16, 2010, again the plot was weeded by hand for a watershed tour that was stopping at the plot. However, only half the plot was weeded, it was decided to leave some of the cheatgrass to show how the materials planted were competing with the cheatgrass.

This year no pre-emergent was applied to the plot and the plant materials were not cut.

CONCLUSION

We will continue to monitor the demonstration plot, and use whatever results we get for educational and demonstrational purposes.

Bluebell Field Evaluation Planting

INTRODUCTION

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

OBJECTIVE

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

EXPERIMENTAL DESIGN

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

METHODS

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

Project COPMC-F-0605-RA

Report-2010

By: Heather Plumb

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

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

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By: Heather Plumb

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

RESULTS

2007

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

On July 24, 2007, the plots were evaluated. A visual estimate of plant stand per plot was recorded and analyzed statistically. Rabbits had gained access to the plots and had done considerable damage to most plots. Plant vigor was not taken due to the damage performed by rabbits, making it impossible to truly assess plant vigor. A second row of chicken wire was purchased to be added to the fence surrounding the plot to help prevent future rabbit damage.

2008

The plots were evaluated for the second growing season in May 25, 2008. From the time the plots were planted to May 15, 2008, the plots received about 10 inches of precipitation for a period of 18.5 months. No rabbit damage was observed since the additional wire was added to the fence.

2009

On September 18, 2009, the plots were evaluated for the third growing season (Table 2). Visual estimates of plant percent stand and vigor were recorded and statistically analyzed. Heights of plants were also recorded.

2010

On June 3, 2010, the plot was evaluated during its fourth growing season (Table 3). Evaluators included UCEPC staff, Steve Parr and Heather Plumb, with help from Colorado Plant Materials Specialist and Roosevelt Utah Field Office personnel. Visual estimates of plant percent stand and vigor were recorded and statistically analyzed. Heights of plants were also recorded. Top percent stand performers were Luna, Fish Creek, 739, Vavilov, and Nezpar.

Project COPMC-F-0605-RA

Report-2010

By: Heather Plumb

Table 2. Percent Plant Stand and Vigor for 50 Perennial Grasses at Bluebell, UT, 2009.

Accession	Common Name	Percent Plant Stand 1*	Plant Vigor 2*
Luna	Intermediate wheatgrass	32.5	3.25
Paloma	Indian ricegrass	28.25	1.5
Vavilov	Siberian wheatgrass	22	2.25
Rush	Intermediate wheatgrass	21.5	2.5
Fish Creek	Bottlebrush squirreltail	20	2.5
Nordan	Crested wheatgrass	18.25	2.25
Volga	Mammoth wildrye	18	2.75
Douglas	Crested wheatgrass	18	2.75
Continental	Basin wildrye	16.25	2.75
Graystone	Needle & thread	15.5	2.25
P-7	Bluebunch wheatgrass	15.25	2.25
Nezpar	Indian ricegrass	15.25	1.5
Trailhead	Basin wildrye	14.75	2.75
Arriba	Western wheatgrass	13.25	2.5
739	Indian ricegrass	13	2
Rimrock	Indian ricegrass	12.75	2
P-24	Bluebunch wheatgrass	11.75	2.75
Toe Jam	Bottlebrush squirreltail	8.75	2.5
Sodar	Streambank wheatgrass	8.75	2.25
Sand Hollow	Bottlebrush squirreltail	8.5	3.25
White River	Indian ricegrass	8	2
P-22	Bluebunch wheatgrass	7	3
Maybell	Needle & thread	6.75	2
Anatone	Bluebunch wheatgrass	6	2.75
Bozoisky	Russian wildrye	5.25	2
Critana	Thickspike wheatgrass	5	2.25
Goldar	Bluebunch wheatgrass	4.5	2.75
Simms	Needle & thread	4.5	3.25
Star Lake	Indian ricegrass	4	2.25
Price	Salina wildrye	3.75	3.75
Bannock	Thickspike wheatgrass	3.75	3.25
State Bridge	Bottlebrush squirreltail	3	2.75
Ephraim	Crested wheatgrass	2.75	3.75
L-46	Basin wildrye	1.75	4.3
Hycrest	Crested wheatgrass	1.5	4
Colorado	Bluebunch wheatgrass	1.25	2.5
Magnar	Basin wildrye	0.75	4.25
Pueblo	Bottlebrush squirreltail	0.75	3.75
Wapiti	Bottlebrush squirreltail	0.5	3.75
Hachita	Blue grama	0	5
Aldous	Little bluestem	0	5
Niner	Sideoats	0	5
Bad River	Blue grama	0	5
Goshen	Prairie sandreed	0	5
Yampa	Prairie Junegrass	0	5
Badlands	Little bluestem	0	5
Tusas	Bottlebrush squirreltail	0	5
Vaughn	Sideoats	0	5
Pierre	Sideoats	0	5
Alma	Blue grama	0	5
LSD (0.05) 3*		25.02	2.39

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent; 2 = Good, 3 = Fair ; 4 = Poor; 5 = Very poor
3. LSD =Least Significant Difference at P<0.05.

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By: Heather Plumb

Table 3. Percent Plant Stand and Vigor for 50 Perennial Grasses at Bluebell, UT, 2010.

Accession	Common Name	Percent Plant Stand 1*	Plant Vigor 2*
Luna	Intermediate wheatgrass	41.25	3.25
Fish Creek	Bottlebrush squirreltail	32.25	2.5
739	Indian ricegrass	30	2.25
Vavilov	Siberian wheatgrass	28.75	2.25
Nezpar	Indian ricegrass	27.5	2.25
Douglas	Crested wheatgrass	26.75	2.25
Paloma	Indian ricegrass	26.25	2.25
Continental	Basin wildrye	25.5	2.5
Rush	Intermediate wheatgrass	24.25	2.5
P-24	Bluebunch wheatgrass	22.25	2
Volga	Mammoth wildrye	19.75	3
Nordan	Crested wheatgrass	19.5	2
P-7	Bluebunch wheatgrass	17.75	3
Trailhead	Basin wildrye	17.75	2.75
White River	Indian ricegrass	15.75	2.25
Rimrock	Indian ricegrass	13.5	2
Toe Jam	Bottlebrush squirreltail	11.75	2.5
P-22	Bluebunch wheatgrass	11.5	1.75
Graystone	Needle & thread	9.75	3
Anatone	Bluebunch wheatgrass	9.75	3.25
Sand Hollow	Bottlebrush squirreltail	8.75	3.25
Bozoisky	Russian wildrye	8.25	1.5
Arriba	Western wheatgrass	8	3.75
Critana	Thickspike wheatgrass	8	2.25
Maybell	Needle & thread	7	2
Bannock	Thickspike wheatgrass	6.5	3.25
Sodar	Streambank wheatgrass	6.25	3
Simms	Needle & thread	4	3.25
State Bridge	Bottlebrush squirreltail	3.75	3.25
Star Lake	Indian ricegrass	3.25	2.75
Goldar	Bluebunch wheatgrass	2.5	2
Price	Salina wildrye	2.5	3
Ephraim	Crested wheatgrass	2.25	3.75
L-46	Basin wildrye	2	4.25
Magnar	Basin wildrye	2	4
Pueblo	Bottlebrush squirreltail	2	4.25
Hycrest	Crested wheatgrass	1.25	4.5
Colorado	Bluebunch wheatgrass	1.25	3
Wapiti	Bottlebrush squirreltail	1	4.5
Yampa	Prairie Junegrass	1	4.5
Tusas	Bottlebrush squirreltail	1	4.5
Hachita	Blue grama	0	5
Aldous	Little bluestem	0	5
Niner	Sideoats	0	5
Bad River	Blue grama	0	5
Goshen	Prairie sandreed	0	5
Badlands	Little bluestem	0	5
Pierre	Sideoats	0	5
Vaughn	Sideoats	0	5
Alma	Blue grama	0	5
LSD (0.05)*3		15.97	1.22

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent; 2 = Good, 3 = Fair ; 4 = Poor; 5 = Very poor
3. LSD =Least Significant Difference at P<0.05.

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CONCLUSION

The Bluebell plot has been evaluated for the last four years. However, only three years out of four have had complete data collected, additional data is definitely needed for this plot. The 2010 growing season was the first year where established materials have produced good top growth and seed heads formed.

The Bluebell plots will continue to be evaluated in the future until sufficient data is collected to make confident recommendations to the NRCS Field Office.

Snowmass Field Evaluation Planting

INTRODUCTION

There is limited information on the performance of perennial native grasses and forbs at altitudes near 8000 feet or above. With this in mind, Upper Colorado Environmental Plant Center in cooperation with Mount Sopris Conservation District and St. Benedict’s Monastery installed a high altitude planting to evaluate the performance of different species. The site is located on the Monastery at 7800 feet near Snowmass, Colorado.

OBJECTIVE

To determine suitability of grasses for high altitude revegetation

EXPERIMENTAL DESIGN

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

METHODS

The planting site was prepared in the fall of 2006 and spring of 2007. Existing vegetation was removed by chemical and mechanical means. The site was seeded on October 4-5, 2007. Thirty eight entries were seeded with a four-row cone-seeder. The rate of seeding was 30 pure live seeds per linear foot of row. The plot size is 4 x 20 ft with four rows. The site was also fenced to protect the planting from livestock use. Plots will be evaluated for establishment, vigor, and performance for at least five years. Table1 lists the 38 entries for the study.

Table1. Thirty-eight Grass Species Planted at Snowmass

Common Name	Release Name or Accession No.	Scientific Name
Arizona fescue	Florrisant	<i>Festuca arizonica</i>
Arizona fescue	Redondo	<i>Festuca arizonica</i>
Big bluegrass	Yampa	<i>Poa secunda</i>
Big bluegrass	Sherman	<i>Poa secunda</i>
Bluebunch	Anatone	<i>Pseudoroegneria spicata</i>
Bluebunch	Colorado BLM	<i>Pseudoroegneria spicata</i>
Bluebunch	Goldar	<i>Pseudoroegneria spicata</i>
Bluebunch	P7	<i>Pseudoroegneria spicata</i>
Blue wildrye	California Park	<i>Elymus glaucus</i>
Blue wildrye	Flat Tops	<i>Elymus glaucus</i>
Blue wildrye	Marvine	<i>Elymus glaucus</i>
Blue wildrye	Park Range	<i>Elymus glaucus</i>
Blue wildrye	Rabbit Ears	<i>Elymus glaucus</i>

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Common Name	Release Name or Accession No.	Scientific Name
Blue wildrye	Uncompahgre	<i>Elymus glaucus</i>
Bottlebrush	State Bridge BLM	<i>Elymus elymoides</i>
Bottlebrush	Tusas	<i>Elymus elymoides</i>
Bottlebrush	Wapiti	<i>Elymus elymoides</i>
Columbia needlegrass	2A	<i>Achnatherum nelsonii</i>
Columbia needlegrass	12A	<i>Achnatherum nelsonii</i>
Indian ricegrass	715	<i>Achnatherum hymenoides</i>
Indian ricegrass	739	<i>Achnatherum hymenoides</i>
Indian ricegrass	741	<i>Achnatherum hymenoides</i>
Indian ricegrass	Rimrock	<i>Achnatherum hymenoides</i>
Meadow brome	Regar	<i>Bromus biebersteinii</i>
Mountain brome	Garnet	<i>Bromus marginatus</i>
Mountain brome	Elk Creek	<i>Bromus marginatus</i>
Mountain muhly	Florrisant	<i>Muhlenbergia montana</i>
Salina wildrye	Price	<i>Leymus salinus</i>
Sandberg's bluegrass	Gypsum	<i>Poa secunda</i>
Sandberg's bluegrass	High Plains	<i>Poa secunda</i>
Slender wheatgrass	Pryor	<i>Elymus trachycaulus</i>
Slender wheatgrass	San Luis	<i>Elymus trachycaulus</i>
Slender wheatgrass	Summitville	<i>Elymus trachycaulus</i>
Spike trisetum	Summitville	<i>Trisetum spicatum</i>
Thurber fescue	Hiner Spring	<i>Festuca thurberii</i>
Western wheatgrass	Arriba	<i>Pascopyrum smithii</i>
Western wheatgrass	Irish Canyon BLM	<i>Pascopyrum smithii</i>
Western wheatgrass	Rosana	<i>Pascopyrum smithii</i>

RESULTS

2008

On July 17, 2008, the plots were weeded by hand and evaluated. Most species established very well for the first year after planting. The top five percent plant stand performers were Elk Creek, Pryor, Garnet, San Luis, and Wapiti.

2009

On July 16, 2009, UCEPC staff evaluated, weeded by hand, and sprayed the Snowmass plot. As the plot was weeded, Steve Parr and Heather Plumb evaluated. After evaluations the broadleaf weeds were hand sprayed with glyphosate. On October 7, 2009, Terri Blanke and Heather Plumb pre-emerged the plot with pendimethalin to help prevent volunteer seedlings for the 2010 growing season.

Evaluation data recorded was analyzed statistically and top percent plant stand performers were; Pryor, Elk Creek, Rosana, Regar, and Goldar. All top percent stand performers additionally had high vigor results (See Table 2).

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By: Heather Plumb

Table 2. Percent Plant Stand and Vigor for Snowmass Field Evaluation Planting, 2009.

Release Name or Accession Number	Common Name	Percent Plant Stand *1	Plant Vigor *2
Pryor	Slender wheatgrass	76.5	2
Elk Creek	Mountain brome	74.5	2
Rosana	Western wheatgrass	72.5	3
Regar	Meadow brome	67	3
Goldar	Bluebunch	64	2
Flat Tops	Blue wildrye	61.75	2.5
San Luis	Slender wheatgrass	60.75	2.75
Garnet	Mountain brome	59	3
Wapiti	Bottlebrush	58	2.75
Arriba	Western wheatgrass	57.75	2.25
California Park	Blue wildrye	57.5	3
P7	Bluebunch	55.5	2.75
715	Indian ricegrass	44.5	2
Summitville-wheat	Slender wheatgrass	40.5	4
State Bridge BLM bottle	Bottlebrush	40	2.5
Irish Canyon BLM wheat	Western wheatgrass	40	3.25
Park Range	Blue wildrye	37	3
Marvine	Blue wildrye	35	3
Uncompahgre	Blue wildrye	33.75	3.25
Colorado BLM	Bluebunch	33	2.75
Anatone	Bluebunch	30.5	3.25
12A	Columbia Needlegrass	26	3
739	Indian ricegrass	24.75	3
741	Indian ricegrass	24.75	3
Rabbit Ears	Blue wildrye	21.75	3
2A	Columbia Needlegrass	21.75	3
Rimrock*	Indian ricegrass	17	2.5
Price	Salina wildrye	16.75	3
Yampa	Bluegrass	13	2.25
Sherman	Bluegrass	11	2.25
Florissant fescue	Arizonia fescue	1.75	4
Hiner Springs	Thurber fescue	1.75	4
Redondo	Arizonia fescue	1.5	4.25
Gypsum	Sandberg bluegrass	1.5	4.5
Summitville-spike	Spike trisetum	1.5	4.25
Florissant muhly	Mountain muhly	1.25	4.75
High Plains	Sandberg bluegrass	1.25	4.25
Tusas	Bottlebrush	1	5
LSD (0.05)*3		19.87	0.75

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent; 2 = Good, 3 = Fair ; 4 = Poor; 5 = Very poor
3. Least Significant Difference at P<0.05.

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Report-2010

By: Heather Plumb

2010

On July 13, 2010, the Plant Materials Specialist, Christine Taliga, visited the plot and evaluated REP 1. Christine noted that the plots looked great and had lots of growth. On July 16, 2010, UCEPC staff went to evaluate the plot along with personnel from the Glenwood Springs field office. However, horses had gotten into the plot since Christine's visit three days prior and grazed all plot materials within the enclosed area. How the horses had gotten in the enclosed area is unknown. The plot was weeded by hand and an inventory of surviving materials was taken based off of plant material stubble. It was noted that the purple aster was greatly encroaching into the plot area and will need to be sprayed out next year if necessary.

During the month of September, UCEPC staff contacted Stephen Jaouen, Glenwood field office personnel, to see if he could look at the plot to determine if a re-evaluation could occur during the 2010 season. Stephen visited the site and determined re-growth of materials occurred and the plot could be evaluated. On September 30, 2010, UCEPC staff along with Stephen evaluated the plot again. It was observed that some materials were recovering well after being grazed by the horses and others appeared to be slowly recovering or needed to be re-seeded.

Evaluation data recorded was analyzed statistically and top percent plant stand performers were; Arriba, Pryor, Rosana, Goldar, and Elk Creek (Table 3).

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By: Heather Plumb

Table 3. Percent Plant Stand and Vigor for Snowmass Field Evaluation Planting, 2010.

Release Name or Accession Number	Common Name	Percent Plant Stand *1	Plant Vigor *2
Arriba	Western wheatgrass	83.75	1.75
Pryor	Slender wheatgrass	77.75	3
Rosana	Western wheatgrass	76.5	2.75
Goldar	Bluebunch	73.25	1.5
Elk Creek	Mountain brome	67.5	2.5
San Luis	Slender wheatgrass	58.75	3.75
Regar	Meadow brome	57.5	2
P7	Bluebunch	56.25	2.5
Irish Canyon BLM wheat	Western wheatgrass	56.25	3
Garnet	Mountain brome	52.5	3
Wapiti	Bottlebrush	40.25	2.75
Anatone	Bluebunch	33.25	2.25
State Bridge BLM bottle	Bottlebrush	32.75	3.25
715	Indian ricegrass	27.5	3.25
Colorado BLM	Bluebunch	27.5	2.5
Summitville-wheat	Slender wheatgrass	27	3.5
Flat Tops	Blue wildrye	26.5	3.5
12A	Columbia Needlegrass	20.75	2
741	Indian ricegrass	19.75	3.25
2A	Columbia Needlegrass	19	2
California Park	Blue wildrye	17.5	3.75
Park Range	Blue wildrye	17.5	3.5
Price	Salina wildrye	17.25	2
739	Indian ricegrass	11.5	3.25
Marvine	Blue wildrye	11	3.5
Rimrock	Indian ricegrass	9	3.75
Sherman	Bluegrass	9	2.75
Rabbit Ears	Blue wildrye	6.75	3.75
Yampa	Bluegrass	4.75	3
Uncompahgre	Blue wildrye	3	3.25
Summitville-spike	Spike trisetum	3	3.25
Hiner Springs	Thurber fescue	1.25	4.25
Redondo	Arizonia fescue	1.25	4.25
Tusas	Bottlebrush	1.25	4.25
Florrisant fescue	Arizonia fescue	1	4.5
Gypsum	Sandberg bluegrass	1	5
Florrisant muhly	Mountain muhly	1	4.75
High Plains	Sandberg bluegrass	1	4.5
LSD(0.05)		21.27	0.89

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent; 2 = Good, 3 = Fair ; 4 = Poor; 5 = Very poor
3. Least Significant Difference at P<0.05

Project COPMC-F-0801-RA

Report-2010

By: Heather Plumb

CONCLUSION

The 2010 growing season was the third year the Snowmass plot has undergone evaluation. Most plant species prior to the horse grazing were well established. Re-growth of some material had occurred showing high altitude plant materials can recover from grazing, but some plots were severely damaged from the grazing. Some materials may need to be re-seeded next year to ensure proper recommendations can be made to the field office about high altitude plant materials.

The purple aster encroaching into the plot will need to be sprayed out before it goes to seed next year to help ensure no further encroachment occurs.

The Snowmass plots will continue to be evaluated in the future until sufficient data is collected to make confident recommendations to the local NRCS Field Offices about high elevation plants.

Project: COPMC-F-0802-IN

Report- 2010

By: Heather Plumb

Tamarisk Replacement Planting

INTRODUCTION

Riparian ecosystems are ideal ecosystems for invasive plant species infestations. There is an ever increasing demand to use native plants for revegetating infested ecosystems. Upper Colorado Environmental Plant Center (UCEPC), United States Department of Agriculture (USDA), The Tamarisk Coalition and the Young Ranch are working cooperatively to rehabilitate a known riparian ecosystem where tamarisk *Tamarix* spp. has rigorously invaded and taken over the area.

OBJECTIVE

To determine what native woody species are suitable and effective in replacing post treated tamarisk infested sites.

METHODS

In February 2008, the UCEPC staff collected one hundred willow whips *Salix* spp. from Horsethief Canyon near Grand Junction, Colorado. Willow whips were placed in cold storage for the winter and were kept in cold storage until spring planting. Most of the willow whips had begun developing roots and sprouts while in cold storage. Nine silver buffaloberry *Shepherdia argentea* were grown over a period of several years in the UCEPC greenhouse.

Planting of the willow whips and silver buffaloberries began May 29, 2008, at Salt Creek. Sites for willows were chosen according to erosion patterns along the creek bank. Approximately ten willows were planted in each site. Willows were planted as deeply as possible directly into the sand bank or in the creek itself. Of the 100 original willow whips, 50 were cut in half to make 50 additional whips to be inserted into the sand banks. A total of 150 willow whips were planted at the site. August 13, 2008, five more willows were planted at the site.

Two different sites were chosen for the silver buffaloberries. The first site was located 100 yards from Salt Creek in an old washed out area. The area was sprayed with glyphosate for weed control. Holes for the plants were hand dug and filled with water from the creek. One 4-year-old plant and three 2-year-old plants were planted and watered. The second site was 1000 yards away from Salt Creek below an old terrace. The area was sprayed with glyphosate for weed control. Holes were hand dug again and filled with creek water. One 4-year-old, three 2-year-old plants and one 1-year-old plant were planted and additionally watered.

Project: COPMC-F-0802-IN

Report- 2010

By: Heather Plumb

RESULTS

2008

The NRCS office in Grand Junction observed deer browsing on the silver buffaloberries. August 13, 2008, UCEPC staff evaluated willows and silver buffaloberries. Tamarisk was sprouting and coming back within the treatment areas. A 20% survival rate for the willow whips was observed, majority of willow whips were washed away or died. Surviving willows ranged in size and location along Salt Creek. Eight wire pens were made and placed around the silver buffaloberries to prevent further deer damage. One silver buffaloberry plant at the first site by the creek was not found, and only three plants were observed. All plants at the second site were found. Silver buffaloberries that were observed were alive and trimmed to help promote growth.

2009

On March 24, 2009, UCEPC staff visited the Mack site. At this time buds were beginning to form on the buffaloberries and pictures were taken.

June 4, 2009, Heather Plumb and Terri Blanke evaluated the buffaloberries and took height measurements. Of the buffaloberries planted by Salt Creek only one was observed to be alive; the others were dead. The height of the surviving plant was 47.5 inches and it was the plant that was furthest from the creek. The buffaloberries that were planted by the bench had a much higher survival rate as three of the four had survived. The heights of the surviving plants were 29, 42, and 43 inches. Deer browsing was observed on the new growth, the surviving plants all looked healthy. However, the buffaloberry site was heavily infested with white top and survival for next year may be lowered.

Few willow whips were observed, but it was undeterminable if they were native or transplanted whips. The transplanting was determined a failure and whips need to be re-transplanted.

2010

In 2010, the site was visited and it was determined that white top had completely taken over the site. The silver buffaloberries were evaluated and all were dead. The Mack site is currently being reviewed to see if more materials will be transplanted again in this site. The site may be abandoned and a new site will be needed.

CONCLUSION

If the site is to remain, additional willow whips and buffaloberries should be established to replace those lost to high salt content and white top infestation. However, if the white top continues to spread, the site may have to be abandoned and a new site must be found to replant.

Beefsteak Riparian Planting

INTRODUCTION

With ongoing efforts to repair our riparian ecosystems from the damage done by invasion of Russian olive *Elaeagnus angustifolia* L. and tamarisk *Tamarix spp.* the need for restoration material is greater than ever. Upper Colorado Environmental Plant Center (UCEPC) and the Meeker Bureau of Land Management (BLM) have recognized this need and are working together to collect, propagate, increase, study, and implement the best suitable materials for these riparian restoration/enhancement projects. Silver buffaloberry *Shepherdia argentea* is a hearty shrub native to Colorado with many conservation attributes. UCEPC has recognized silver buffaloberry as a possible native woody riparian replacement material.

OBJECTIVE

To determine adaptation of buffaloberry accession 9008027 for riparian restoration plantings

METHODS

This is a non-replicated planting.

Silver buffaloberry, accession number 9008027, was planted in the UCEPC orchard in 1977. The shrub was selected for superior performance and isolated in the windbreak area in 1991. UCEPC staff continues to evaluate, maintain, and collect seed when available. Buffaloberry shrubs were successfully propagated in the greenhouse by seed for several years later. On June 9, 2008, fifteen potted silver buffaloberry plants of various size and age were planted in the BLM Beefsteak pasture between the White River and Highway 64, Meeker, Colorado. The location hosted a variety of riparian species including willow, alder, juniper, hackberry, skunkbush sumac, Gambel oak, and volunteer buffaloberry. The soil was mostly sand/silt with plenty of moisture. The public access is also a holding field for cattle that are being relocated. Melissa Kindall and Mary Taylor of the Meeker BLM office along with Heather Plumb and Terri Blanke of UCEPC used a portable 8" auger for digging holes to place the shrubs in. The holes were filled with water and then backfilled as necessary. Planting locations varied to study survivability. Material was placed directly into the high water, at shoreline, higher up on the bank and out into the field. UCEPC employees watered the shrubs periodically through the summer. The buffaloberry shrubs were fenced for protection from wildlife browsing and cattle.

Project No. COPMC-F-0803-RI

Project Report-2010

By: Terri Blanke

RESULTS

July 7, 2009, UCEPC staff evaluated the buffaloberry. See the COMPC-F-0803-RI 2009 Report for additional information and results. In August of 2010, UCEPC staff evaluated the shrubs for a second time. The buffaloberry shrubs were tagged for identification and photographed. Survivability and vigor are recorded in the table below.

Plant #	Vigor	Notes	Protection	
1	Tag	5	Dead	Fenced
2	Tag	3	Heavily browsed, moist area, competing well	Fenced
3	Tag	3	Lightly browsed, moist area, competing ok	Fenced
4	Tag	3	Moist area, competing well, good growth	None
5	Tag	2	Healthy, some browse, moist area, competing well	Fenced
6	Tag	4	Heavy browse, dry area, spindly & sparse	Fenced
7	Tag	3	No browse, healthy but small plant	Fenced
8	Tag	2	No browse, tall , medium health	Fenced
9	Tag	5	Dead	Fenced
10	Tag	3	Little browse, tall plant, dry and in dry area	Fenced
11	No	5	Could not find	None

1 = excellent 2=good 3 = average 4=fair 5=dead

CONCLUSION

The silver buffaloberry plants are proving to be very tolerable to a variety of environmental conditions. They have survived heavy browsing, drought, and high water. UCEPC will record the height and vigor in 2011. We will continue to monitor the shrubs for berry production as well. UCEPC anticipates a possible release of the Silver buffaloberry to the general public for conservation practices.

Project: COPMC-F-0804-RI

Report- 2010

By: Heather Plumb

Silver Buffaloberry Field Planting

INTRODUCTION

Riparian ecosystems are extremely sensitive areas that are used by both humans and wildlife. Riparian areas are well known for major soil erosion problems because of natural and man induced practices. As a result, habitat can be severely degraded. Native plants are in constant demand to be used as soil and stream bank stabilizers to help eliminate or reduce soil erosion effects. Upper Colorado Environmental Plant Center (UCEPC) and the Gunnison NRCS Field Office are working cooperatively to rehabilitate known riparian ecosystems where soil erosion at high elevations has occurred and depleted riparian habitat. The plant specie chosen to be used in this field planting is silver buffaloberry *Shepherdia argentea*. Silver buffaloberry is a deciduous, thorny shrub/tree that is well adapted to mid-level elevations, but is unknown how suited it is to elevations over 8000 feet. Plants at maturity can reach heights of 6 to 20 feet. Roots are shallow and are readily sprouting making them excellent at stabilizing eroding soils. Silver buffaloberries are very common along streams and on exposed moist hillsides in the service area for UCEPC.

OBJECTIVE

To determine adaptability of silver buffaloberry *Shepherdia argentea* selection for riparian plantings at high elevations in Colorado.

METHODS

June 26, 2008, forty live silver buffaloberries were picked up and delivered to Jason Turner at the Gunnison Field Office in Gunnison, Colorado. Silver buffaloberry plants ranged in size and age. Plants delivered were as follows; one 1-gallon pot, one 3-gallon pot, two-6"x 16" tree pots, seven-2"x 12" cones, eighteen-2"x 2"x 11" tree pots and eleven-4"x 4"x 14" tree pots.

RESULTS

The buffaloberries were all planted the day after the Gunnison field office received them in 2008. The buffaloberries were planted in a reclaimed reservoir site. The site presented a great opportunity to test the plants in various soils (clayey to sandy loam) and at various depths to the water table.

2008

The landowner working with the Gunnison field office reported that in late summer 2008, many of the silver buffaloberries were looking good and he was optimistic.

Project: COPMC-F-0804-RI

Report- 2010

By: Heather Plumb

2009

UCEPC staff contacted Elizabeth With, from the Gunnison field office, to see how the silver buffaloberries were doing since the summer of 2008. Elizabeth observed that only four of the larger, hearty plants survived the harsh winter. When they were first planted they were each about 1.5 feet tall, except for one which was a little over two feet. During the 2009 evaluation performed by Elizabeth, plants were measuring 1.5, 2, 2.5 and 3 feet tall. The smaller buffaloberries were not observed and were believed to be dead. Pictures of the site were provided by Elizabeth With showing elk browsing on the larger buffaloberry plants.

2010

No official evaluation occurred this year on the silver buffaloberries. Elizabeth With was contacted to see how the buffaloberries performed. She said that only three appeared to be alive. The enclosed plants seemed to be doing well, but had not put on much top growth. The plants were additionally being browsed heavily by the local wildlife. From Elizabeth's observations thus far, she has concluded that silver buffaloberry can survive at high elevations, but they might not thrive.

CONCLUSION

The plan for further follow-up is to go and visit the site in the summer of 2011 to see how the surviving three plants are doing. More buffaloberry plants may need to replace any plants that did not make it through the harsh winters.

Piceance Basin Evaluation Planting

INTRODUCTION

Successful revegetation of well pads, pipelines, roadsides, and other surface disturbances related to natural resource extraction is a critical aspect of long-term land stewardship. Energy extraction in Western Colorado and the associated activities has increased substantially since 2004. According to the U.S. Energy Information Administration, the nation's use of natural gas will increase by more than 50 percent by 2025. This is echoed by Joe Jagers, vice president of exploration and production of Williams Energy Company, who said, "In a national sense, the Rocky Mountains have the most undeveloped potential that we can access".

This project addresses some of the most pressing natural resource conservation concerns that surface disturbing activities related to natural gas exploration, extraction, and transmission create. The construction of well pads, roads, and pipeline transmission corridors are all activities that, if left unchecked, result in loss of topsoil and invasion by annual or noxious weeds. Additionally, if revegetation activities utilize improper methods or materials that are not suited to the site, failure is the most common result. In order to reduce or minimize the ecological negative affects of natural gas extraction, soil surface disturbances must be successfully revegetated with products that are well suited to the site and that have long term environmental benefits.

Private landowners, conservation district members, and public land managers are directly and indirectly affected by pipeline and well pad disturbances. Annual and invasive weed spread, soil loss, reduced grazing opportunities, water quality degradation and loss of wildlife habitat, including critical mule deer and sage-grouse habitat, are some of the conservation challenges that landowners and land managers will be facing if surface disturbances occur without successful revegetation.

OBJECTIVE

The goal of this project is to identify practices and products that result in successful well pad revegetation. The principle objective is to identify which conservation plant materials will establish and persist on abandoned well pads, and secondarily, to compare how new releases and experimental products compare to current seed mix and source recommendations by the Natural Resource Conservation Service (NRCS) and Bureau of Land Management (BLM) field offices.

BACKGROUND

BLM, White River Field Office, Riata Energy Company, and Upper Colorado Environmental Plant Center (UCEPC) were original partners on the project. Likely additional partners included

Project COPMC-F-0805-CR

Project Report - 2010

By: Steve Parr

NRCS, Colorado State University, and Colorado Division of Wildlife. However, no additional partners have contributed time or resources as of the date of this report. Riata had agreed to allow UCEPC to conduct this research on two well pads they had abandoned, and were to have fenced both sites to exclude livestock. In exchange, BLM was to release Riata's reclamation bond.

The two sites are typical of much of the Piceance Basin where extraction activities are being conducted. In addition, one site was identified as important sage-grouse habitat and both sites are important mule deer habitat components. This project specifically addresses which plant material product(s), out of 52 entries, replicated four times, shows promise for long-term revegetation success on well pads that are plugged and recontoured. Successful revegetation ensures conservation of topsoil, reduction of weed invasion, improved wildlife habitat, and livestock grazing opportunities, reduced fire hazards, and enhanced water quality. Additionally, it will help to demonstrate that successful revegetation is an expected outcome of surface disturbing activities in the Piceance Basin.

In order to simulate actual well pad revegetation activities, a well pad that had been constructed, and then abandoned and recontoured prior to revegetation, was necessary. This effort required the coordination of the White River Field Office of the BLM, and resource specialists for many of the major oil and gas companies operating in the Piceance Basin. After several site evaluation trips, one was selected that was permitted to Riata Energy Company. Riata Energy Company, who was an initial partner on the project, provided the site location, did the recontour work on the well pad, and was in the process of signing a long-term agreement that would allow the research to be done on the site. They were also agreeable to pay for the fencing of the site. However, they sold to Sand Ridge Energy before the agreement was signed, and ceased all operations in the area. An agreement could not be reached with Sand Ridge, so the BLM identified the site as a public research location which is off limits to any future permitting for oil and gas activities. This permit is presently owned by Williams. Both the frequency of permit sales and the length of commitment by a given energy company to a research site were concerns of UCEPC and BLM.

METHODS

Once the site was chosen, BLM acquired the necessary National Environmental Policy Act (NEPA) documentation to allow research on public lands. This permit allowed the use of herbicide and the construction of an enclosure fence around the research site. BLM sprayed herbicide (glyphosate) in the spring and fall of 2007 and 2008 to help control annual weeds. UCEPC personnel tilled the site with a vertical axis tiller prior to the last herbicide application. This was done to prepare a suitable seed bed and to germinate annual weeds before applying herbicide and installing the research project.

A draft species list was circulated within the local BLM office, the Meeker NRCS Field Office, NRCS State Plant Materials Specialist, and EnCana Oil and Gas (USA) Inc. (EnCana) field specialists. A final entry list was selected, and the materials were obtained. The project utilizes a randomized, complete block research design (included) for statistical analysis, and this, too, was

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circulated for input. The materials were assembled by UCEPC personnel, and the project was installed on September 26, 29, and 30, 2008. On October 31, the site was sprayed with glyphosate to suppress or kill winter annual weeds that had germinated since the tilling operation on August 27.

The original NEPA permit, which allowed the construction of a livestock enclosure fence, was also determined to be acceptable to allow for the construction of a wildlife enclosure fence for the project. However, the correspondence confirming permission to construct a “wildlife enclosure” fence was not received until December 8, 2008. As a result, the fence was not constructed by the end of the calendar year, but the project was bid and a construction company has been selected to install the fence. EnCana had initially agreed to pay for the entire fencing project.

A written project description and two oral presentations were made to members of the Rio Blanco County Users Group. This group is an assembly of energy companies conducting oil and gas extraction activities in Rio Blanco and Garfield Counties. The interest in the project expressed by this group resulted in a tour of UCEPC facilities on September 10, prior to the monthly meeting.

A Matching Grant was provided by the Colorado State Conservation Board (CSCB) as the primary funding source for the project. This grant was a \$25,000 cash award. The BLM provided coordination for the involvement of a cooperating energy company, and site selection that encompassed location and stage of development. The BLM also obtained the necessary NEPA documentation that allows for the establishment of a research site on public lands and the associated activities related to the research. The BLM has applied herbicide four times to the site and has agreed to assist with the monitoring of the project. This has all been provided as In-Kind contributions.

UCEPC provided tillage and seeding equipment and all staff time, travel, meetings, and coordination activities not covered by the CSCB Matching Grant as In-Kind contributions.

The NRCS provided species recommendations for the specific Major Land Resource Areas and soil types, seed of certain native species that were planted in the project, and assistance in entry selection and project installation. These services were all In-Kind contributions. The Board of Directors for White River and Douglas Creek Conservation Districts encouraged the development of the project and agreed to allow the use of UCEPC staffing and resources to initiate, coordinate, and establish the project, and to commit to long term monitoring and educational outreach.

The individual plots will be evaluated on at least three parameters; percent cover, vigor, and biomass production. If there is not adequate biomass to acquire from clipping plots, height, and width will be used for measurements instead.

The project will be monitored and results assessed, presented, and published. As described above, one or more commercially released plants may result from the project. These releases

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will have substantial site documentation to show the attributes that they exhibit for use on similar sites in the Piceance Basin. Site tours for energy companies, public land management agencies, and private landowners will be conducted for educational purposes.

RESULTS

Over 50 native and introduced plant materials were planted in replicated plots and with plans for annual evaluations for five years to identify the products that are most successful at establishing and persisting on one of the abandoned well pad sites. This project represents one of the most comprehensive studies of released, experimental, and locally collected native plant materials assembled for performance comparison in the Piceance Basin. Because of the scope of the study and the long-term benefits, this project will be monitored annually through 2015. Data will be collected, analyzed, and summarized in annual reports to determine the most successful revegetation products for this site. Because the project utilizes the materials presently recommended for revegetation seed mixes on these ecological sites, and compares them to newly released commercial products, experimental products and locally collected Piceance Basin source products, the most successful products for revegetating similar sites will be identified.

Promotion of superior performers, whether old, established cultivars, or newly released products, will be done to increase industry awareness and contribute to enhanced revegetation success and conservation benefits. Experimental materials and local collections that show promise will be developed further for eventual release and commercial production.

If no releases result, the analysis of data will document the findings of the project. These results will show that the most suitable products, at the time of the installation of the study, already exist in the commercial market. Regardless, the study will provide confidence in the selection of the best revegetation materials for comparable sites. At the completion of this project, what to plant and how to plant for successful revegetation of well pads will be better understood. Both NRCS and BLM will have the most up to date information for specifications and recommendations for seeding mixes, individual plant material performance, and planting methods for the Piceance Basin.

2009

On an evaluation and weed removal trip to Piceance Basin, it was noted that livestock grazing had been and continued to be very concentrated on the new planting. The exclosure fence that was to be installed the fall of 2008 was put on hold because of budgetary considerations of the donor, EnCana for the construction of the fence. As a result and after inspecting the site, it was felt that the only truly meaningful scientific aspect of replicated plant materials trials on this site would be obtained from a project where both livestock and wildlife were excluded from the project.

Weeding and evaluations were suspended and efforts were focused on obtaining funds for the construction of an exclosure fence. The project was not re-evaluated until progress could be made on the fence construction. With persistence from Alvin Jones and Lannie Massey, both

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with EnCana, funds were set aside for construction in 2009. The fence was completed on Friday, December 4, 2009, by Bolton Construction.

2010

A preliminary trip on May 4, 2010, showed that there were many weeds and off-type grasses that had come in on their own. A follow-up trip was conducted to spray herbicide on the disturbed portion of the exclosure that had not been planted, and to determine the fate of the planted portion. The disturbed, weedy portion of the exclosure is the east half; roughly 20 feet east of the well pipe located near the center of the exclosure. However, the sprayer nozzle on the boom had broken during our trip out to the site, and it was not possible to apply herbicide evenly. So, we just determined that the site would lose a year of treatment, and we returned on September 29, 2010, to remove thistle and hound's tongue by hand to reduce noxious weed competition within the exclosure and to provide some responsible stewardship to the plots. Aggressive herbicide control of weedy species will be done in 2011 with an assessment to follow on re-seeding.

CONCLUSION

With much persistence, a wildlife exclosure has been installed on the Ryan Ridge site of Piceance Creek. To date, the project is considered a failure. At this time, there is no information that can be obtained from the evaluation of the planting, primarily because of two things; 1) poor weed and perennial plant control prior to planting and 2) no way to eliminate grazing from newly seeded plots. As a minimum, electric fencing or livestock (3 strand barbed wire) fencing should have been constructed to keep cattle off the seeded plots, and UCEPC should have been in charge of herbicide application/weed control on the site. A transfer of the BLM contact from the Meeker office to the Montrose office the year of planned seeding was a big blow to the timing and level of prioritization that BLM placed on the project. As a result, poor plant and weed control was obtained in the spring and summer of 2009. Concern was expressed from UCEPC staffers about the effectiveness of the herbicide treatment. Many plants remained green and apparently growing without appearing decadent or damaged from herbicide application.

In retrospect, UCEPC should have applied the herbicide at the time and rate that we felt would be effective. Untimely herbicide application or application rates that suppress, but do not eliminate vegetative competition, are not acceptable for good plot preparation. Weed control is critical to the success of any Field Evaluation Planting, as is the exclusion of livestock grazing. UCEPC was under a time constraint with a grant that was received from the Colorado State Conservation Board, and the terms of completing the work were for the end of the fiscal year. Aside from the challenges of working with the constraints of a grant, biological and climatic variation, multiple partners, and change in personnel, the site is now fenced. Weeds and perennial plants will be controlled; the seed bank minimized and the planting conducted only when the timing and conditions are optimal for installation of plant materials that will help solve resource problems in the Piceance Basin for many years to come.

Mack Field Evaluation Planting

INTRODUCTION

Salt Creek runs through Stan Young's property in Mack, Colorado. The creek is so named from the high concentration of salt that is in the area soil. The area receives minimal amounts of precipitation and is generally hot in the summer. Over the years tamarisk invasion has further depleted the riparian area's ability to support its native ecosystem. Several methods of removing the tamarisk have been applied to the infested areas along the creek. Upper Colorado Environmental Plant Center (UCEPC), Grand Junction NRCS field office, the Tamarisk Coalition, the Palisade Insectary, and the Young Ranch are working cooperatively to rehabilitate the once infested site. A field evaluation planting was placed on the ranch to help identify which grass and forbs species will thrive in a known salty soil site.

OBJECTIVE

To establish herbaceous plant materials on post treated tamarisk and Russian olive infested riparian sites.

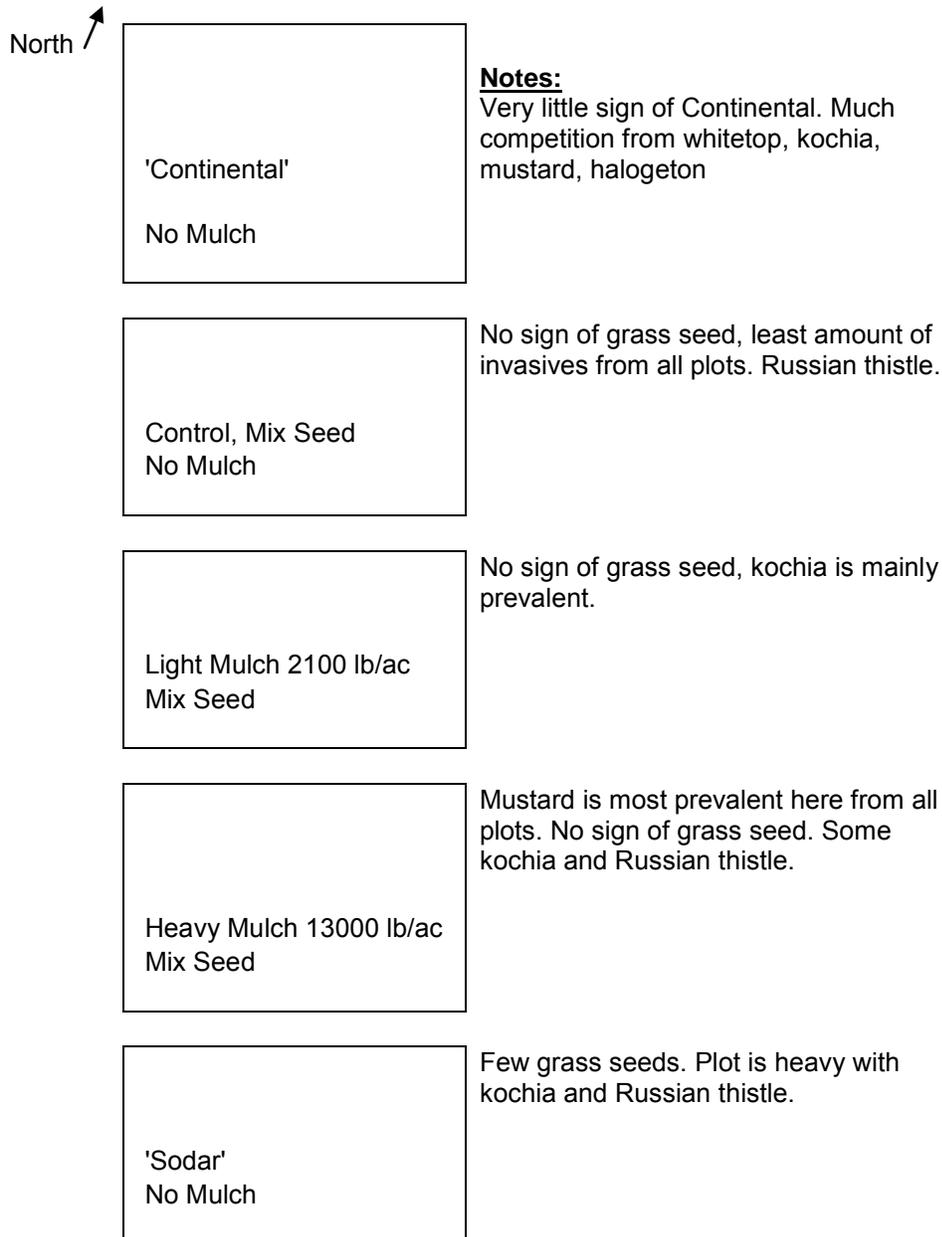
METHODS

This planting consists of 25 entries replicated three times in a randomized block design.

The site was prepared with a spring application of herbicide, glyphosate, on May 29, 2008, to eliminate existing weeds, cheatgrass, native forbs, and grasses. The site was then plowed and disked by the property owner. On August 12 and 13, 2008, UCEPC staff and Grand Junction field office personnel planted 25 entries consisting of 15 species. Twenty-three grasses and two forbs were seeded using a planet junior. The total plot size is 4275 square feet (62.5 feet wide and 70 feet long). A detailed list of entries and additional plot plan information can be found in the 2008 report, COPMC-F-0806-RI.

After the field planting was completed it was decided by UCEPC staff to create an observational seed broadcast trial with mulching. Five blocks were created to the south of the field planting. 'Sodar' and 'Continental' were the accessions chosen to be used for the seed broadcasting. The mulch, attained from a restoration company, was wood shavings ¼ inch in diameter and 4-12 inches long. All five blocks were hand raked. One block was broadcast with just 'Continental' and one was broadcast with just 'Sodar'. The remaining blocks were broadcast with a blend of both species. After broadcasting was completed, mulch was applied at different rates, by hand, to the observational blocks (see Figure 1).

Figure 1. Plot plan for the observational seed broadcast and mulching blocks with visual notes made in 2010.



RESULTS

On June 4, 2009, UCEPC staff evaluated the mulch plots. After evaluations, the plots were sprayed with the herbicide dicamba. A backpack sprayer was utilized with an application rate of 0.2 ounces of chemical to a gallon of water. The kochia was visibly affected by the spray application during the course of the day. The kochia was 12 inches high on average.

The UCEPC staff visited the site on March 21, 2009. It was noted that several of the entries showed signs of emergence but there was also signs of invasive emergence. The staff traveled back to the Stan Young ranch in early June for a full evaluation. The entire area was heavily infested with whitetop. Kochia, mustard, and tamarisk were also evident. The plot was evaluated, photographed, hand weeded and chemically treated. A back pack sprayer was utilized to apply the herbicide dicamba at an application rate of 0.02 ounces to a gallon of water.

On May 5, 2010, UCEPC staff along with Christine Taliga, Colorado Plant Material Specialist, traveled to the Mack site to conduct an evaluation. The site was very dry and the plot materials were suffering due to heavy competition from invasives. Purple mustard, kochia, white top, Russian thistle and tamarisk had out competed any materials that had previously established. The staff noted it was difficult to see if materials were present because of the heavy weed infestation. The evaluation was done on an actual count of plants identified by the staff compared to percent stand as evaluated the previous year. Table 1 below shows the second year's results for number of plants identified and vigor of each entry.

Project: COPMC-F-0806-RI
Report- 2010
By: Heather Plumb and Terri Blanke

Table 1 : Young Ranch Initial Field Evaluation 2010					
Species	Release/Accession	Entry #	Rep #1	Rep #2	Rep #3
Alkali muhly	9066232	1			
		# of plants	0	2	0
		Vigor	5	4	5
Alkali sacaton	Salado	2			
		# of plants	0	3	1
		Vigor	5	3	4
Basin wildrye	Continental	3			
		# of plants	16	3	0
		Vigor	2	3	5
Basin wildrye	Trailhead	4			
		# of plants	18	21	6
		Vigor	2	2	3
Bearless wildrye	Shoshone	5			
		# of plants	0	0	0
		Vigor	5	5	5
Bluebunch whtgrs	Secar	6			
		# of plants	0	3	0
		Vigor	5	3	5
Bottlebrush sqrtl	Fish Creek	7			
		# of plants	6	0	9
		Vigor	3	5	3
Bottlebrush sqrtl	Toe jam Creek	8			
		# of plants	0	3	0
		Vigor	5	3	5
Crested whtgrs	Hycrest	9			
		# of plants	0	5	2
		Vigor	5	3	4
Crested whtgrs	Hycrest-II	10			
		# of plants	1	11	7
		Vigor	4	2	3
Forage kochia	Kochia	11			
		# of plants	0	0	0
		Vigor	5	5	5
Indian ricegrass	661	12			
		# of plants	3	1	8
		Vigor	4	2	4
Indian ricegrass	664	13			

Project: COPMC-F-0806-RI
Report- 2010
By: Heather Plumb and Terri Blanke

Table 1: Young Ranch Initial Field Evaluation 2010					
Species	Accession	Entry #	Rep #1	Rep #2	Rep #3
Indian ricegrass	741	15			
		# of plants	5	22	14
		Vigor	4	3	4
Indian ricegrass	Paloma	16			
		# of Plants	1	2	3
		Vigor	4	4	4
Mammoth wildrye	Volga	17			
		# of plants	0	0	0
		Vigor	5	5	5
Penstemon	San Juan	18			
		# of plants	0	3	0
		Vigor	5	2	5
Sand drop seed	VNS	19			
		# of plants	1	2	0
		Vigor	4	4	5
Siberian whtgrs	Vavilov	20			
		# of plants	9	6	17
		Vigor	2	3	3
Siberian whtgrs	Vavilov-II	21			
		# of plants	17	7	9
		Vigor	3	2	3
Streambank whtgrs	Bannock	22			
		# of Plants	7	2	3
		Vigor	3	3	3
Streambank whtgrs	Sodar	23			
		# of plants	6	0	2
		Vigor	2	5	4
Tall whtgrs	Jose	24			
		# of plants	14	0	6
		Vigor	2	5	3
Thickspike	Critana	25			
		# of plants	5	1	1
		Vigor	2	4	4
Rating 1=excellent 2=good 3= fair 4=poor 5= no plant					
* Spray damage					

CONCLUSION

Even though the project was only evaluated for two years, it appears there are materials that could prove themselves useful to rehabilitate the tough sites after the tamarisk and Russian olive have been removed. After the spring visit and evaluation of the site, UCEPC has determined that the noxious weed plot invasion must be controlled before any further time and material will be invested in the Mack project.

Project: COPMC-P-0701-CR
Report- 2010
By: Heather Plumb

Initial Evaluation of Blue Wildrye

INTRODUCTION

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

OBJECTIVE

To evaluate different seed sources of blue wildrye *Elymus glaucus* for performance and expressed attributes at UCEPC.

EXPERIMENTAL DESIGN

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

METHODS

Forty-two collections of blue wildrye were attained from Medicine Bow-Routt National Forest and cleaned at UCEPC. Twenty-seven collections of the original 42 Medicine Bow-Routt National Forest collections were used in the initial evaluation study as well as two plant material collections from UCEPC. For comparison, blue wildrye releases “Arlington” and “Elkton” from Corvallis, Oregon and two potential blue wildrye releases from Pullman, Washington were used in the evaluation. A total of 33 collections were used in the initial evaluation. Table 1 lists the accessions used in the evaluation. No PLS seed testing was performed on the Medicine Bow-Routt National Forest seed collections or the two plant material collections from UCEPC, thus seed viability was assumed. Planting began on August 1, 2007. A total of 49 plots were planted due to high wind conditions. The remainder of the plots had to be planted on August 2, 2007. The plots were designed as 16-foot-long rows, three rows per plot, three replications for each entry, 30 seeds per linear foot, 12 foot and six foot spacings between plantings for alleyways. Table 2 provides a visual for the plot plan design. This configuration allowed for 14.6 grams of seed per entry for a single test. This plot design was used due to the fact the collection grams made by the Medicine Bow-Routt National Forest were insufficient to have more replications and longer row lengths.

Plot locations were determined by using Excel. Random plot numbers were placed into the Excel randomization function and random plots were chosen. A belt seeder was used for the entire planting of the three replications. Prior to planting, five grams of blue wildrye seed were

Project: COPMC-P-0701-CR

Report- 2010

By: Heather Plumb

measured out for each entry and placed in seed packets. These packets were spaced out evenly over the belt on the seeder for planting.

After seeding, no irrigation was needed for germination due to a thunderstorm shower that provided enough water for germination to occur.

2008

The three replications of blue wildrye from Medicine Bow-Routt National Forest were evaluated during the months of June and July. During the evaluations, certain parameters were evaluated and photos were taken.

For the month of June, three parameters were evaluated; plant vigor, height, and seed head maturity (Appendix 1). Plant vigor was evaluated ocularly as: excellent, good, fair and poor. Heights for each accession were attained from the center row approximately five feet in. Seed head maturity was evaluated by ocular observation. Photos were then taken of the observed good performers.

For the month of July, four parameters were evaluated; plant vigor, percent stand cover, height, and width (Appendix 2). Plant vigor was evaluated as: excellent, good, fair, and poor. Heights and widths for each accession were attained from the center row approximately five feet in. Plant vigor and percent stand cover were both ocular observations. Photos were taken of the observed good performers.

2009

The three replications of the Medicine Bow-Routt National Forest blue wildrye were evaluated in June. Parameters evaluated were percent plant stand, plant vigor, height and width. Plant vigor was evaluated as: excellent, good, fair, and poor. Heights and widths for each accession were attained from the center row approximately five feet in. Plant vigor and percent stand cover were both ocular observations (Appendix 3). Photos were taken of the observed good performers. A more in-depth percent plant stand was taken in 2009 compared to the 2008 evaluation.

2010

The three replications of the Medicine Bow-Routt National Forest blue wildrye were evaluated in July. Parameters evaluated were the same as in previous years with two extra parameters; tallest seed head and seed head appearance. Plant vigor was evaluated as: excellent, good, fair, and poor. Heights and widths for each accession were attained from the center row approximately five feet in. Seed head appearance was attained visually from the three rows. Tallest seed head was attained by visually finding the tallest head and measuring it. Plant vigor and percent stand cover were both ocular observations (Appendix 4). Photos were taken of the observed good performers.

Project: COPMC-P-0701-CR

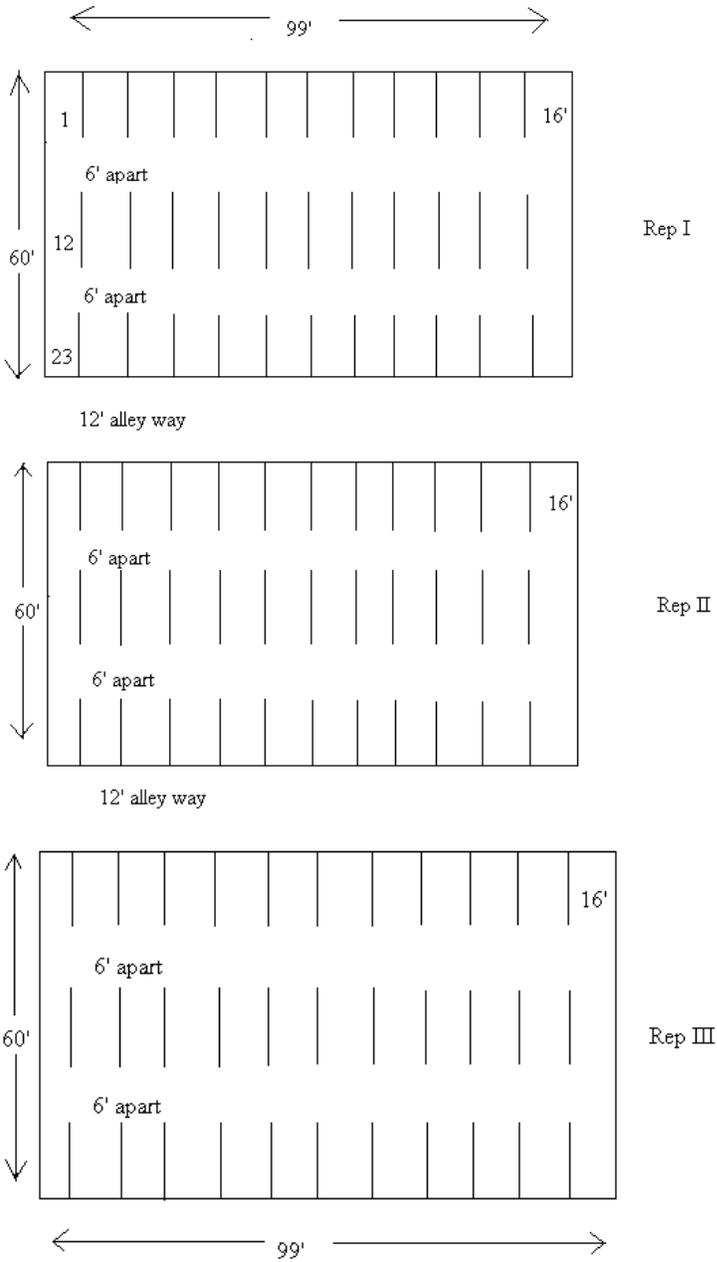
Report- 2010

By: Heather Plumb

Table 1. List of blue wildrye accessions used in the Initial Evaluation.

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

Table 2. The plot plan design for blue wildrye.



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Report- 2010

By: Heather Plumb

RESULTS

2008

It was observed that accession 091406-A1 from seed zone 481 and accession 080406-A1 from seed zone 221 were overall good performers from two of the three different seed zones being evaluated for Medicine Bow-Routt National Forest. No single accession from seed zone 214 was observed as a good producer.

In June, it was observed that accession 481-05 from seed zone 481 was an early seed head producer, seed heads were completely headed out on June 12, 2008.

In both June and July 2008 evaluations, it was observed that accessions 080906-A1, 214-01, 221-01 and 221-02 consistently did poor in all three replications.

2009

On June 25, 2009, the initial evaluation of blue wildrye was evaluated by Terri Blanke and Heather Plumb. Data from the 2009 evaluation was statistically analyzed (Table 3). From the statistical analysis none of the collections appear to be statistically significant at the 5% level. However, collections "H" and "D" over three evaluations have surfaced as consistently good performers. Both "H" and "D" collections have above 95 percent stands and excellent to good plant vigor. On the 2009 evaluation sheet, a side note stated that collection "H" was visually appealing in its appearance.

2010

On July 14, 2010, the blue wildrye initial evaluation was evaluated by Terri Blanke, Christine Taliga, and Heather Plumb. Data from the evaluation was statistically analyzed and results are presented in Table 4. Top percent plant stand entries were; "X", "Q", "Z", "E" and "L". From the analysis it was determined this year the released materials did better than any collection from Medicine Bow-Routt National Forest. Overall percent stand, vigor, seed head abundance, height and width dropped this year. It was noted during the evaluation that the plot looked unhealthy in its appearance and several bug varieties were observed. However, the bugs did not appear to be browsing the plants.

CONCLUSION

2010 marks the third year of evaluation for the initial evaluation of Medicine Bow-Routt blue wildrye. In the first two years of evaluations it was looking promising to get an entry that did perform better or as well as already released products. However, after year three there has been no Medicine Bow-Routt entry that has consistently performed well throughout the evaluation. We were hoping that with the stand looking weak during the 2010 evaluation the better entries from Routt would pop out. Only the released products and a collection made by UCEPC have proven to do better under weak conditions. The 2011 growing season marks the last year of evaluation for the initial evaluation. Four years of data should provide a Routt Medicine-Bow entry, if any, that out performs the released materials being used as comparisons. With any luck the plot will be in better shape than it was during 2010 and top entries will surface.

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Report- 2010
By: Heather Plumb

Table 3. Statistical Analysis of Variance results from the 2009 evaluation of blue wildrye Initial Evaluation.

Plot ID	Collection	Percent Plant Stand *₁	Plant Vigor *₂
Y	SBR-06-Arling	100	1
Z	SBR-06-Elkton	100	1.6
H	481-06	99.33	2
Q	Marvine Creek	98.33	2.3
X	BO5-1	98.33	1.6
D	091406-A1	96.67	1.6
G	091206-A1	96.67	2.3
O	481-05	96.67	2
AC	073106-A1	95	1.3
B	080406-A1	95	2
C	080106-A4	95	2
F	481-02	95	3
J	091206-A3	95	2
L	481-07	95	2.3
P	080106-A3	95	2
W	SP05-1	95	1
AH	221-03	93.33	2
E	091406-A2	93.33	2
I	481-04	93.33	2
K	091206-A2	93.33	2.3
AE	072006-A1	93	1.6
AA	080106-A2	90	2.3
AF	214-03	88	2.6
A	080106-A1	86.67	2.3
AD	072706-A3	81	2.3
AG	214-02	81	2.6
AB	073106-A2	80	2.6
R	Uncompaghre 04	71.67	3
N	080306-A1	68.33	3.3
M	221-02	33.33	3.3
V	221-01	28.33	3.6
S	080906-A1	25	3.6
T	214-01	20.67	3.6
LSD(0.05)*₃		14.73	1.78

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent, 2 = Good, 3 = Fair, 4 = Poor, 5= None
3. LSD: Least Significant Difference at P<0.05.

Project: COPMC-P-0701-CR
Report- 2010
By: Heather Plumb

Table 4. Statistical Analysis of Variance results from the 2010 evaluation of blue wildrye Initial Evaluation.

Plot ID	Collection/Release Name	Percent Plant Stand *₁	Plant Vigor *₂
X	BO5-1	95	1
Q	Marvine Creek	90	2.6
Z	SBR-06-Elkton	90	1
E	091406-A2	83.33	2.3
L	481-07	83.33	3
A	080106-A1	81.66	2.6
AC	073106-A1	81.66	2.3
D	091406-A1	80	3
G	091206-A1	80	3.3
Y	SBR-06-Arling	78.33	3
AA	080106-A2	76.66	3
AB	073106-A2	76.66	3.3
P	080106-A3	76.66	3
AD	072706-A3	75	3
B	080406-A1	75	2
J	091206-A3	75	3
AE	072006-A1	73.33	3
C	080106-A4	73.33	3.3
AG	214-02	71.66	3.3
AH	221-03	71.66	3
K	091206-A2	71.66	3
AF	214-03	70	3.3
I	481-04	68.33	3.6
H	481-06	63.33	3.6
N	080306-A1	63.33	3.6
R	Uncompaghre 04	58.33	3.3
F	481-02	48.33	4
W	SP05-1	48.33	3
M	221-02	40	4
O	481-05	40	4
S	080906-A1	37.66	4
V	221-01	31.66	4
T	214-01	20	4
LSD (0.05)		19.13	0.77

1. Plant stand: Visual estimate per plot: Four complete rows = 100 percent
2. Plant vigor: Visual estimate per plot: 1 = Excellent, 2 = Good, 3 = Fair , 4 = Poor, 5= None
3. LSD (0.05): Least Significant Difference at P<0.05.

Project: COPMC-P-0701-CR
Report- 2010
By: Heather Plumb

Appendix 1. Plant vigor, height and seed head comments for June 2008 evaluation.

REP I	Plant Vigor	Height (Inch)	Comm.
A	1	16	NA
AA	1	20	NA
AB	2	15	NA
AC	1	15	NA
AD	3	11	NA
AE	2	17	NA
AF	1	16	H
AG	3	17	NA
AH	2	17	NA
B	1	21	NA
C	1	18	NA
D	1	18	BH
E	1	19	BH
F	2	13	BH
G	2	17	BH, H
H	2	13	BH
I	2	13	NA
J	3	14	BH
K	3	14	BH
L	3	15	BH, B
M	4	9	NA
N	3	15	BH
O	2	16	BH, H, *
P	1	12	BH
Q	2	16	NA
R	2	18	NA, S
S	4	8	NA, S
T	4	10	H, S
V	4	11	NA, S
W	1	10	even, thick
X	1	13	even, thick
Y	3	5	flat apperc.
Z	2	14	NA

REP II	Plant Vigor	Height (Inch)	Comm.
Z	2	17	BH
Q	1	17	BH
L	3	15	BH, B
AD	3	14	BH
V	4	10	NA
K	2	11	BH
B	1	15	BH
H	2	17	NA
AF	2	16	BH
AA	2	18	BH
S	4	11	NA
I	3	17	stemmy, BH
R	3	16	NA
E	2	13	NA
J	3	13	NA
AH	3	14	NA
AE	3	12	NA
AB	2	18	B
C	3	17	NA
M	4	7	NA
N	3	13	BH
A	2	17	NA
X	2	17	NA
G	1	18	BH, H
AG	3	13	NA
T	4	8	BH, H, S
P	2	18	BH
O	1	18	BH, H
D	1	19	BH
Y	1	12	flat apperc.
AC	1	16	B
F	2	17	BH
W	1	10	even, thick

REP III	Plant Vigor	Height (Inch)	Comm.
N	3	14	BH
X	1	13	NA
F	2	11	BH
H	2	16	BH
Y	1	9	NA
P	2	14	NA
O	1	17	BH, H, *
L	2	16	BH, B
J	2	17	BH
AH	3	15	NA
Z	1	14	thick
AF	2	16	H
D	2	15	NA
M	4	7	NA
V	4	12	NA
C	2	17	NA
K	2	17	BH
I	2	14	NA
G	1	19	BH
AC	3	16	BH, soil?
AA	2	15	NA
AD	3	16	H, S
AB	3	13	NA
T	4	8	H, (BAD), S
S	4	6	NA
AG	3	12	NA
Q	2	15	NA
AE	3	14	NA
E	4	12	NA
A	3	14	NA
R	4	12	NA
W	2	12	NA
B	2	14	BH

Plant Vigor
1- Excellent
2- Good
3- Fair
4- Poor

Comments (Comm.)	
brome=B	*=Good heads
possible sprayed=S	no heads = NA
headed=H	beginning to head=BH

Blue Wildrye Project
Evaluations

Date Evaluated: 6/12/2008

Person(s) Evaluating: Terri Blanke, Heather Plumb

24 DEGREES last night

Project: COPMC-P-0701-CR
Report- 2010
By: Heather Plumb

Appendix 2. Plant vigor, percent stand cover, height and width for July 2008 evaluation.

REP I	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)
A	2	5	35	9
AA	2	5	38	10
AB	2	5	32	8
AC	2	5	34	12
AD	3	4	30	11
AE	2	4	31	8
AF	2	5	32	10
AG	3	4	30	7
AH	2	4	25	8
B	2	5	30	10
C	1	5	31	11
D	1	5	35	11
E	2	5	34	10
F	3	5	30	10
G	2	5	33	8
H	2	5	26	10
I	2	5	31	13
J	3	4	27	12
K	3	4	29	11
L	3	5	30	10
M	4	2	24	10
N	3	4	28	9
O	3	5	28	11
P	2	5	27	9
Q	2	5	34	9
R	2	3	29	10
S	4	1	16	6
T	4	2	11	4
V	4	2	17	7
W	2	5	29	9
X	2	5	30	6
Y	3	5	21	10
Z	2	5	24	8

REP II	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)
Z	1	5	29	11
Q	1	5	31	9
L	2	5	31	9
AD	3	4	23	8
V	4	2	17	5
K	3	4	27	8
B	2	5	31	8
H	2	5	32	12
AF	3	5	28	9
AA	2	5	35	10
S	4	2	12	6
I	2	5	32	9
R	2	4	32	11
E	2	5	28	9
J	1	5	28	8
AH	2	5	28	9
AE	3	4	24	10
AB	2	4	34	11
C	2	5	21	8
M	4	1	15	7
N	3	4	25	9
A	1	5	35	10
X	2	5	32	8
G	3	5	32	7
AG	3	4	28	7
T	4	2	15	5
P	2	5	36	9
O	1	5	31	9
D	1	5	30	9
Y	1	5	20	10
AC	1	5	30	10
F	2	5	28	8
W	2	5	27	7

REP III	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)
N	3	4	31	8
X	2	5	37	7
F	3	5	27	6
H	2	5	31	7
Y	1	5	20	8
P	2	5	36	6
O	2	5	31	9
L	2	5	31	8
J	2	5	32	9
AH	2	5	36	8
Z	2	5	26	7
AF	2	4	30	7
D	2	5	31	7
M	3	3	17	6
V	4	2	13	4
C	2	5	33	8
K	3	4	28	7
I	2	5	33	7
G	1	5	35	7
AC	3	5	31	4
AA	2	5	35	9
AD	3	4	30	8
AB	2	3	30	7
T	4	1	9	2
S	4	1	16	2
AG	3	4	24	5
Q	2	5	28	7
AE	2	4	30	7
E	3	3	29	5
A	3	4	32	5
R	3	3	26	5
W	2	5	28	6
B	2	5	31	8

Plant Vigor
4- Poor
3- Fair
2- Good
1- Excellent

Stand Cover
2= 16-25%
1= 1-15%
4= 51-75%
3= 26-50%
5= 76-100%

Blue Wildrye Project

Evaluations

Date Evaluated: 7/10/2008

Person(s) Evaluating: Terri Blanke and Heather Plumb

Project: COPMC-P-0701-CR
Report- 2010
By: Heather Plumb

Appendix 3. Plant vigor, percent plant stand, height and width for June 2009 evaluation.

REP I	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)		REP II	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)		REP III	Plant Vigor	% Stand Cover	Height (Inch)	Width (Inch)
A	4	75	33	23		Z	3	100	27	19		N	4	40	26	25
AA	4	85	34	18		Q	3	95	29	20		X	2	100	35	14
AB	3	90	37	21		L	2	95	33	25		F	3	100	31	25
AC	2	85	39	21		AD	3	75	28	18		H	2	100	40	21
AD	2	90	41	21		V	4	30	13	21		Y	1	100	23	26
AE	2	95	35	22		K	2	90	37	22		P	1	100	39	22
AF	3	95	31	19		B	2*	100	33	20		O	1	100	40	26
AG	3	95	38	25		H	2	100	35	24		L	2	95	36	25
AH	2	95	42	27		AF	2	95	32	23		J	2	100	40	24
B	2	95	36	24		AA	2	95	35	24		AH	2	95	42	24
C	2*	95	37	24		S	4	30	19	23		Z	1	100	40	24
D	3	95	33	21		I	3	90	27	19		AF	3	75	25	22
E	3	95	35	19		R	3	85	26	25		D	1	100	35	20
F	3	90	33	24		E	1	95	40	22		M	3	45	34	20
G	3	95	35	24		J	2	90	35	22		V	3	20	30	27
H	2	98	34	23		AH	2	90	41	22		C	2	100	29	23
I	2	95	36	26		AE	1	90	36	25		K	2	95	36	19
J	2	95	40	25		AB	2	90	42	27		I	1	95	40	24
K	3	95	34	21		C	2	90	33	26		G	1	100	40	24
L	3	95	34	24		M	4	30	23	22		AC	1	100	40	23
M	3	25	41	29		N	3	75	40	22		AA	1	90	40	22
N	3	90	36	17		A	1	95	40	23		AD	2	80	40	24
O	4	90	23	13		X	2	95	32	18		AB	3	60	28	22
P	3	95	27	22		G	3	95	40	19		T	4	2	27	13
Q	2	100	34	22		AG	2	75	34	24		S	3	25	20	21
R	3	85	19	20		T	3	30	33	14		AG	3	75	40	23
S	4	20	18	20		P	2	95	37	25		Q	2	100	33	20
T	4	30	25	16		O	1	95	44	23		AE	2	95	33	19
V	4	35	26	23		D	1	95	37	26		E	2	90	34	21
W	1	100	31	17		Y	1	100	14	21		A	2	90	40	22
X	1	100	32	19		AC	1	100	34	25		R	3	45	25	23
Y	1	100	21	27		F	3	95	36	22		W	1	85	25	16
Z	1	100	34	27		W	1	100	36	16		B	2	90	30	19

Plant Vigor
4- Poor
3- Fair
2- Good
1-Excellent

Blue Wildrye Project

Evaluations

Date Evaluated: June 25, 2009

Person(s) Evaluating: Terri Blanke and Heather Plumb

Comparative Evaluation of Tall Wheatgrass

INTRODUCTION

Bio-fuels can be produced from any biological carbon source; although, the most common sources are plants. Biomass produced from plants is processed into liquid fuel such as ethanol and biodiesel. In order to be considered a bio-fuel the fuel must contain over 80 percent renewable materials. This study is a cooperative effort between various plant materials centers in the west and northeast to learn more about the potential of tall wheatgrass, a cool season grass, as a source for bio-fuel. The study is linked to the NRCS 2006 National Strategic Plan, 2006-2010 National PM Strategic Plan, and the FY-2007 West Region technology working group business plan.

OBJECTIVE

To comparatively evaluate three commercially available plant releases of tall wheatgrass *Thinopyrum ponticum* from the U.S. to an improved cultivar from Hungary for potential use as a bio-fuel crop in the cool-season-grass ecosystem of the west and northeast.

METHODS

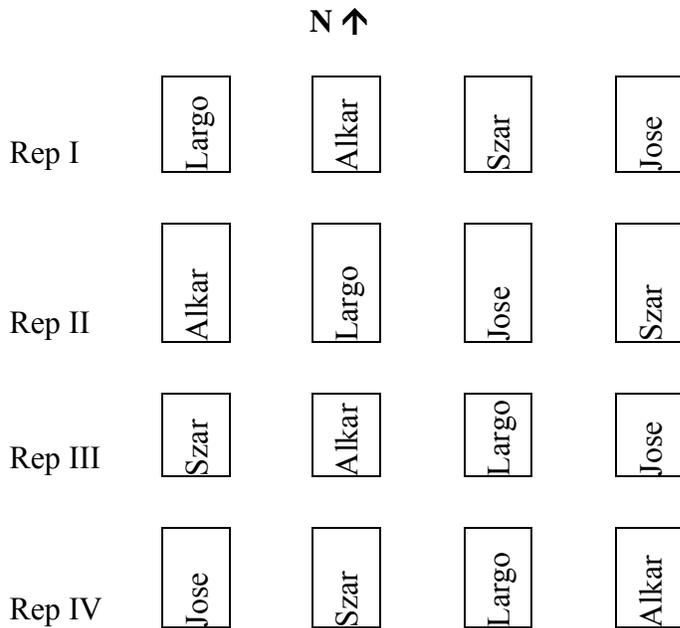
Four entries of tall wheatgrass; 'Alkar', 'Jose', and 'Largo' from the US and one from Hungary 'Szarvasi-1' were seeded on November 20, 2007. The entries were seeded with a hand-pushed Planet- Jr.-drill at the rate of 24 seeds per linear foot or eight pounds per acre of pure live seed. The plot size is four feet wide by 20 feet long, with four rows per plot at one foot centers. The planting was irrigated to get it established and herbicide was applied to control broadleaved weeds in the first growing season. Nitrogen fertilizer will be applied in the spring of the second growing season at the rate of 100 pounds of nitrogen per acre. Plots will be harvested at full maturity. Eighty inches (6.66 feet) of middle two rows will be harvested and dried for biomass production. Plots will also be evaluated for plant stand. Biomass samples will be sent to the lab to obtain a chemical analysis of bio-fuels parameters to compare the entries. The study will be conducted for three years. Below is the plot plan for the study.

Project COPMC-P-0801-CP

Report-2010

By: Heather Plumb

Plot Plan



RESULTS

2008

The plots were evaluated for establishment on September 2, 2008, and harvested for biomass production on September 17, 2008.

2009

During the 2009 growing season the tall wheatgrass plot was evaluated once. On July 2, 2009, UCEPC staff evaluated the plot ocularly for percent cover. At that time it was observed that ‘Largo’ had the best percent stand cover. On September 24, 2009, the plot was harvested and heights were measured. After harvest wet weights were documented and samples were placed in bags to air dry. Dried samples for the study will be shipped to Cornell University for wet chemistry work. Dried sample weights are presented in Table 1. Average mean dry weights were figured for the four entries used in this trial and are presented in Table 2.

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By: Heather Plumb**

Table 1. Dry weights for the four entries of tall wheatgrass, UCEPC, 2009.

REPS	Net Weights (grams)
I Jose	719
I Largo	1501
I Szar	542
I Alkar	1181
II Jose	1244
II Largo	811
II Szar	893
II Alkar	944
III Jose	797
III Largo	1202
III Szar	975
III Alkar	1006
IV Jose	1018
IV Largo	1261
IV Szar	1032
IV Alkar	690

Table 2. Average mean dry weights for the four entries of tall wheatgrass, UCEPC, 2009.

Entries	Average Net Dry Weights (grams)
Jose	945
Largo	1194
Szar	861
Alkar	955

2010

On February 17, 2010, dry material weights for the tall wheatgrass were weighed and results are shown in Table 3 and averages for the varieties are shown in Table 4. The dried material from the tall wheatgrass varieties was shipped out to Cornell University on March 3, 2010. The final report for this project was written by Jim Briggs, Western Region Plant Materials Specialist. The final report included all data from the other plant material centers who participated in this project. The tall wheatgrass grown at UCEPC showed no significant difference between any of the wheatgrass varieties.

**Project COPMC-P-0801-CP
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By: Heather Plumb**

Table 3. Dry weights for the UCEPC tall wheatgrass varieties, UCEPC, 2010.

REPS	Net Dry Weights (grams)
I Alkar	1180
II Alkar	953
III Alkar	999
IV Alkar	681
I Jose	726
II Jose	1226
III Jose	817
IV Jose	999
I Largo	1498
II Largo	817
III Largo	1180
IV Largo	1271
I Szar	545
II Szar	908
III Szar	953
IV Szar	1044

Table 4. Average mean dry weights for the four entries of tall wheatgrass, UCEPC, 2010.

Entries	Average Net Dry Weights (grams)
Jose	942
Largo	1192
Szar	863
Alkar	953

CONCLUSION

In Jim Brigg's final report for the tall wheatgrass project UCEPC had no significant differences between the different varieties of wheatgrasses grown at the center. A copy of the final report is available upon request from UCEPC.

Observational Planting of Canada Milkvech

INTRODUCTION

Canadian milkvech *Astragalus Canadensis* is a native legume widely distributed throughout the United States. It is commonly found in dry prairies, moist shores, marshy grounds, and open or partly shaded habitats. Canadian milkvech is propagated by seed. This is an inter-center strain observational trial in cooperation with the Washington (Pullman) Plant Materials Center. Information obtained from the observation will aid in collecting agronomic information for technology development and plant releases.

OBJECTIVE

To determine suitability and performance of an accession of Canadian milkvech from the Pullman Plant Materials Center under the environmental conditions at Meeker.

METHODS

This is a non replicated trial for observational purposes.

Seed sent from the Pullman Plant Material Center was planted at Upper Colorado Environmental Plant Center (UCEPC) in the demonstrational planting site. A hand-pushed belt seeder was used to plant the seed. Two rows 20 feet long at three-foot centers were seeded in November 20, 2007, at the rate of two grams per 20 feet of row.

RESULTS

For establishment results and evaluation see COPMC-P-0802-RA, 2008 report.

For information on the 2009 evaluation, maintenance and seed collection of *Astragalus Canadensis*, see COMPC-P-0802, 2009 report.

In May of 2010, sweeps were passed through the milkvech plot causing damage to many of the new sprouts. The pre-emergent, Pendulum®, was applied to help control invasives but it greatly reduced the number of new sprouts as seen in the previous year. In June and July, the plot was hand weeded and photos were taken. Fourteen grams of seed were collected in August from few plants that remain. An evaluation was done in early September and the results are shown below. The Canadian milkvech plot received only a small amount of irrigation, mainly overspray from nearby fields.

**Project COPMC-P-0802-Ra
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By: Terri Blanke**

Observational Plantings Evaluation Worksheet			Establishment year:2008 Evaluation year: 2010	
Releasing PMC	WAPMC	Contact person for originating PMC	Mark E. Stannard PMCM	
Testing PMC	COPMC	Contact Person for Participating PMC	Terri Blanke	
Study Title: Observational Planting of Canada Milkvetch		Study Purpose	To determine suitability and performance of accession at UCEPC	
Study Number: COPMC-P-0802-RA		Study Duration : 2007-2010		
Precipitation During Growing Season (in.): (April-August)		Irrigation Applied During Growing Season (in) NA		
Scientific Name	<i>Astragalus Canadensis</i>			
Accession #				
Release Name				
Evaluation Date 1	6/9/10		08/03/10	
% Stand ¹	15%		_____	
Vigor*	3		_____	
Evaluation Date 2	_____	09/02/10	Collected Seed	
% Stand	_____	5% **	_____	
Vigor	_____	5	_____	
Drought Tolerance	3	3	3	
Insect Problems	None observed	None Observed	None Observed	
Disease Problems	None observed	None Observed	None Observed	
Seed Production	Yes	Yes	14 Grams	
Plant Height (in.)	11			
Notes: ** Damage to both rows from tractor and disc				

* Vigor; where 1 = excellent; 3 = good; 5 = average; 7 = fair; 10 = none

1. Plant stand: visual estimated per plot (two complete rows = 100 percent)

CONCLUSION

The Canadian milkvetch grew rapidly each spring and survived continuous disc damage. It appears to be tolerable of our dry climate and short growing season. Seed production was good considering the plants condition. The *Astragalus canadensis* performed well under the environmental conditions at Meeker. The seed collected from the milkvetch is available upon request. This will be the final report for this project.

Observational Planting of Bismarck Shrubs

INTRODUCTION

This is an Inter-Center Strain Trial (ICST) for observational purposes. These types of plantings are intended to determine basic adaptability and performance of the materials at different localities to spread out their suitability. In addition, the plantings should serve to demonstrate and educate the Upper Colorado Environmental Plant Center (UCEPC) staff as well as visitors to UCEPC on recent plant releases or potential candidates for future plant releases.

OBJECTIVE

To determine suitability and performance of four shrub accessions from Bismarck's Plant Materials Center

METHODS

This is a non-replicated trial for observational purposes

Four shrub species were received from Bismarck's Plant Materials Center on May 22, 2008. Table 1 identifies the shrubs:

Table 1. Bismarck's Shrubs for Observational Planting

Accession No./ Name	Common Name	Scientific name	Lot No.	Plants Shipped
323957	Black chokeberry	<i>Photinia melanocarpa</i>	VCE -07-BIGSIU	5
9047203/Prairie Red	Plum	<i>Prunus</i>	VCE -07-BIGSIU	5
9076686	Fireberry hawthorn	<i>Crataegus chysocarpa</i>	VCO-07- BIGSIU	5
9082687	American black currant	<i>Ribes americanum</i>	VCE -07-BIGSIU	5

The shrubs were shipped bare-root then transferred to 14" x 4" x 4" tree pots until they were transplanted into the field. On June 25, 2008, in the windbreak demonstrational planting site at UCEPC, nineteen shrubs were planted. Planting holes were dug with a post-hole digger, eight feet apart. A basin was prepared around each hole to retain water. Shrubs were hand watered immediately after transplanting. Black plastic weed barrier was placed around the stem to help retain moisture and combat invasive weeds. On August 8, a new one inch drip line irrigation system was installed to provide water to all windbreak species. Irrigation was applied bi-weekly for approximately four hours.

An initial evaluation of the shrubs was taken after planting in 2008. They are evaluated, photographed, irrigated and weeded throughout the growing season each year. See the Table 2.

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Table 2. Initial Evaluation of Bismarck's Shrubs

Accession/ Common Name	Shrub Number (North- South)	Height ¹ 2008	Height ¹ 2009	Height 2010	Stem Diameter ² (Cm) 2010	
9047203 Prairie Red plum	1	25	18	25.5	2	Vigor 3
	2	26	16	25	2	
	3	24	14	25	2	
	4	26	15	28	2	
	5	15	19	12	.5	
323957 Black chokeberry	1	25	18.5	20	.5	Vigor 2
	2	21	6	15	.5	
	3	27	21	23.5	1	
	4	26	16	19.5	1	
	5	26	23	Na	Na	
9076686 Fireberry hawthorn	1	21	Na	21	2	Vigor 1
	2	18	19.5	Na	Na	
	3	6	4	Na	Na	
	4	19	17.5	17.5	2	
	5(dead)		Na	Na	Na	
9082687 American black currant	1	14	14	27.5	1	Vigor 4
	2	21	21	32	2	
	3	16	15	35.5	1	
	4	18	19.5	33	1.5	
	5	16	13	34	2	

1. Height in inches of tallest stem.
2. Stem diameter taken at the base (root collar) of thickest stem.
3. Vigor for stand: 1=Poor 2=Fair 3=Good 4=Excellent

Additional information on the shrubs performance can be found in the COPMC-P-0803-WI, 2008 and 2009 reports.

RESULTS

On May 25, 2010, an early evaluation was completed on the Bismarck shrubs. It was noted that the previous fall, wildlife had heavily browsed all the shrubs except the American Black Currant. At that time, the American Black Currant was flowering. It is possible that the herbicide overspray and wildlife browse were the cause for the loss of two RL Hawthorne and one black chokeberry. On August 25, 2010, the shrubs were again evaluated for growth, vigor and were photographed. The American black currant was producing seed. The shrubs receive irrigation throughout the growing season and are both mechanically weeded and treated with an herbicide to fight invasives.

CONCLUSION

The UCEPC staff will continue to monitor the shrubs for performance and suitability at Upper Colorado Plant Material Center. Since this project began, three of the four shrubs have since been released by Bismarck's Plant Material Center. Black chokeberry, 'McKenzie', hybrid plum 'Prairie Red' and American black currant, 'Riverview Germplasm', are now available to the public. A copy of this report will be sent to the Bismarck Plant Material Center.

Project: COPMC-S-0101-RI

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By: Terri Blanke

Seed Production of Thinleaf Alders

INTRODUCTION

Thinleaf alder *Alnus tenuifolia* is a large shrub or small tree found in riparian areas from Alaska and the Yukon south into New Mexico and Utah. In Colorado, thinleaf alder occurs along mountain streams, rivers and in canyon floors at from 5,000 to 10,000 feet in elevation. Thinleaf alder has gray, smooth bark with conspicuous white lenticels. The male and female flowers are borne separately, but on the same plant. Male spikes are slender and drooping, up to 3 inches long. Female spikes are upright and up to 0.5 inch long. Flowers open in the spring before the leaves unfold. The fruit ripens from August through September. Nodules found on the roots of thinleaf alders contain *Frankia* that are important in nitrogen fixation. Thinleaf alder could have potential for riparian habitat improvement.

OBJECTIVE

Develop techniques to promote viable seed production from a selection of thinleaf alder for riparian revegetation.

METHODS

This is a non-replicated planting.

In 1983, three collections of thinleaf alder *Alnus tenuifolia* were made in the eastern corner of Rio Blanco County, Meeker, Colorado. Seedlings were started in the greenhouse at Upper Colorado Environmental Plant Center (UCEPC) and transferred into a single row on the south side of Field 3, approximately 20 feet to the north of the *Amelanchier alnifolia*, Long Ridge, Utah serviceberry. Information on planting, establishment, and evaluation results can be found in progress reports 08I160 dated 1987 – 1999, by Dr. Gary L. Noller.

In October 2000, the three local collections from Rio Blanco County were chosen to be kept for seed production for a blended release. A new accession number was assigned to the blend, 9070975. There was no significant difference detected between the three collections and the increased number of plants would provide ample amounts of seed for the release. The alders produced enough seed that fall for a sample to be sent to the Colorado Seed Laboratory for seed sample analysis. Colorado Seed Laboratory reported that the alder seed was only 8% viable.

In the summer of 2008, the UCEPC staff applied the glyphosate to the Field 3 for weed control. The alders were pruned and thinned.

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The thinleaf alders received no supplemental irrigation until the summer of 2009. A small ditch was dug along the single row of alders. Irrigation water was applied three times throughout the growing season. Glyphosate was applied beneath the alders with an ATV sprayer and pruning was needed to remove broken branches. Seed was harvested in late November.

RESULTS

Fifteen thinleaf alders *Alnus tenuifolia* remain in Field 3 at UCEPC. It was noted in all the previous reports that there were signs of wildlife use, but very light. Seed was harvested from the alders in 2000, 2001, and 2009. No seed was collected in 2010. Several germination trials were conducted on the alder seed but none were successful. Table 1 below shows years of seed production and quantities collected.

Table 1. Thinleaf alder seed production.

Scientific name	Accession #	Year	Acres	Harvest Date	Field #	Cleaned Amnt
<i>Alnus tenuifolia</i>	9070975	1992-99	0.25	-	3	0
		2000	0.25	10/04	3	558 g
		2001	0.25	10/2-10/3	3	2.13 lb
		2002-08	0.25	-	3	0
		2009	0.25	11/25	3	82 g
		2010	0.25	Na	3	0

UCEPC staff completed an evaluation of the thinleaf alders on September 28 of 2010. Some of the smaller trees appear to be dead. The remaining alders are producing seed and the smaller ones have multiple new sprouts. Table 2 below gives a brief description of the alders and their development.

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Table 2.

Thinleaf alder Evaluation 2010			
W		E	
Tree #1		Tree #27	
Alder #	Height Ft. Est.	Base Dia. Inches	Comments
1	na	na	dead
2	na	na	dead
3	11"	1/4"	re-sprouting
4	8"	1/4"	re-sprouting
5	12'	3"avg	forked trunk,light seed,re-sprts
6	12'	3.5"	re-sprouts,light seed
7	2.2'	1/4"	re-sprouting
8	11'	2"	light seed
9	na	na	dead
10	11'	3"	re-sprouts,light seed
11	10'	2.5"	re-sprouts,light seed
12	12'	3.5"avg	forked trunk,light seed,re-sprts
13	na	na	dead
14	na	na	dead
15	10'	2.5"	re-sprouts, very light seed
16	12'	4"svg	triple trunks,some sprouts, med. seed
17	13'	3.5"avg	triple trunks, Few sprouts, hvy seed
18	na	na	dead
19	na	na	dead
20	12'	4"avg	triple trunks, mostly male
21	13'	3"avg	triple trunks, medium seed
22	12'	4" avg	4 trunks, light seed
23	10.5'	4" avg	4 trunks, light seed
24	12'	4"avg	triple trunks, light seed
25	11'	2"avg	4 trunks, light seed
26	12'	4.5"avg	forked trunk, light seed
27	4"	1/4"	stump

Base diameter is measured @ 20" from the ground

CONCLUSION

The alders produced seed in 2009, after six years of little or no production. With supplemental water, those results may increase. The branches seem to be very brittle, possibly from the herbicide or lack of water. There appears to be some insect damage to the alders but it has not been identified at this time. Various germination trials are being conducted at UCEPC to determine the best method for propagation. It is possible that the alder's seed viability period is short. UCEPC will continue to monitor, evaluate, and research the shrubs for successful propagation methods.

Project: COPMC-S-0103-UR
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Aphid Resistant Utah Honeysuckle

INTRODUCTION

On August 8, 1977, a planting of 179 accessions of woody tubling species was completed. This project (081020J - Orchard) was initiated to evaluate the survival and performance of those materials at Upper Colorado Environmental Plant Center (UCEPC) in Meeker, Colorado. Included in this project were four accessions of *Lonicera utahensis*, Utah honeysuckle. The information for these four accessions can be found in the 1998 progress report by Dr. Gary Noller. Witches broom aphids *Hyadaphis tartaricae*, were first noted in the orchard in 1986. These aphids are found on the tips of branches of Utah honeysuckle and produce a growth called a witches broom. It was noted that two of the accessions had no infection. Those plants were marked and monitored from 1987 to 1992. In 1996, new accession numbers were given to the plants that were sent to Dr. Whitney Cranshaw at Colorado State University. Dr. Cranshaw conducted experiments at the university greenhouse for witches broom aphid resistance. The information received from Dr. Cranshaw in 2000 indicated that two plants (#3 and #15) were highly resistant to witches broom aphids. Plant 3 from accession 9070920 and plant 15 from accession 9070921 were then selected for cutting block material. In August of 2001, cuttings were taken from these two shrubs. The honeysuckle cuttings were rooted and potted in the greenhouse for a future field planting.

OBJECTIVE

This project was created to produce cutting stock for use in xeriscape and landscape horticulture, windbreaks, and urban beautification. The duration of the project is 2001 – 2011.

METHODS

This is a non-replicated planting.

Utah honeysuckle plant 3 of accession 9070920 and plant 15 of accession 9070921 are both located in Field 14 – West (orchard) at the COPMC. Figure 1 shows their location in the orchard.

Figure 1. UCEPC Map

N ↑

Field 14 – Shrub Orchard abbreviated diagram

Row	Accession Group	Accession Group	Accession Group	Accession Group
1			Ash	Maples
2	Chokecherry	Chokecherry	Chokecherry	Chokecherry
**				
7	Golden Currant	Wax Currant	Gooseberry	Mahogany
8		Utah Honeysuckle 9070920 22* Plant 3 in group	Utah Honeysuckle 9070921 22* Plant 15 in group	Bearberry honeysuckle

* Number of original plants in this accession

** Rows 3 through 6 not shown in diagram

In March of 2007, the 23 remaining honeysuckle cuttings that had been rooted in 2001 were transplanted into two-gallon containers. They were pruned, fertilized, photographed, and transferred outside to the UCEPC lathhouse in June to be hardened off. On August 21, 2007, twenty-one Utah honeysuckles were transplanted by hand in a single row (North-South) with 8-foot spacing between each shrub. The honeysuckles were watered by hand immediately after planting. They were weeded, watered, and monitored through the fall. The planting is on the west side of UCEPC and serves as a demonstration for the use of woody materials in a windbreak/shelterbelt.

RESULTS

Growing season of 2008

On June 25, 2008, the honeysuckles were evaluated for survival, height, and browse. The plant height was measured to the tallest branch and recorded in inches. The north end of the row is plant number 1. Photos were taken. Weed barrier fabric was placed at the base of each shrub to help fight weeds. A new one-inch drip line irrigation system was installed during the summer. The system provides water to all windbreak species. Irrigation is applied once a week at four hours per setting. Aphids were noted on several of the honeysuckles but no sign of the disease witches broom.

Spring 2009

The honeysuckles were evaluated and photographed. The shrubs were pruned heavily to promote a denser trunk. They were watered throughout the summer and herbicide was applied near the base to suppress invasive weeds. It was noted that several of the shrubs had a different berry color. Those shrubs were tagged and will be monitored in the future. There was no sign of witches broom. Wildlife browsed the shrubs heavily in the fall. The UCEPC staff placed protective fencing around seven shrubs.

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

INTRODUCTION

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

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

OBJECTIVE

Develop seed sources of western Colorado native plant species important in post-fire revegetation on BLM lands.

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.

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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, UCEPC 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 Natural Resource Conservation Service (NRCS).

METHODS

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

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

Seed collection results were disappointing for the first year. Drought conditions over much of the collection area produced little amounts of viable seed. In addition, a hard freeze occurred on May 20, which also contributed to the poor seed fill in much of Northwest Colorado. Seed of one species, Utah sweetvetch, was collected in quantities large enough to plant a seed increase

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field, but was collected primarily from one site. It is the recommendation of UCEPC that we add to the genetic variability and diversity of the increase species by collecting from several locations, bulking the seed and then planting the source field. Additional collections were obtained in 2007, but on a limited scale. The other four materials, bottlebrush squirreltail, beardless bluebunch wheatgrass, western wheatgrass, and Sandberg 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 UCEPC, extremely poor seed fill resulted in collections of gram quantities of two species, Sandberg 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 known 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

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subspecies of *E. elymoides* exist in identifiable populations: *E. elymoides elymoides* and *E. elymoides brevifolius*. We had also collected from extreme northwest Colorado an *E. elymoides elymoides* sub-species. Again, after consultation with Dennis Zachman, we opted to use the same source material rather than mixing sub-species or waiting for a good collection opportunity for the *elymoides* sub-species.

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

The third material, bluebunch wheatgrass, was the most equally represented blend used for increase. Three collections from northwest Colorado were utilized to establish this species. Collections were obtained from Pisgah Mountain in north central Colorado, State Bridge in the central portion of the mountains and Irish Canyon in extreme northwest Colorado. These collections are identified by accessions 9092276, 9092277, and 9092274, respectively. These blended accessions make up accession 9092281, a three way bluebunch blend from northwest Colorado and are in production as such at UCEPC.

The Sandberg bluegrass increase field was comprised of an equal blend of two collections from an area north of Gypsum, Colorado. One accession collected up Gypsum Creek is identified as accession 9092279. The second collection used in the blend was obtained from approximately two miles further up the creek and from 500 feet or so higher in elevation near a landmark known as Radio Tower. The collection is accession 9092282. Together, these collections make up the blended accession, 9092283, which was used for the seed increase field at UCEPC.

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. 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. The source that is in production is from accession 9092283, Blair Mesa. However, the species has been recognized as being an important component in the fire rehabilitation seed mix. Additional collections were made from a separate site in 2008 near Pinto Mesa, Piceance Creek, Colorado, accession 9092298. Because the species is also insect pollinated, subsequent seed collections will be added to the seed production field to increase the genetic base.

Species	Common Name	Accession for Planting	Accession Source
<i>Elymus elymoides</i>	Bottlebrush squirreltail	9092275	State Bridge, Eagle Cty, CO
<i>Hedysarum boreale</i>	Northern sweetvetch	9092283	Blair Mesa, Rio Blanco Cty, CO
		Planned addition of accession 9092298*	Pinto Mesa, Rio Blanco Cty, CO

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Species	Common Name	Accession for Planting	Accession Source
<i>Pascopyrum smithii</i>	Western wheatgrass	9092278	Irish Canyon, Moffat Cty, CO
<i>Poa secunda</i>	Sandberg bluegrass	9092295	Blended accession from those below
		9092279	Gypsum Creek, Eagle Cty
		9092282	Radio Tower, Eagle Cty
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass	9092281	Blended accession from those below
		9092276	Pisgah Mt., Eagle Cty
		9092277	State Bridge
		9092274	Irish Canyon

2006

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

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

2007

In light of the difficulties encountered with Utah sweetvetch collections, activities for 2007 included a transplant effort of containerized stock and two intra-seedings in the spaced planting. The Sandberg bluegrass was not strongly evident in 2006, so additional efforts were necessary for the establishment of it in 2007. A small seeding was also conducted in the north end of the bottlebrush squirreltail field. The bluebunch and western fields have filled in nicely, and they were productive in 2007.

RESULTS

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

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

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

2008

Seed collections from native stands were excellent in 2008. A total of 15 separate collections were obtained, 11 of which were for the five targeted species. These collections will be tested against the products that are presently in production for the BLM project. Presently, the bluebunch, western, and bottlebrush fields are producing seed, while the sweetvetch and Sandberg are just coming into production. The added collection of sweetvetch will be particularly important as the field has been established on a spaced planting basis, and individual “hills” can be seeded with this new collection to add to the diversity of the crop. This has been the intent of this project with each product from the inception. The table below identifies the collections.

Species	Date	Collected Amount	Location
Basin wildrye		6.9 lb	Yellow Creek
Bluebunch wheatgrass	7/15	721 g	Piceance Creek County Road 22
Bluebunch wheatgrass	7/24	418 g	Rio Blanco County Road 20
Blue flax	7/15	299 g	Piceance Creek
Bottlebrush squirreltail	6/27 & 7/9	31 g	Deserado Mine
Prairie Junegrass	7/29	18 g	Pinto Mesa
Prairie Junegrass	8/7	17 g	County Road 1509
Sandberg bluegrass	6/27	106 g	County Road 73
Sandberg bluegrass	7/11	63 g	County Road 1509
Sandberg bluegrass	7/21	19 g	Irish Canyon

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Species	Date	Collected Amount	Location
Sandberg bluegrass	7/9	47 g	Deserado
Sandberg bluegrass	7/24	76 g	Pinto Mesa
Utah sweetvetch	6/27	95 g	Blair Mesa
Utah sweetvetch	7/29	354 g	Pinto Mesa
Western wheatgrass	8/11	80 g	Ryan Ridge

Production in 2008 was down from the previous year for all products. Because of the apparent reduction in productivity, a new western wheatgrass field was established. Commonly, rhizomatous species tend to put more energy into lateral vegetative spread than seed production, so older stands need to be reestablished with greater frequency than bunch grasses. A typical stand life for seed production of western is four years. Additional work continues with the Utah sweetvetch field and the Sandberg bluegrass field.

2009

There were no collections done in 2009 for the project, as all fields are established. Some additional work was done to fill voids in the Utah sweetvetch field and the bluebunch field. Twelve sweetvetch hills were re-seeded on September 9, and 71 bluebunch tublings were planted on September 2. A new western wheatgrass field was planted on August 26, 2008, with previously produced seed, but did not produce seed in 2009.

Additional activities that occurred in 2009 were the completion of a seed grower agreement form between UCEPC and growers of BLM source products, advertisement, and solicitation through the Colorado Seed Growers Organization for growers of interest and the confirmation of growers for three species; bottlebrush squirreltail, bluebunch wheatgrass, and western wheatgrass. Interest has also been expressed in Sandberg bluegrass production. Distribution of bottlebrush squirreltail seed was provided to Walter Henes, Southwest Seeds in Dolores, Colorado, and Brian Duyck, Powell, Wyoming. Forty PLS pounds were supplied to Southwest Seeds on July 22, 2009, and 30 PLS pounds were sent to Brian Duyck on July 7, 2009. A recap of the production of each product is provided below.

SPECIES	UCEPC FIELD #	ACREAGE	PLANTING DATE	HARVEST DATE	YIELD
Bluebunch	6	0.87	Aug. 13, 2004	6/29/2006	32.00 lb
				7/6/2007	61.00 lb
				7/14/2008	50.00 lb
				7/15/2009	63.00 lb
				7/12/2010	40.00 lb
Bottlebrush	17	0.80	Aug. 13, 2004	7/13/2006	45.00 lb
				7/20/2007	55.00 lb
				7/28/2008	27.50 lb
				7/24/2009	72.00 lb
				7/18/2010	55.00 lb

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SPECIES	UCEPC FIELD #	ACREAGE	PLANTING DATE	HARVEST DATE	YIELD
Sandberg bluegrass	12	1.00	Aug. 8, 2005 Aug. 9, 2007	No harvest	
				7/17/2008	1.86 lb
				6/29/2009	89.00 lb
				6/28/2010	215.00 lb
Utah sweetvetch	12	1.00	Sept. 15, 2005	No harvest	
			Intra-seeded June 6, 2007		
			Transplanted June 2007		
			In 2008 transplanted and seeded 3 times; 6/19, 7/30, 8/19		
			Seeded 12 hills 9/9/2009		
				7/6/2010	11.00 lb
Western wheatgrass	7A	0.80	Aug. 13, 2004	8/2/2007	212.00 lb
		1.10	Aug. 26, 2008	8/6/2008	43.00 lb
			2009	No harvest	
				8/8/2010	145.00 lb

2010

The BLM western, Sandberg, bluebunch, and bottlebrush have been included in a Field Evaluation Planting near Snowmass, Colorado, and the bottlebrush and bluebunch are also being tested west of Roosevelt, Utah. Results of these off-center evaluations will help determine the range of adaptation of these products. A shipment of western wheatgrass and bluebunch wheatgrass was made to Steve Monsen for a research project he is conducting with Williams Energy and Colorado State University near Parachute, Colorado, that was installed November 2010. All BLM produced materials were also planted at Sims Mesa near Montrose by UCEPC staff November 2-3, 2010 for comparisons against commercial sources and new experimental products. Some interesting results have also been obtained from Brian Meador, Wyoming State Weed Specialist, from an herbicide resistant native plant greenhouse experiment. Additionally, an Inter-Center-Strain Trial for bottlebrush squirreltail is being conducted with five commercially available releases, Toe Jam Creek, Tusas, Fish Creek, Wapiti, and the BLM source at five NRCS Plant Materials Centers. The information from this coordinated study will add substantially to the known attributes and range of adaptation for the bottlebrush squirreltail complex.

CONCLUSION

The Utah sweetvetch field is believed to have a full stand, but will be supplemented with an additional accession of Utah sweetvetch. This year, 2010, did yield the first crop of this product. For the future, we will monitor and adjust seed sources after planting the Pinto Mesa source to identify cross pollinated blended seed from single source seed which should end in 2011.

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Interestingly, Brian Duyck will gladly produce seed of this material for increase. We are preparing to ship seed to Brian at the time of this writing.

Seed production in quantities large enough for large-scale increase has been successful for each of the five species. This upcoming year, 2011, represents the final year of the agreement. The production from this year should serve as a bit of a reserve for future distribution to growers and for testing against like materials for suitability. Four species, bluebunch wheatgrass, western wheatgrass, and bottlebrush squirreltail, and finally, Sandberg bluegrass, all have excellent stands and are good producers. Again, the Utah sweetvetch has been more difficult to establish a field of mature plants from which to harvest viable seed. Where voids exist, a new collection from Pinto Mesa, Piceance Creek, Colorado, accession number 9092298, will be added for genetic diversity. Colorado State University Extension Entomologist, Bob Hammon, brought some leafcutter bees to UCEPC in 2007 in an effort to assure the presence of pollinators for the crop. However, UCEPC continues to have a challenge keeping deer out of the sweetvetch, which has proven to be one of their favorite forage products. This year, the perimeter fence was fixed in areas where it appeared deer were getting into UCEPC. However, deer were able to get in when the irrigation ditch was turned off, and they immediately went to the sweetvetch field for grazing. UCEPC experimented with a small electric fence around a small penstemon field with excellent results. If deer are again successful in breaching our perimeter fence, we will use electric fencing to try to keep them out of the field.

A coordinated plan for seed dispersal has been adopted and has worked thus far for seed allocations to commercial growers. Coordination partners include UCEPC, Colorado Seed Growers Association, and BLM. Seed has been distributed to Southwest Seed and Brian Duyck, a grower in Powell, Wyoming.

This upcoming year represents the final year of this agreement. It would be mutually beneficial to maintain these products until a full assessment of their performance and adaptability can be compared against commercially available products, much like the Inter Center Strain Trial being conducted for the bottlebrush squirreltail. The information that is acquired from such tests is what will be used to sustain the products in the free market. Each of the products is potentially worthy of a formal release, but replicated plots at multiple locations will help substantiate what is known and how each product compares to “standards”.

Additional native species, which may be represented by products of distant origin or manipulated genetic tracking, or are not available, should also be developed for use within Colorado BLM managed lands and to some extent, on the eastern portion of the Colorado Plateau. Indian ricegrass, salina wildrye, basin wildrye, muttongrass, Junegrass, galleta grass, and needle-and-thread grass are all very important products that exist as variety not stated, VNS, or from products with distant or manipulated genetic origins. Forbs in general are much needed as components in seed mixes and for restoration diversity. UCEPC recommends an extension of the existing agreement or the creation of a new cooperative effort for product development, testing, release, and maintenance.

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 (UP), 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 (PLP) was created. Upper Colorado Environmental Plant Center (UCEPC) was contacted by Rick Sherman in 2001. A series of meetings were held at UCEPC and BLM and Forest Service offices in Delta and Montrose in 2001 and 2002. Correspondence was received from UCEPC in May 2002 from Rick Sherman that a large grant had been obtained by the Uncompahgre Restoration Plateau project, and from that point, UCEPC was included in the project.

METHODS

Collections

UCEPC was contracted to collect and increase seed of selected species in 2002. Because of substantial and prevalent drought conditions throughout much of western Colorado, collectible populations were very isolated and it was deemed uneconomical to continue to attempt collections on such a poor year.

Collections the following year, and on several years since, were much more productive. 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 UP. 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 UP in 2004. All of these materials remain on inventory at UCEPC.

UCEPC has not collected from the UP since most of the seed collection and program coordination was turned over to Steve Monsen in 2003. Each of the collected grass species represent products that have practical application for use in the Pinion-Juniper zone, which is where most of the emphasis for the project originated. Since the early planning meetings, many more species represented by most habitats have been added to the project.

**Table 1. Uncompahgre Restoration Project
UCEPC Collections**

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

* Positive identification pending

The blue wildrye was included in an initial evaluation planting at UCEPC for comparison against 32 other collections, including two released products, Arlington and Elkton. The data compiled from this project will help support the decisions about the use of this selection of blue wildrye for potential development. Bottlebrush squirreltail will be added to a trial in 2009 to compare the UP collection to six other products, including the releases, Wapiti, Pueblo, Toe Jam Creek, Fish Creek, and Tusas.

PLANTINGS

2004

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

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

2005

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

2006

No plantings were done in 2006.

2007

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

2008

No plantings were done in 2008.

2009

No plantings were done in 2009.

2010

No plantings were done in 2010, and no funding was provided to UCEPC for field production efforts in 2010. As a result, the fields of muttongrass, Junegrass, and yarrow were removed. The grass fields were last funded in 2008, and the yarrow was last funded in 2007. None of them were very productive, and the pls factor was a concern. Additionally, the senecio had not been funded in 2007-2010, and the bluestem penstemon was only funded in 2008-2009. All seed except bluestem penstemon produced in 2009 has been provided to UP. The penstemon remains on inventory at UCEPC.

HARVESTS

Each product was harvested with the Hege plot combine in 2005 and 2006. All materials except the Senecio were harvested in 2007 with a pull-type swather. The swathed windrows were then

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picked up with pitchforks and transported to seed drying areas in buildings. After the material was dry, it was run through the Hege combine repeatedly until no appreciable seed recovery was obtained.

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

2008

Seed from the muttongrass, Junegrass, and multi-lobed senecio were harvested in June and July. It was mutually determined by UP and UCEPC to discontinue funded production of yarrow. Bluestem penstemon did not produce a seed crop in 2008.

2009

Seed was harvested from muttongrass, Junegrass, multi-lobed senecio, yarrow, and bluestem penstemon. However, the only contracted species with UP for production was the bluestem penstemon. Funding for yarrow, multi-lobed senecio, muttongrass, and Junegrass has been discontinued. As per the work plan, harvests would be conducted as time and resources allowed on established plots of UP products. Produced seed will be used for additional testing.

2010

Two fields, both forbs, were maintained and harvested in 2010. The UP source of multi-lobed senecio produced 11 pounds of clean seed, but only 2.5 pls pounds. Seed quality has been a concern for this product as it has been below 40% pls with each seed lot. For the bluestem penstemon, 29 clean pounds of seed were produced with a low pls factor as well. Seed lab results indicate only 11.5 pounds of pls seed.

RESULTS

Table 2. Summary of planting dates, acreage, and harvest dates and amounts.

Species	Accession	Year Established	Acreage	Harvest Amount	Harvest Date
Bluestem penstemon	9092290	8/17/2007	0.20 acre	68 lb	8/12/2009
				29 lb*	7/30/2010
Junegrass	9092273	6/18/2004	0.27 acre	-0-	NA
				15 lb	7/26/2005
				10.4 lb	7/12/2006
				9.0 lb	7/12/2007
				9.6 lb	7/23/2008
				1.4 lb*	7/22/2009

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Species	Accession	Year Established	Acreage	Harvest Amount	Harvest Date
Muttongrass	9092272	6/17/2004	0.27 acre	-0-	NA
				2 lb	6/8/2005
				16.5 lb	5/30/2006
				5.0	5/30/2007
				15.0	6/13/2008
				3.5 lb*	6/1/2009
Senecio	9092280	7/1/2005	0.13 acre	-0-	NA
				15 lb	6/21/2006
				292 g *	7/5/2007
				23 lb *	7/04/2008
				98 g *	7/13/2009
				11 lb *	6/25/10
Yarrow	9092271	6/16/2004	0.20 acre	43 g	11/2/2004
				17.5 lb	8/6/2005
				14 lb	8/2/2006
				10 lb	7/27/2007
				No harvest	2008 *
				2.0 lb	8/19/09 *

*Denotes products not under contract with UP. Seed is available for development, production, and testing through UCEPC.

A formalized work plan was developed for 2009. This plan identified only the harvest of bluestem penstemon that was planted in 2007. Although harvests were conducted on all the UP products, only the penstemon produced well this year. Seed test results showed very low viability on the other products, and removal of the grasses and yarrow is recommended. There is still interest in the multi-lobed senecio as a reclamation forb.

2010

Results from 2010 indicate that bluestem penstemon, while substantially less productive in 2010 than the year prior, is still a potentially important product for commercial release consideration. Many lobed senecio has produced fairly well on even numbered years after having been planted only once, in 2005. It is apparent that the crop is biennial, but re-seeds itself so that it remains a potentially viable commercial product.

Interest had been expressed in the installation of a Field Evaluation Planting at one of the UP enclosures in or near the Montrose area. In 2010, coordinated efforts were undertaken to install a formal Field Evaluation Planting. On April 6, 2010, a site visit to two different enclosures near Montrose was conducted with Jim Free, Ken Holsinger, Jim Garner, and Steve Parr. The site at Sims Mesa was chosen primarily because of ease of access, but it did not need as much site preparation work as the alternate site.

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Coordination on-site preparation, size of field planting, soil conditions, and annual weed control were conducted via e-mail and telephone. Jim Free and Ken Holsinger did most of the preparatory work and the plots were installed November 2-3, 2010. A number of the products that UP is interested in promoting were placed in the test and will be compared to like collections of the same or similar species. A full report will be provided in the fiscal year 2011 report.

CONCLUSION

UCEPC will coordinate with the UP Technical Committee about a work plan for 2011 and beyond, but the general operating agreement ends in December of 2011. Besides bluestem penstemon, a native collection of Lewis flax had been verbally agreed upon to be produced at UCEPC. It is anticipated that other materials may be planted or tested at UCEPC and results and products delivered to seed growers upon release.

UP contracted with UCEPC for five years to grow Junegrass and muttongrass from 2004-2008, yarrow for four years 2004-2007, many lobed senecio for two years 2005-2006, and bluestem penstemon for two years 2008-2009. After 18 crop-years, UCEPC still has interest in the senecio and the penstemon, but little value was expressed for continuing with the yarrow and two grasses produced here.

Field planting results will ultimately determine the attributes of a given collection when compared to other like species collections. If further development or testing is warranted, UP may be interested in partnering with the efforts and eventual release. This represents the final report for this cooperative project.

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By: Heather Plumb

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

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) and Medicine Bow-Routt National Forest formally entered Cooperative Agreement 06-CS-11020604-042 in August of 2006. The agreement called for an increase of a single specie, blue wildrye *Elymus glaucus*, collected within the boundaries of Medicine Bow-Routt National Forest. Collection ELGL-080106-A1 from California Park was selected to be used in the 1/3-acre-field planting. The field planting will increase seed from seed zone 215, one of the four seed zones Medicine Bow-Routt would like to have seed increased for. This agreement ran through the fiscal year of 2010.

OBJECTIVES

Increase a selection of blue wildrye for eventual release and use by Medicine Bow-Routt National Forest.

METHODS

In 2007, a seed increase field of 1/3 acre, was planted using material from Seed Zone 215, accession number ELGL080106-A1. Seed was harvested from the field for the first time in 2008. The second harvest on the field was conducted on July 16, 2009. The final harvest on the plot was conducted on July 13, 2010. Seed was sent to the Colorado Seed Laboratory for blue wildrye seed analysis.

RESULTS

2008

Staff members from UCEPC evaluated blue wildrye seed increase field, 080106-A1, on June 26, 2008. It was observed that the blue wildrye plants were in the head stage and were flowering. Seed heads on the plants were abundant and healthy. Foliage was robust and was a dark green. Bare spots within the field were minimal, blue wildrye plant vigor and percent stand cover were excellent. There were no signs of water stress, bug damage or heavy infestation of weeds. Weeds were present, but were not abundant. Squirreltail and mountain brome were mixed in with some of the blue wildrye plants, but were removed manually by the staff as the field was evaluated.

Seed harvested from the field was cleaned December 12, 2008, resulting in 44.5 pounds of blue wildrye. Seed was sent out to the Colorado State Seed Lab for analysis and PLS came back as 29.83%.

2009

During the 2009 growing season it was observed by UCEPC staff that the field of blue wildrye was unhealthy in its appearance. Bob Hammon, Colorado State University Extension entomologist for Mesa County, was called and asked to inspect the field. He concluded that the field was infested by flea beetles and perhaps should be sprayed. However, UCEPC staff was

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worried that if the field was sprayed the seed could potentially carry the chemical with it, so the field was not sprayed.

On July 23, 2009, the blue wildrye seed from 2008 was shipped to Luck Peak for storage. This was requested by Barbara Vasquez.

Seed harvested from the field was cleaned December 22, 2009, resulting in 22 pounds of blue wildrye. Seed was sent out to the Colorado State Seed Lab for analysis and PLS came back as 69.88%.

2010

Throughout the 2010 growing season it was yet again observed that the field of blue wildrye was unhealthy in its appearance. Bob Hammon was again called to inspect the field. He concluded that the field was still infested by flea beetles. At the time of the inspection, herbicide could not be applied to the field as seed heads had matured and any spraying might have damaged the mature seed.

The field was harvested on July 13, 2010. The cleaned bulk seed weight resulted in 388 grams of seed. No tests were performed on the 2010 lot due to the fact that all seed from the 2010 growing season would have been used up in the seed tests.

CONCLUSION

The contract for the seed increase of Medicine Bow-Routt blue wildrye expired at the end of the 2010 growing season. Seed yield off this field has been poor over the three years it has been in production at UCEPC.

There are many reason why the field performed so poorly, but two particular incidents could stand to reason why the field performed the way it did. The first reason could be attributed to the flea beetle infestation during the second year of growth in 2009. The infestation perhaps was so severe that it damaged the stand to the point it could not recover properly. The second reason is that the low seed yields may be a result of the collection chosen for seed increase. One of the deciding factors to plant collection 080106-A1 at the time was that it had the second highest amount of seed collected for seed zone 215. No prior tests or evaluation data had been performed on collection 080106-A1. Though the collection was used in the initial blue wildrye evaluation for Medicine Bow-Routt National Forest, no data from the initial evaluation had been obtained at the time of planting the seed increase field. As seen in the initial evaluation report for the past three years, collection 080106-A1 has not been a superior performer.

Though the collection was observed to have good vigor and percent stand in its first year of establishment, the second year both vigor and percent stand dropped drastically, changing the total appearance of the field. It is not recommended to use this collection for further seed increase efforts. It is suggested to find an alternative blue wildrye seed source to fit this seed zone. The Colorado Seed Laboratory reports are available upon request for the blue wildrye. Blue wildrye seed from 2009 and 2010 is being stored at UCEPC.

**Evaluation of Griffith's Wheatgrass and Poverty Oatgrass
for Seed Increase Potential**

INTRODUCTION

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

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

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

OBJECTIVE

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

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By: Steve Parr

METHODS

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

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

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

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

POVERTY OATGRASS

2007

The planting of poverty oatgrass was also conducted as a split application. One-third acre was planted on August 10, 2007, and 1/3 acre was planted as a dormant planting on October 11, 2007. Buctril herbicide was used on November 2 to control winter annual broadleaf weeds. Eight tenths of one pound of 2004 Heil Valley Ranch was used in the planting with the target again being 30 PLS seeds per linear foot of row.

Project COPMC-S-0702-CR

Project Report 2010

By: Steve Parr

2008

Spring observations showed the poverty oatgrass nearly a complete loss. Because of severe frost heaving, most of the planted crop was lost during the winter of 2007. As a result, 0.57 acre was reseeded on June 28, 2008. Sprouting was good, and a well established field noted two weeks later. However, as was noted the previous year, the growth was very minimal with the crop and concerns about the increase potential of this product were becoming evident. There was approximately 0.17 acre of the dormant planting that remained a bit more robust than the new planting, but no seed heads were produced from this portion of the planting either.

2009

In July of 2009, it was determined that the increase of poverty oatgrass by UCEPC for Boulder County was not an economically viable option. While there were plants and a fair to poor stand established, the plants with seed had little amounts and the individual plant vigor was not good. It is suspected without confirmation that our soils are too heavy and that perhaps, our pH is too high for seed production of this species which tends to occur in granitically derived soils along the foothills of the front range of the Rocky Mountains. At any rate, production efforts for this species were suspended and a new increase species, mountain muhly, was planted as a replacement. A $\frac{2}{3}$ -acre field was planted on August 21, 2009, with 400 grams of seed that had been tested by Bend Seed Extractory.

GRIFFITH'S WHEATGRASS

2007

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

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

2008

The Griffith's wheatgrass established nicely and remained healthy coming out of the winter in 2007-2008. No re-seeding was necessary in 2008, and the plants continued to mature. There was a minimal amount of seed produced, 144 grams, that was hand harvested on August 5.

2009

On July 8, 2009, Claire DeLeo, Plant Ecologist for Boulder County Parks and Open Space, visited UCEPC and viewed the poverty oatgrass and Griffith's wheatgrass fields as well as a quick tour of the facility. Some concern was expressed over the robust nature of the Griffith's field, and it was requested that a specimen be sent to Boulder County for taxonomic identification. This was done, but the results, if confirmed, have not been relayed to UCEPC. On May 13, thirty-six pounds of seed was shipped to Claire DeLeo of Boulder County.

Project COPMC-S-0702-CR

Project Report 2010

By: Steve Parr

2010

Griffith's wheatgrass was harvested on July 23, 2010. Thirty-two pounds of clean seed resulted from the increase effort this year. Seed was shipped to Boulder County on March 7, 2011. On July 14, 2010, Claire DeLeo and John Proctor made a site visit to UCEPC to review production fields. After additional review and discussion of the Griffith's field, concern was even more pronounced than previously as to the true identity of the Griffith's source. The field produced plants are large, robust upright plants that do not closely resemble native stands of Griffith's wheatgrass. As a result, it was determined in late 2010 to remove the Griffith's field and replace it with prairie Junegrass.

RESULTS

The initial establishment of both materials was very good. Both products responded well to irrigation and germinated readily after a single irrigation of a two 12-hour set from overhead sprinkling. While the Griffith's continued to produce above and below ground biomass late into the season, the growth of poverty oatgrass stopped or nearly stopped by early October. The plants also started to change color and go dormant by mid October. Additionally, we noted substantial frost heave damage to the oatgrass field established in August. A planting of poverty oatgrass in June of 2008 still did not establish well after wintering and no appreciable harvest would be obtained in 2009 after three plantings. Poverty oatgrass seed increase efforts were suspended in July 2009.

2009

A substitute species, mountain muhly, was planted in place of the poverty oatgrass on August 21, 2009. This has been a slow to establish species from previous increase plantings, so additional inner-seeding and plugging is anticipated in 2010.

Griffith's wheatgrass has performed very well to date. A minimal seed harvest was completed in 2008, but in 2009, thirty-six pounds of clean seed was produced. There is room within the rows for the species to fill in and become more productive in the next one to two years.

2010

Mountain muhly was planted on June 17, 2010, after soil temperatures were adequate to germinate the warm-season seed. Furrow irrigation was applied to moisten the field adequately for seven days with wet/dry cycles so that the soil surface did not crust, but that the tiny seed remained moist throughout the germination process. As a result, an excellent stand was achieved. Seed production is anticipated in 2011 for this generally difficult establishing material.

Prairie Junegrass seed will be provided by Boulder County to UCEPC for planting in the spring of 2011. These two products will be produced in place of Griffith's wheatgrass and poverty oatgrass. A new agreement between Boulder County and Douglas Creek and White River Conservation districts is being drafted at this time. For demonstrational purposes only, some

Project COPMC-S-0702-CR

Project Report 2010

By: Steve Parr

Parry's oatgrass and big bluestem of Boulder County origin will be planted in the demonstration plots this year.

Below is a recap of the production efforts to date on three non-released products that are of importance to the foothills area of the front range of Colorado, Wyoming, and New Mexico.

Species	Common Name	Activity	Result
Danthonia spicata	Poverty oatgrass	Planted 0.33 acre 8/10/2007	Good stand noted fall; poor stand June 2008
Establishment:		Planted 0.33 acre 10/11/2007	Fair stand June 2008
		Reseeded 6/28/2008 0.57 acre	0.17 acre of dormant seeding still fair; reseeded establishment was good
Production:		2008	No harvest
		2009	No harvest; Field production suspended
Elymus albicans	Griffith's wheatgrass	Planted 0.33 acre 8/10/2007	Good stand noted fall; Good stand June 2008
Establishment:		Planted 0.33 acre 10/11/2007	Good stand June 2008
Production:		2008	144 grams
		2009	36 lb
		2010	32 lb
Shipment:		2009	36 lb shipped May 13, 2010
		2010	32 lb shipped March 7, 2011
		2010	Production suspended
Muhlenbergia montana	Mountain muhly	Planted 0.67 acre 8/21/2009	Planting failed
		Replanted 0.67 acre 6/17/2010	Excellent stand established

CONCLUSION

The Griffith's wheatgrass has shown good increase potential utilizing standard cultural methods at UCEPC. Boulder County has been very patient with the development of the crop, which has contributed to the potential for success with the project in general. Although seed production for Griffith's wheatgrass was not outstanding, there was adequate production to establish commercial production fields for large scale increase. However, it is not known whether the source is true-to-type for the species. Additional production was not needed by Boulder County, so the production of this material has been terminated.

Poverty oatgrass did not perform well at UCEPC. Three attempts at establishing a field, and having that field come out of the winter still in-tact was never accomplished, even though germination and summer stand establishment was achieved twice. A theory is that soils at UCEPC simply are not conducive to field producing this product. Field production of this material was also terminated, but because no seed was produced.

Boulder County has expressed interest in doing an increase with mountain muhly and prairie Junegrass as replacement products. The mountain muhly field is established, and should produce seed in 2011. A draft of the new agreement is being circulated at this time for review, with expectations that a fully executed agreement will be in place by late April 2011 to produce the mountain muhly and a new product, prairie Junegrass.

Kura Clover Seed Increase

INTRODUCTION

Kura Clover germplasm *Trifolium ambiguum* was released March 1988 as ARS-2678. It was developed by USDA-ARS, USDA-SCS and the Utah Agriculture Experimental Station. The 81 parent clones for ARS-2678 were selected because of their winter hardiness in the Intermountain west. ARS-2678 is relatively heat and drought tolerant, spreads predominately using rhizomes, and exhibits superior forage and seed yields in non-irrigated areas. It additionally is a good nitrogen fixating legume.

OBJECTIVE

To determine seed production potential of a legume for use in irrigated and dryland pastures.

METHODS

Four 20-foot rows were prepared for the plot before planting occurred. On August 15, 2007, eighty-one plugs of Kura Clover were transplanted into a small plot located on the south side of the headquarters fence. Water was applied after planting to help with establishment. The majority of the plot was planted using greenhouse produced plugs. However, seed from the following year, 2008, was used to finish the plot. The plot is watered off and on throughout the summer months using a small sprinkler head. Seed from the plot is harvested by hand.

2010

On July 27, 2010, the Kura Clover field was hand harvested by the summer employees. On August 2, 2010, Steve Parr evaluated what was left of the Kura Clover field.

RESULTS

2008 and 2009

Seed from the field was harvested and cleaned by UCEPC staff. In 2008, thirty-five grams were cleaned and in 2009, 3.5 pounds were cleaned.

2010

Seed from the field was harvested and cleaned by UCEPC staff. A total of 3 pounds were cleaned from the 2010 growing season.

CONCLUSION

The plot of Kura Clover has established well since it was plugged into the field in 2007. On hand currently UCEPC has 6.5 bulk pounds on inventory. This seed will be used for direct seeding trials on-center. No seed lab reports are available for this material.

Carson National Forest Native Plant Production

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) and Carson National Forest (CNF) formally entered Cooperative Agreement 08-IA-11071600-013 in November of 2007. The agreement called for UCEPC to clean, process, propagate, and increase the plant materials collected from CNF for their use in restoration of abandoned mine land projects. This agreement will run through the fiscal year of 2009.

OBJECTIVES

Propagate native riparian plants for revegetation projects within Carson National Forest, New Mexico.

METHODS

In 2007, a list was created of potential species for restoration at the abandoned mine sites around Taos, New Mexico. In September, CNF employees made two trips to collect seed from within five areas of the national forest. The first box of seed was received at UCEPC on January 15, 2008. In late September 2008, a second shipment of seed was received at UCEPC. That seed was cleaned in February of 2009. For a complete list of species and quantities collected, see report number COPMC-S-0902-RI of UCEPC's Annual Technical Report 2009. Germination tests, results, and propagation protocol can also be found in the above report.

RESULTS

UCEPC received the final list of plants requested for the La Jara project on June 25, 2008. On March 4, 2009, UCEPC staff planted seeds for the tufted hairgrass *Deschampsia caespitosa* in 1" x 9" cones. There was 94% germination and plants were delivered to CNF in July of 2009. The thinleaf alder *Alnus incana* was cold stratified for 180 days and planted directly into 1" x 9" cones. The seed did not germinate. Seed of *Carex microptera* and *nebrascensis* was also cold stratified and planted directly into 1" x 9" cones. There was 50% germination on the sedges. The *Geum aleppicum* was cold stratified for 60 days and had 95% germination. The geum was planted into 2" x 12" number one treepots. The Wood's rose *Rosa woodsii* was cold stratified for 120 days and had very poor germination. Only three plants remain. Swordleaf rush *juncus ensifolius* was planted directly into 1" x 9" cones. Poor germination resulted. Three *juncus*' survived. UCEPC staff contacted the Bridger Plant Materials Center in Montana for further information on germinating techniques for the alder and swordleaf rush. UCEPC still had poor results.

Project: COPMC-S-0902-RI

Report- 2010

By: Terri Blanke

In 2010, UCEPC continued to propagate material for CNF. The *nebrascensis* and *microptera* established well enough that the plants were divided at the roots and replanted. UCEPC determined that the *juncus* seed collected at La Jara was mostly chaff and CNF was notified. CNF approved of UCEPC collecting a local source of *juncus* as well as Woods' rose to provide material for CNF. In June 2010, UCEPC staff collected *juncus* near Maybell, Colorado, and wood's rose was dug at the plant material center. Those materials are ready for delivery to CNF upon their request. Alder continues to be propagated. In July 2010, UCEPC shipped seven boxes of material to CNF. The table below lists those materials.

Table 2. La Jara Project. Targeted species, targeted quantity and amounts delivered.

Common Name	Species	Target Qty	'09 Delivery	'10 Delivery
Geum	<i>Geum aleppicum</i>	100	123	37
Nebraska sedge	<i>Carex nebrascensis</i>	200		197
Smallwing sedge	<i>Carex microptera</i>	200		199
Swordleaf rush	<i>Juncus ensifolius</i>	200	Poor germ	26
Thinleaf alder	<i>Alnus incana</i>	200	No germ	0
Tufted hairgrass	<i>Deschampsia caespitosa</i>	300	294	-
Woods' rose	<i>Rosa woodsii</i>	50	Poor germ	-
	Total	1250	417	203

CONCLUSION

With the poor germination results of the alder, Woods' rose, and swordleaf rush, UCEPC had a shortfall for delivery of woody products scheduled in 2010. UCEPC will continue to propagate the material for CNF that is in the greenhouse. UCEPC has on inventory 36 *juncus*, 60 Woods' rose and four alder. UCEPC has begun germination tests on alder that was collected at UCEPC to complete the CNF contract.

Project No. COPMC-S-9104-WL

Project Report-2010

By: Terri Blanke

Clark Source Serviceberry Seeds Increase

INTRODUCTION

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

OBJECTIVE

Release root sprouting selection of Saskatoon serviceberry accession 9021441.

METHODS

This study is a non-replicated test.

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

On May 24, 1991, twenty-two serviceberry sprouts were dug by hand. A channel was plowed and the sprouts were planted in one row on ten-foot spacings next to the channel. The shrubs were evaluated, hand watered, and weeded through the summer on an as needed basis. Only seven plants remained in September.

In June of 1992, twenty-two new sprouts were added to the original seven. Sixteen of those perished. An additional 30 sprouts were dug, potted, and grown out in the lathhouse to increase survival in the field.

Project No. COPMC-S-9104-WL

Project Report-2010

By: Terri Blanke

In May of 1993, only five plants remained. Eight of the potted shrubs from the lathhouse were planted in the isolated field with the original five.

In April of 1994, seven more serviceberry shrubs were added. Multiple stems were placed into each hole. The holes were filled with water and the tops were pruned back after planting.

RESULTS

The serviceberry shrubs continued to survive for the next 12 years but due to heavy wildlife browsing, they had no new growth or seed production.

In 2006, fifteen small serviceberry shrubs were still surviving in the isolated planting. The shrubs were evaluated, fenced, photographed, and herbicide was applied to fight competition from weeds.

Clark's source serviceberry was evaluated two times in 2007. There was very little new growth. Herbicide, pruning, and hand weeding applications continued through the summer.

On August 26, 2008, seed was collected from two plants. There was significant new leader growth. The shrubs were again evaluated, pruned, photographed, and treated with herbicide to suppress invasive. The wildlife continued to browse anything that emerged through the cages.

In May of 2009, the cages were removed for evaluating and photos. Fourteen of the Clark's source serviceberry continue to flourish aided by the protection from wildlife browsing. A small ditch was dug alongside the row of serviceberry. Water is channeled from a nearby irrigation ditch and applied to the shrubs three or four times during the growing season. This planting received no supplemental water until this time. All the shrubs produced berries in 2009 but because of the cold and wet spring, disease hindered the plants from producing viable seed. The herbicide, Roundup, was applied around the base of the shrubs to help suppress invasives.

July 20, 2010, UCEPC staff evaluated and photographed the Clark's source serviceberry. Again, heavy browsing by wildlife was noted. A total of 24 grams of seed was collected from the remaining shrubs. Seasonal workers raised and enlarged the protective fences around the shrubs to allow for growth. A few small sprouts were dug and placed into the empty cage. UCEPC will monitor the sprouts to see if they survive. Irrigation and Roundup were applied during the 2010 growing season.

The table below shows how the serviceberry has performed since 2006.

Clark's Serviceberry Performance

Shrub No.	2006 Height	2007 Growth	2008 Growth	2009 Growth	2010 Growth	Seed Production	Vigor*
1	27"	54"x 46"	63"x 46"	74"x 46"	85"x 62"	Med-light	1
2	21"	24" x 23"	43"x 24"	49"x 31"	49"x 37"	Med-light	3
3	18"	22"x 36"	36"x 39"	51"x 41"	50"x 69"	Light	3
4	16"	23"x 19"	33"x 19"	39"x 24"	45"x 30"	Heavy	3
5	18"	34"x 36"	33"x 41"	49"x 31"	47"x 26"	Heavy	5
6	21"	36"x 36"	54"x 39"	69"x 29"	81"x 38"	Light	3**
7	13"	25"x 20"	28"x 18"	43"x 22"	48"x 28"	Med-light	3
8	14"	23"x 22"	38"x 28"	45"x 18"	46"x 28"	Med-light	5
9	9"	8"x 3"	Na	Na	Na	Na	Na
10	15"	28"x 17"	36"x 19"	38"x 18"	52"x 25"	Light	3
11	16"	20"x 24"	35"x 27"	41"x 23"	46"x 27"	Light	3
12	12"	16"x 10"	19"x 18"	25"x 8"	27"x 14"	Very light	5
13	15"	16"x 8"	17"x 9"	14"x 3"	7"x 9"	None	5
14	14"	18"x 10"	26"x 14"	25"x 15"	30"x 17"	Light	5
15	15"	18"x 14"	22"x 9"	21"x 16"	24"x 19"	None	5

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

** Browsing damage

CONCLUSION

Serviceberry is a valuable plant for wildlife habitat, providing both food and cover for many species. Its leaves and twigs are readily consumed by big game animals, and its berries are relished by many species of birds, wildlife, and livestock. Its massive root system is beneficial in reducing erosion in rangeland and mined land plantings, and its growth form and showy white flowers are an attractive addition in natural landscape and urban xeriscapes. As a result, it is used in wildlife habitat, pollinator enhancement plantings, range, and mined land reclamation plantings, shelterbelts, windbreaks, and other native landscape plantings. The serviceberry has cultural significance to the Native American as well. UCEPC will continue with efforts towards releasing the Clark's source serviceberry for public use.

Silver Buffaloberry Seed Increase

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) has identified the native Colorado shrub, silver buffaloberry *Shepherdia argentea* as a species with many conservation attributes. Adapted to elevations below 7500 feet and requiring 13 to 21 inches of precipitation, the silver buffaloberry offers wildlife habitat improvement, windbreak potential, landscaping, riparian enhancement, and erosion control. The plant is a deciduous, thorny shrub, or small tree reaching 6 to 20 feet in height. The leaves are silver gray in color on top and bottom and are 1 to 2 inches long, 3/8-inches wide. The thin bark becomes grayish-brown and will begin peeling as the plant matures. The plant has opposite branching. Fruit is drupe-like, ovoid, about 1/4 inch long, mostly reddish orange. Rarely, yellow fruit can be seen. Roots are shallow and much branched; readily sprouting. Silver buffaloberry can be found growing along streams, in coulees and on exposed, moist hillsides. The plants are winter hardy and alkaline tolerant. Silver buffaloberry is capable of fixing nitrogen in root nodules that contain bacteria.

OBJECTIVE

Pre-cultivar release, seed increase.

METHODS

Accession 9008027 was planted into the UCEPC orchard on August 8, 1977. Fourteen years later this accession was chosen for its superior performance and was relocated to Field 18 for further evaluation.

On May 24, 1991, a channel was plowed and holes were dug beside the channel on ten-foot spacing. Twenty silver buffaloberry sprouts were planted and hand watered through the summer. Five sprouts had to be replaced by 1993. No further evaluations were conducted.

In January of 2006, three native shrub seeding trials were conducted at UCEPC. The trials included the germination rate of non-stratified seed from native shrubs, relative success of direct seeding of native shrubs for conservation use and seeding success of our better performing native shrubs in field conditions. Results from those trials can be found in the COPMC-T-0601-UR, COPMC-T-0602-UR, and COPMC-T-0702-UR, 2006-2009 reports.

In the fall of 2007, a field crew heavily pruned the original shrubs and sprayed around the trunks for weed control. That winter, wildlife browsed them heavily. The damaged shrubs were pruned again in the fall of 2008.

Three off-site riparian studies began in 2008 incorporating the silver buffaloberry.

Project COPMC-S-9105-RI

Report-2010

By: Terri Blanke

Study COPMC-F-0802-IN will determine if silver buffaloberry is suitable and effective in replacing post treated tamarisk sites. Study COPMC-F-0803-RI will determine adaptation of silver buffaloberry selection for riparian restoration plantings. Study COPMC-F-0804-RI will determine adaptation of the buffaloberry for riparian restoration plantings at high elevations.

In March 2009, UCEPC sent silver buffaloberry bareroot stock to Kaycee, Wyoming. The United States Department of Agriculture/Natural Resources Conservation District along with local cooperators is implementing the buffaloberry in a field planting for a windbreak/tree establishment.

In 2009, a small ditch was dug alongside the row of silver buffaloberry. Water was channeled and applied three to four times during the growing season from a nearby irrigation ditch. Round-up herbicide was applied beneath the buffaloberry in the spring to help suppress invasives. Some pruning was needed as wildlife browsing had damaged lower branches. Wire cages were placed around the lower part of the shrubs for protection from the wildlife. Seed was harvested from four of the shrubs in mid August. The table below shows the years of seed production and amounts.

For year 2010, irrigation was applied through the summer. A mixture of Roundup and 2,4-D was applied around the shrubs to help suppress invasives. The fencing is providing protection from the wildlife browse. It was raised a few inches to further protect the upper limbs as well as the trunks. New germination trials have begun on silver buffaloberry seed. The seed was dried in two environments; one hot and one cool. UCEPC hopes to learn if a heat drying method increases the seeds dormancy.

Several donations of silver buffaloberry plants, accession 9008027, were made in 2010. The Nature Conservancy's "Carpenter Ranch", Hayden, Colorado, the Steamboat Community Garden, Steamboat Springs, Colorado, and the Colorado State University Extension Office, Grand Junction, Colorado, added the buffaloberry plants in their native plant demonstration gardens for educating the public. The Uintah River High School, Fort Duchesne, Utah, implemented accession 9008027, in a Ute ethnobotany educational garden for their students.

May 13, 2010, Andy Warren of the Rawlins, Wyoming, Bureau of Land Management, arranged for the delivery of 30 silver buffaloberry plants. The contracted material was for a native riparian field planting in Wyoming.

Information on the performance of the silver buffaloberry from these projects will be useful in the preparation for release of the silver buffaloberry.

Project COPMC-S-9105-RI

Report-2010

By: Terri Blanke

RESULTS

Silver buffaloberry shrubs remain in Field 19 at UCEPC. The shrubs have multiple trunks and have grown from 8 to 10 feet tall. They are evaluated, maintained and photographed yearly. The first seed was harvested from the shrubs seven years after isolating the sprouts.

Year Harvested	Clean Seed Wt.
1998	13 g
2003	238 g
2007	751 g
2008	2.6 lb
2009	117 g
2010	368 g

Buffaloberry seed is easily germinated in the greenhouse. Germination trials have shown no significant difference in the methods used to dry buffaloberry seed. UCEPC continues to propagate the shrub for further testing, off-site projects and numerous requests from the public.

Some of the shrubs that had been pruned showed signs of stress on outer branches. The damage could possibly be due to overspray from the herbicide or wildlife browsing. We will continue to monitor those individual plants for future outcome. It was noted that several species of wildlife have been seen utilizing the silver buffaloberry.

Off-site project information and results can be found in the individual reports listed above.

CONCLUSION

The silver buffaloberry shrubs have potential for being released for conservation use by the general public. UCEPC will continue its efforts towards releasing the silver buffaloberry for the general public use. As tamarisk and Russian olive abatement projects throughout the southwestern United States continue to be successful and gather momentum for large scale implementation, suitable native woody riparian replacement materials will be in high demand. This selection of silver buffaloberry may help satisfy this anticipated conservation need.

Chokecherry Seed Increase

INTRODUCTION

Chokecherry *Prunus virginiana* is a native shrub which grows in a large geographic range in North America. The shrub grows abundantly in many habitat types and plant associations. Chokecherry occurs naturally in a wide range of soil types and textures making it key in restoration/reclamation projects. Chokecherry is found growing in precipitation ranges from 13 to 65 inches annually and the shrub prefers low to mostly mid-elevations. Chokecherry is perennial, deciduous, woody, and thicket-forming. They are a large erect shrub or small tree, rarely reaching 30 feet. The stems are numerous and slender with a root network of rhizomes. The bark of young trees may vary from gray to reddish brown. With age it will become darker, almost brownish-black and noticeably furrowed. Leaves of this shrub are alternate, simple, glabrous, and oval to broadly elliptic in shape, 1 to 4 inches long and $\frac{3}{4}$ to 2 inches wide. The leaves are dark green and glossy above, paler and lighter beneath. The margins are toothed with closely-spaced sharp teeth pointing outward to form a serrated edge. They will turn yellow in autumn. Flowers are arranged in cylindrical racemes 3 to 6 inches long, $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter with five white petals. The fruits are spherical drupes, globose, $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter. Small ripe cherries range in color from dark red to purple or almost black. Limiting factors in the chokecherry's habitat are poor drainage, frequent flooding, or soil with large amounts of clay and shade. Chokecherry is well adapted to fire disturbance. Seed for accession 9024060 was collected in 1975 at the Meeker Jr. High School in Rio Blanco County, Colorado.

OBJECTIVE

Pre-cultivar release, seed increase

METHODS

This study is a non-replicated test.

Accession 9020640 was planted in the Upper Colorado Environmental Plant Center (UCEPC) orchard on August 8, 1977. Fourteen years later, due to superior performance, it along with two other shrubs, silver buffaloberry and Clark's serviceberry, were chosen for isolation and further evaluation.

On May 24, 1991, twenty-one chokecherry sprouts were hand dug from the UCEPC orchard and planted in field 18. A channel was plowed and the sprouts were planted in one row on ten foot spacing next to the channel. They were watered by hand weekly and weeded through the summer.

Project COPMC-S-9106-WL

Project Report-2010

By: Terri Blanke

In 1992 and 1993, new sprouts were dug to replace those that perished. The planting received no supplemental water.

In January, 2006, accession number 9024060 was incorporated into four native shrub seeding trials. The trials included the germination rate of non-stratified seed from native shrubs, relative success of direct seeding of native shrubs for conservation use, seeding success of our better performing native shrubs in field conditions and establishment of accession number 9024060 from various seed lots. For information on those trials see study numbers COPMC-T-0601-UR, COPMC-0602-UR, COPMC-T-0702-UR, and COPMC-T-0801-WL, 2006-2009 reports.

In September of 2007, the chokecherry shrubs were pruned and the ground beneath them was treated with an herbicide to help fight invasive plants.

The following summer, 2008, lower branches had to be pruned off again due to damage sustained from wildlife browsing. The shrubs were fenced to help protect the trunks from any further damage. Herbicide was applied around the trunks for weed control.

In March of 2009, UCEPC sent bare-root stock of accession number 9024060 to Kaycee, Wyoming, Soda Springs and Lewiston, Idaho. The United States Department of Agriculture/Natural Resources Conservation Service along with local cooperators is implementing the chokecherry in field plantings for a variety of uses. No project information has been reported at this time.

In later spring 2009, a small ditch was dug alongside the row of chokecherry. Water was channeled and applied three to four times during the growing season from a nearby irrigation ditch. Glyphosate herbicide was applied to help suppress invasive plants. Seed was collected in August. The collected seed was dried in two separate methods to later determine if extreme heat increases seed dormancy.

For year 2010, the chokecherry shrubs received irrigation and an herbicide treatment. Seed was collected in August. The protective fencing was raised higher on the trunks as wildlife continues to cause damage to the shrubs. UCEPC donated many chokecherry plants to various projects thorough Colorado and Utah. The Nature Conservancy Carpenter Ranch in Hayden, Colorado, the Steamboat Community Garden, Steamboat Springs, Colorado and the CSU Extension office, Grand Junction, Colorado, included Colorow Germplasm in native gardens to educate the public. The Uintah River High School, Fort Duchesne, Utah, implemented the chokecherry in a Ute ethnobotany educational garden for their students.

RESULTS

The chokecherry planting in field 18 was evaluated from 1991 to 1994. In August of 1998, seven years after original planting, the first seed harvest was made from the chokecherry shrubs. The shrubs are currently 12 to 14 feet tall. Several of the shrubs showed signs of stress on outer branches. This could be caused by overspray from the herbicide or wildlife use.

Project COPMC-S-9106-WL

Project Report-2010

By: Terri Blanke

We will continue to monitor those individual plants for future occurrences. It has been noted that various species of wildlife have been seen utilizing the chokecherry shrub. Due to its aromatic flowers, accession number 9024060 was also named on a list of potential plant specie that UCEPC could provide to enhance pollinator conservation projects. The shrubs continue to be maintained at UCEPC.

UCEPC completed all necessary components to release accession number 9024060 *Prunus virginiana*. Colorow Germplasm, black chokecherry, became available for public use in the summer of 2009. A notice of release article was published in the 2010 spring Native Plants Journal.

UCEPC published a Plant Fact Sheet on Colorow Germplasm that same year.

Table 1 below shows the years that seed has been harvested and the amount of cleaned seed produced.

Table 1. Accession number 9024060 seed production from UCEPC

Year of Harvest	Amount of Cleaned Seed
1998	106.0 lb
1999	9.0 lb
2000	30.5 lb
2001	21.92 lb
2003	4.80 lb
2007	47.0 lb
2008	36.5 lb
2009	90.5lb (un-cleaned)
2010	35 lb

CONCLUSION

Colorow Germplasm black chokecherry has been sent to other plant material centers and outside cooperators to further determine it's suitability in a variety of conservation settings. It has proven itself useful in urban landscaping, range and mined land reclamation, shelterbelts, windbreaks, and reducing and controlling soil erosion. It is a plant of cultural significance and valuable specie for wildlife and pollinators. This will be the final report for this study.

High Altitude Sweetgrass-Seed and Plant Increase

INTRODUCTION

Sweetgrass *Hierochloe odorata* is a native perennial grass with creeping rhizomes that grows in wet mountain meadows, bogs, and springs. Sweetgrass is an early flowering plant, found in mid-successional communities among other grasses and shrubs, usually occurring in wet valleys and along streams. Accession 9039770 was collected in 1977 from Independence Pass, Colorado, at an elevation of 12,095 feet.

OBJECTIVES

Develop techniques for the establishment and uses of this culturally significant plant. Observe growth habits and performance of the accession under managed conditions at Upper Colorado Environmental Plant Center (UCEPC). Increase vegetative material for distribution to other regions.

METHODS

Three of the remaining five seeds from the 1977 collection packet were germinated and placed in ½-gallon pots in 1996. In 1997, the rhizomes from the three pots were separated and placed into large flats to spread. The flats were hardened off in the lathhouse for six weeks before the study area was established. From 4" x 4" pieces of rooted sod produced in the greenhouse, a small 4' x 5' plot was established at the south end of the greenhouse in the UCEPC headquarters in July 1998. There has been no supplemental irrigation to the plot. Minimal weeding has been done, mainly to combat invasive species.

In 2002, the initial evaluation study of sweetgrass from regional collections began. Study number COPMC-F-0202-OT (2002-2005) was a coordinated evaluation of sweetgrass collections from five Plant Material Centers in the Northern Plains Region. Information obtained would be used to evaluate genetic viability and recommend potential areas of adaptation for local collections. Although the Colorado collection of sweetgrass listed in this study has a different accession number, UCEPC is certain that it is accession 9039770.

There was a request for sweetgrass plants by David Sanford, Southern Ute Indian Tribe, Department of Natural Resources, Agricultural Division, for a trial planting on the Pine River in the Southern Ute Reservation. This was a 4-H project to provide a local source of sweetgrass for ceremonial blessings. On April 21, 2003, fifteen sweetgrass plants that had been produced in 2002 were shipped out in cone-tainers to Mr. Sanford. They were well rooted and healthy.

Project COPMC-S-9601-OT

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In June of 2006, a sample of accession 9039770 was hand dug from the sweetgrass initial evaluation plot. The sprigs were separated; roots soaked and then packed in moist sphagnum moss for shipping. The sweetgrass was then sent to Vicki L. Bradley, Agronomy Curator, at the Western Regional Plant Introduction Station in Pullman, Washington. The accession was supplied for germplasm storage.

On May 12, 2009, several sprigs of the sweetgrass were hand dug and maintained in the greenhouse. The rhizomes from these plants were divided and planted into 2" x 10" tree pots for a new establishment in the UCEPC compound. This material will be used to reestablish a new plot and in further studies.

In 2010, UCEPC donated sweetgrass plants of accession 9039770 to several organizations throughout Colorado and Utah. The sweetgrass plants were used in unique native gardens for educational purposes and are described in the Results section below.

Due to the lack of seed production, the sweetgrass has not been used in an increase project. The plot has been maintained for requests of either rhizomes or potted plants.

RESULTS

The small 4' x 5' plot of accession 9039770 was tilled under in 2010. Invasives had taken over the small plot. In September, 2010, UCEPC staff transferred the 40 sweetgrass plants from the greenhouse into a new plot south of the initial evaluation study plot. The plants were placed 2 foot apart in four 20-foot rows. Irrigation was applied through the fall and the plot was pre-emerged to control invasives.

May 2010, several sweetgrass plants were delivered to Dr. Curtis E. Swift, Area Extension Agent Horticulture, in Grand Junction, Colorado. Mesa State College, United States Forest Service, Bureau of Land Management, Grand Junction, Colorado, and Colorado State University teamed up to develop an Ethnobotany Garden. This learning garden identifies and exhibits plants that were used by the Ute Indians when they lived in Western Colorado.

April 2010, twenty-nine sweetgrass plants were donated to the Uintah River High School in Fort Duchesne, Utah. The plants were included in a native/cultural learning garden for the students.

June, 2008, UCEPC staff hand dug sweetgrass sprigs for Debbie Clairmont, Soil Conservationist, Brighton, Colorado. Debbie is a Native American and wanted to produce the sweetgrass at her home.

The sweetgrass plots from study COPMC-F-0202-OT, still remain at UCEPC. Information for that study can be found in UCEPC's Annual Technical reports 2003-2008. Experimental work was conducted on the sweetgrass plots to see how they might work for lawn material. That information can be found in the 2009 report.

Project COPMC-S-9601-OT

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On July 22, 2003, Mr. Sanford wrote UCEPC that he had transplanted the sweetgrass from the cone-tainers into an old Crystalix tub. The plants were doing well and had produced two seedheads. He shipped UCEPC the grass with seed to be identified. Mr. Sanford was unfamiliar with the sweetgrass and believed it could possibly be a fescue that had gone to seed in the tub. He indicated he was having problems identifying the sweetgrass. The sample was never tested to determine if it was sweetgrass.

CONCLUSION

There has been no further information received about performance of the sweetgrass that was sent to Southern Ute reservation.

UCEPC will follow up on the materials sent to Uintah River High School and the Ethnobotany Garden in Grand Junction.

Sweetgrass accession 9039770 has been easily propagated by dividing rhizomes and grows rapidly without much supplemental water. The potential for the rhizomes to be moderately invasive might make this hearty accession a good species for wetlands and riparian restoration or erosion control on steep-mountain slopes.

Along with the above, the cultural importance of the sweetgrass to the Native Americans and susceptibility to overgrazing give us all the more reason to continue evaluating establishment methods and develop propagation protocols for seed production and restoration.

Some good illustrations or pictures of sweetgrass and its rhizomes would be helpful in identifying the plant when people are working with it for the first time.

This will be the final report on this project.

Bigelow's Groundsel

INTRODUCTION

Native high elevation species that are available for revegetation are relatively few in number and seed availability is inconsistent. Additionally, commercial seed availability of high elevation forbs is very limited. One forb that responds well to disturbance at high elevations, has the potential to produce good seed quantities and grows large enough to be harvested with conventional equipment is *Senecio bigelovii*, nodding or Bigelow's senecio. High elevation parks and meadows in the southern Rocky Mountains with ground disturbance promote the occurrence of this species. Bigelow's senecio is a fibrous rooted perennial with erect stems 30-80 cm tall. Stems and leaves have tufts of loose, cobwebby hairs, especially higher up on the stem. Leaves are alternate and become gradually reduced upward, with those near the base of the stem having a petiole. The leaves are 7-20 cm long and 0.6-0.5 cm wide, with oblong to elliptic blades and finely serrated to entire margins. The terminal, raceme-like inflorescence consists of one to eight nodding heads consisting only of yellow disk flowers. Fruits are glabrous achenes (Cronquist 1994; Dorn 1992; Harrington 1954; Welsh et al. 1993).

In 1998, revegetation activities for the Summitville Superfund Site in South-Central Colorado started with seed collection, and a cooperative agreement between Colorado State University (CSU) and Upper Colorado Environmental Plant Center (UCEPC) was signed that identified the target species and quantities needed for site revegetation. Bigelow's senecio was one of five species collected by CSU crews for establishment at UCEPC. After the completion of the Summitville Project, the senecio field remained in production at UCEPC. However, because of other priorities, the senecio field was maintained but not irrigated, fertilized, or harvested; yet maintained its presence. Because of the low maintenance required for the product and its potential value in high elevation revegetation projects, efforts to produce seed were again initiated in 2009.

OBJECTIVE

Develop, test, and release a commercial source of a native forb for very high altitude revegetation and reclamation.

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Report by: Steve Parr

METHODS

Seed collected by CSU was provided to UCEPC in 1999. Weed barrier was used for the production field of 2.5 acres, and seeding was done by hand October 28, 1999. Intra-seeding was done on August 11 and September 13 and 14, 2000, to improve the stand to over 90%. The stand has since declined because of lack of attention, and in 2009, weed control was conducted between the rows of weed barrier and within the blank spots. Some consolidation of the field was done, and fewer rows and a smaller field resulted.

Seed germination trials were conducted in the greenhouse and seed that had been produced in 2001 and 2002 did not germinate, so no intra-seeding was done.

2010

In order to increase the stand within rows of weed barrier fabric without increasing the amount of attention necessary to contribute to the field, approximately seven rows of weed barrier fabric and resulting senecio plants were removed in June of 2010. This was done to improve efficiency of maintaining the field weed free while still harvesting adequate seed for further testing and development. Every other row was removed in order to use field cultivation between the weed barrier rows which reduced labor considerably.

RESULTS

In 2009, there were 6.5 pounds of seed hand harvested from the original field. This seed will be used to inner-seed the blank spots in the field and for testing on high elevation sites.

2010

On July 28, five pounds of seed were hand harvested. Between production from 2009 and 2010, there is adequate seed to begin off center testing.

CONCLUSION

Seed production of Bigelow's groundsel will continue in 2011 in an attempt to acquire adequate seed for testing and small plot increase. If cultural aspects and performance of this native forb are conducive to commercial production, UCEPC will work toward a release.

Cultural Techniques for the Establishment of Thurber's Fescue

INTRODUCTION

Commercial sources of native plant materials available for revegetation and reclamation uses at elevations above 10,500 feet are very limited. Five native grass species, slender wheatgrass, tufted hairgrass, blue wildrye, Idaho fescue, and big bluegrass are the only released sources for very high elevation revegetation and conservation uses. Sources of commercial forbs are even less abundant with Rocky Mountain penstemon being one of the very few species to occur above this elevation. One important grass species that is often dominant in open parks at elevations above 10,000 is Thurber's fescue. This species is a cool season, perennial, large, densely tufted bunchgrass. It grows up to 90 cm tall in Colorado, with narrow, involute leaf blades 10-20 cm long. Thurber's fescue has an extensive root system with a high percentage of a mycorrhizal association reported from one source. Rapid vegetative plant growth by tiller production has also been reported for Thurber's fescue. Additionally, the plants are considered to be long lived and useful for reseeding rangelands.

Because there are few native species available for revegetation of high elevation sites in the central and southern Rocky Mountains and because of the desirable characteristics of the plant for long-term range seedings, Upper Colorado Environmental Plant Center (UCEPC) is investigating the potential of this species for a commercial release.

OBJECTIVE

To determine the cultural techniques and management practices necessary to develop a source of Thurber's fescue for commercial release.

METHODS

In July, 1998, Hal Pearce and Tom McClure of the White River National Forest, Meeker Field office approached UCEPC about producing a seed increase of Thurber's fescue because of its apparent tolerance to herbicide use and invasion by noxious weeds; particularly yellow toadflax. An agreement was drawn up where UCEPC would attempt to produce seed in a one-acre planting. The seeding was done by Hal Pearce of the U.S. Forest Service, and Rodney Dunham

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and Steve Parr of UCEPC on July 17, 2002, with accession number 9024002 collected in the Hiner Springs area on the Buford-New Castle Road, Rio Blanco County, Colorado.

Although the seeding was irrigated, it did not establish well and the project was discontinued after one year. In 2006, plugs of the same seed source were produced in the greenhouse and transplanted to field 20 into a plot approximately 10 by 20 feet. This plot is presently producing seed.

On October 3, 2007, a Field Evaluation Planting was installed above old Snowmass, Colorado, that included Thurber's fescue. The site should support entry from slope, aspect, precipitation and elevational factors, but the accession has performed poorly there. The soils are derived from Mancos shale, and may not be conducive to Thurber's establishment. A seed germination test was done at the UCEPC greenhouse prior to the planting and the seed lot used had about 32% germination. Other products, both released and experimental, have done well on the site.

RESULTS

The following table represents the seed yield from this plot.

Thurber's Fescue Seed Production Yr	Yield
2007	190 g
2008	1.95 lb
2009	390 g
2010	272 g

CONCLUSION

The source has not done well in its initial attempt at increase at UCEPC, nor has it performed as well as expected at the Snowmass Field Evaluation Planting, but we will continue to develop a source at UCEPC. The seed produced in the small plot will serve as the source seed for an increase effort. This seed has not been tested, but viability should be adequate enough to install a second planting. Efforts will be made to contact USFS White River Field Office for interest in cooperating on a new seed increase planting, even at a small scale.

Fringed Sage Seed Increase

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) identified a number of native shrub species with different conservation attributes such as wildlife habitat improvement, windbreaks, restoration, landscaping, riparian enhancement, etc., since its inception in 1975. Fringed sage *Artemisia frigida* is a native half shrub recognized by UCEPC with potential for conservation practices and possibly a release. Fringed sage is a spreading shrublet 4 to 15 inches tall, pleasantly fragrant, with whitish or grayish tomentose stems which rise from a tough, woody crown. The leaves are also tomentose and abundant, clustered toward the base, and scattered along the stem. The lower leaves are petiolate and upper leaves become sessile. The inflorescence is a panicle with small, greenish flower heads. Fringed sage flowers from July to August. Fringed sage grows in the open high plains, prairies and semi-disturbed sites. It has been found growing on some very dry, harsh range sites.

OBJECTIVE

Determine capabilities for direct seeding; evaluate establishment success, seed production, and potential benefit in range and disturbed sited revegetation.

METHODS

Fringed sage *Artemisia frigida*, accession 9021474, was collected from the Piceance Creek area of Rio Blanco County, Colorado. In 1994, a 0.01-acre field was planted with tublings that had been previously established in the UCEPC greenhouse. For additional information on that project see Dr. Gary Noller's project report 08S222 for 1995. The fringed sage field produced 1.80 pounds of cleaned seed that year. Total seed produced in the next six years was 26.80 pounds cleaned seed. The small field was plowed in 2001.

July 7, 2005, another 0.01-acre field of fringed sage was established. Seed previously harvested from UCEPC was used to produce tublings in the greenhouse. The fringed sage plugs were transferred to Field 20 and seed was harvested in the fall of 2006.

On November 6, 2006, fringed sage, accession 9021474, was entered into study number COPMC-T-0702-UR. This study was to determine the success of direct seeding some better performing shrubs under field conditions at UCEPC. Sixteen native shrubs were implemented into the study. The fringed sage seed that was used in this study had been previously harvested at UCEPC. For a complete list of species entered in the study, sources, plot plan, and results, see project report COPMC-T-0702-UR, 2007 and 2008.

Project COPMC-T-0505-WL

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RESULTS

The new 0.01-acre plot in Field 20 produced seed for the 2007 and 2008 growing seasons. Table 1 below shows those results.

In spring of 2009, the 0.01-acre fringed sage plot was weeded by hand to control broadleaf invasives. Seed was harvested by hand in September and the pre-emergent, Pendulum, was applied in October with a Scott's fertilizer spreader. This plot receives no supplemental irrigation.

Table 1. Fringed sage harvested seed amounts.

Forb	Scientific Name	Accession	Year	Acres	Harvest Date	Clean Amt
Fringed sage	<i>Artemisia frigida</i>	9021471	2006	0.01	09/26/06	2.45 lb
			2007	0.01	09/27/07	539 g
			2008	0.01	09/16/08	277 g
			2009	0.01	09/22/09	1.8 lb
			2010	0.01	09/18/10	205 g

CONCLUSION

Fringed sage accession 9021471 has continually been one of the better performers in many plantings both on and off center. Off center test sites where the shrub has performed well include Energy Fuels Coal Mine, Colowyo Coal Company, H and G Coal Mine, all in northwest Colorado, and Coyote Draw Field Planting in Utah, and Pinedale Field Evaluations in Wyoming. The shrub can be easily propagated by seed or division of rootstock. The small bush provides valuable cover and serves as a major food source for the sage grouse. Fringed sage has many culturally significant purposes. UCEPC staff will continue to monitor, harvest, evaluate, and develop fringed sage to complete a release for use by the general public.

Direct Seeding of Native Shrubs

INTRODUCTION

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

OBJECTIVE

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

EXPERIMENTAL DESIGN

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

METHODS and MATERIALS

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

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

Table 1. Sixteen Native Shrub Species Direct Seeded at UCEPC *

Common Name	Scientific Name	Accession No.	Seed Source	Year Harvested
Antelope Bitterbrush	<i>Purshia tridentata</i>	9038521	UCEPC 95-F21	1995
Apache Plume	<i>Fallugia paradoxa</i>	9024141	UCEPC 83-EPC	1983
Basin Big Sagebrush	<i>Artemisia tridentata</i> spp. tridentata		Tom Brown Site-00	2000
Black Chokecherry	<i>Prunus virginiana</i> var. melanocarpa	9024060	UCEPC 03-F18	2003
Cliff Fendlerbush	<i>Fendlera rupicola</i>	9024143	UCEPC 04-EPC	2004
Fringed Sage	<i>Artemisia frigida</i>	9021471	UCEPC	2006

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

*Planting Date: November 6, 2006

Table 2. Plot Plan for Direct Seeded Shrub Trial

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

* Chokecherry seed with pulp or flesh

RESULTS

2007

On May 23, 2007, the plots were checked for germination. Some plots had some shrubs that had germinated at this time with about two to three true leaves and about one to two inches tall. The grass hay used for mulching provided protection against frost heaving of clay soil, however, this

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also created a weed problem since hay had viable grass seed and germinated along with the shrubs. Plots were hand weeded at this time to control broadleaved weeds and an application of the herbicide "SELECT" which controls grassy weeds was also applied at the rate of one ounce per three gallons of water plus 1.5 ounces of oil.

On July 19, 2007, the trial was evaluated for plant stand. The herbicide "SELECT" stopped the growth of grassy weeds but did not completely kill them. Plots were hand weeded for the second time. The results are presented in Table 3.

Table 3. Percent Plant Stand for 16 shrub species direct seeded at UCEPC *

Common Name	Scientific Name	Percent Plant Stand
Antelope Bitterbrush	<i>Purshia tridentata</i>	96.6 a **
Utah Serviceberry	<i>Amelanchier utahensis</i>	91.7 a
Fringed Sage	<i>Artemisia frigida</i>	90.0 a
Squaw Apple	<i>Peraphyllum ramosissimum</i>	71.6 ab
Cliff Fendlerbush	<i>Fendlera rupicola</i>	55.0 bc
Golden Currant	<i>Ribes aureum</i>	43.3 cd
Silver Sage	<i>Artemisia cana</i>	41.7 cd
Silver Buffaloberry	<i>Shepherdia argentea</i>	21.7 de
Black Chokecherry	<i>Prunus virginiana var. melanocarpa</i>	11.7 e
Basin Big Sagebrush	<i>Artemisia tridentata spp. tridentata</i>	6.7 e
Red Barberry	<i>Berberis haematocarpa</i>	5 e
Smith's Buckthorn	<i>Rhamnus smithii</i>	1.7 e
Apache Plume	<i>Fallugia paradoxa</i>	0 e
Littleleaf Mock Orange	<i>Philadelphus microphyllus</i>	0 e
Rockspirea	<i>Holodiscus dumosus</i>	0 e
Wyoming Big Sagebrush	<i>Artemisia tridentata spp. wyomingensis</i>	0 e

* Planting Date: November 6, 2006

** Means followed by the same letters are not significantly different as determined by least significant difference test at $P < 0.05$.

2008

The plots were evaluated for percent plant stand and plant height in July 30, 2008. The majority of species that performed well for the first growing season are still growing well for the second growing season. The entries that did not germinate in the first growing season remained the same with no additional plants. Table 4 presents the results for the 2008 growing season.

Project COPMC-T-0702-UR**Report-2010****By: Steve Parr****Table 4. Percent Plant Stand and Plant Height for 16 shrub species direct seeded at Upper Colorado Environmental Plant Center*.**

Common Name	Scientific Name	Percent Plant Stand	Plant Height (cm)
Antelope Bitterbrush	<i>Purshia tridentata</i>	93.3 a	12.2
Utah Serviceberry	<i>Amelanchier utahensis</i>	93.3 a	10.1
Fringed Sage	<i>Artemisia frigida</i>	93.3 a	70.9
Squaw Apple	<i>Peraphyllum ramosissimum</i>	56.7 b	24.5
Silver Sage	<i>Artemisia cana</i>	53.3 b	86.8
Golden Currant	<i>Ribes aureum</i>	41.7 b	32.0
Cliff Fendlerbush	<i>Fendlera rupicola</i>	8.3 c	11.9
Silver Buffaloberry	<i>Shepherdia argentea</i>	4.3 c	7.6
Black Chokecherry	<i>Prunus virginiana var. melanocarpa</i>	3.7 c	18.0
Basin Big Sagebrush	<i>Artemisia tridentata spp. tridentata</i>	3.7 c	86.7
Smith's Buckthorn	<i>Rhamnus smithii</i>	1.7 c	3.1
Red Barberry	<i>Berberis haematocarpa</i>	0 c	0
Apache Plume	<i>Fallugia paradoxa</i>	0 c	0
Littleleaf Mock Orange	<i>Philadelphus microphyllus</i>	0 c	0
Rockspirea	<i>Holodiscus dumosus</i>	0 c	0
Wyoming Big Sagebrush	<i>Artemisia tridentata spp. wyomingensis</i>	0 c	0

* Planting Date: November 6, 2006

** Means followed by the same letters are not significantly different as determined by least significant difference test at P<0.05.

2009

The plots were not evaluated this year.

2010

Results of the evaluation conducted on September 27, 2010, indicated that most shrubs that had been prevalent from the first year were still well represented four years after planting. All shrubs that established and have persisted in Replication I are also present in Replications II and III. Five species are still represented in Replication I, while Replications II and III are represented by eight and nine species, respectively. Although the project was installed to determine the relative success of direct seeding 16 native shrubs, it is also important to determine whether these same native shrubs can persist under natural conditions. No supplemental water has been supplied to this project after the 2008 growing season. Interestingly, Wyoming big sage, which did not show up in the 2007 or 2008 evaluations, did show up in one plot (Replication III) in 2010. Again, the project was not evaluated in 2009. From the height of the plants, it appears that the Wyoming sage germinated in 2009 and put on a full year's growth. Also interesting was the complete loss of two of the better represented species from the 2007 evaluation. Cliff fendlerbush had a 55.0 percent plant stand averaged over three replications in 2007. It did not show up in 2010. Similarly, silver buffaloberry had a 21.7 percent plant stand and it, too, did not persist until 2010. No plants were found in the 2010 evaluation. Poorly represented Smith's buckthorn and red barberry were not present in any plot in 2010 either.

Project COPMC-T-0702-UR

Report-2010

By: Steve Parr

The three tables below represent the evaluations of the three Replications evaluated on September 27, 2010.

REPLICATION I				
Common Name	Accession No.	Number of Live Plants	Height	Vigor
Antelope Bitterbrush	9038521	9	40 cm	2
Apache Plume	9024141	0		
Basin Big Sagebrush		2	155 cm	1
Black Chokecherry	9024060	6	95 cm	3
Cliff Fendlerbush	9024143	0		
Fringed Sage	9021471	40	80 cm	1
Golden Currant	9030913	0		
Littleleaf Mock Orange	9024096	0		
Red Barberry	9024220	0		
Rockspirea	9024154	0		
Silver Buffaloberry	9008027	0		
Silver Sage	9070850	25	115 cm	1
Smith's Buckthorn	9024308	0		
Squaw Apple	9007948	0		
Utah Serviceberry	9021438	0		
Wyoming Big Sagebrush		0		

REPLICATION II				
Common Name	Accession No.	Number of Live Plants	Height	Vigor
Antelope Bitterbrush	9038521	20	44 cm	2
Apache Plume	9024141	0		
Basin Big Sagebrush		3	170 cm	1
Black Chokecherry	9024060	4	77 cm	3
Cliff Fendlerbush	9024143	0		
Fringed Sage	9021471	50	85 cm	1
Golden Currant	9030913	3	133 cm	2
Littleleaf Mock Orange	9024096	0		
Red Barberry	9024220	0		
Rockspirea	9024154	0		
Silver Buffaloberry	9008027	0		
Silver Sage	9070850	25	160 cm	1
Smith's Buckthorn	9024308	0		
Squaw Apple	9007948	23	93 cm	1
Utah Serviceberry	9021438	25	60 cm	3
Wyoming Big Sagebrush		0		

Project COPMC-T-0702-UR

Report-2010

By: Steve Parr

REPLICATION III				
Common Name	Accession No.	Number of Live Plants	Height	Vigor
Antelope Bitterbrush	9038521	23	50 cm	2
Apache Plume	9024141	0		
Basin Big Sagebrush		1	150 cm	1
Black Chokecherry	9024060	1	46 cm	4
Cliff Fendlerbush	9024143	0		
Fringed Sage	9021471	50	83 cm	1
Golden Currant	9030913	14	175 cm	1
Littleleaf Mock Orange	9024096	0		
Red Barberry	9024220	0		
Rockspirea	9024154	0		
Silver Buffaloberry	9008027	0		
Silver Sage	9070850	50	168 cm	1
Smith's Buckthorn	9024308	0		
Squaw Apple	9007948	11	86 cm	1
Utah Serviceberry	9021438	21	53 cm	2
Wyoming Big Sagebrush		23	12 cm	2

CONCLUSION

Direct seeding of the native shrubs in this project has shown success with several species. In all, 10 out of 16 species were represented by 10 percent stand or greater averaged over three replications the year after planting. Four species did not germinate or establish at any time during the first four years of this project. However, several species are persisting quite well. Antelope bitterbrush, basin big sagebrush, black chokecherry, fringed sage, and silver sage were found in each plot over three replications, while golden currant, squaw apple, and Utah serviceberry were found in two of three plots, but at high numbers (34 squaw apple plants, 46 Utah serviceberry plants and 17 golden currant plants) four years after planting.

Perhaps the most surprising finding in this study is the late occurrence of Wyoming big sagebrush. The species did not show up in any plot the spring after planting, nor did it occur in any plot the following year during the July 30, 2008, evaluation. The evaluation in 2010 found one plot very well represented with 23 plants with a height of 12 centimeters. This would indicate the seed germinated the year before in the spring of 2009 or the fall of 2008. At any rate, in this project, Wyoming big sagebrush exhibited a great deal of seed dormancy. Further investigations on the species and the collection will be conducted as a result of this project.

Space Planting of Salina Wildrye (9043501) *Leymus salinus*

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.

In 1993, vegetative samples for the accession 9043501 were sent to Utah State University for species confirmation. It was determined that accession 9043501 represents *Leymus salinus*.

Accession 9043501 has been under study at UCEPC for the past 20 years. It performed well in initial evaluations as well as in advanced evaluations, however, seed production in seed increase fields has been poor. Several studies have been conducted at UCEPC to enhance seed production but none have proven to solve the problem in order to release the accession. This study is another attempt to identify cultural practices that improve seed production of accession 9043501.

OBJECTIVE

To determine the effects of plant spacing or density on seed yield of salina wildrye accession number 9043501

METHODS

2008

On May 22, 2008, seed of accession 9043501 was started in plugs in the UCEPC greenhouse to later be transplanted in the space planting. Seven density treatments were planted on September 15-16, 2008. Single plots for the study consist of two rows on three-foot centers by 20 feet long. Table 1 presents the densities for the study.

Table1. Space Planting of Salina Wildrye (9043501)

Treatment(density)	Distance between Rows in feet	Distance within Rows in feet	Total Number of Plants/plot¹	Plants/Acre
Density-1	3	1	40	14,520
Density-2	3	2	20	7,260
Density-3	3	3	14	5,082
Density-4	3	4	12	4,356
Density-5	3	5	10	3,630
Density-6	3	6	8	2,904
Density-7(Control)	3	30 PLS/foot*	1200	435,600

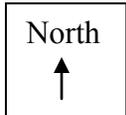
1. Plots are 6 x 20 feet with two rows/plot at three-foot centers

*Traditional way of seeding native seed for seed production; 30 Pure Live Seed/foot of row

**Project COPMC-T-0802-RA
Report-2010
By: Terri Blanke and Heather Plumb**

Following is the plot plan for the study:

Block-IV	1	7	2	5	4	6	3
Block -III	2	1	7	4	6	3	5
Block-II	2	3	4	6	5	1	7
Block I	4	5	2	7	1	3	6



2009

The plot was heavily infested with purple mustard weed at the beginning of May 2009. The plot was brush hogged, sprayed with herbicide and hand weeded until the purple mustard was under control. An evaluation in July was conducted on how the plugs were establishing. More plugs for the plot were started in the greenhouse in September of 2009.

RESULTS

2009

On May 15, 2009, UCEPC staff observed that the weed, purple mustard, had taken over the salina wildrye plot. Although the plot seemed a failure, the plugs of salina were still alive. On May 18, 2009, the plot was sprayed with 4 oz to the acre of Pursuit. Within a few days the purple mustard showed signs of herbicide damage. It was then decided to use a brush hog on the plot to cut down the purple mustard to give the salina plugs sunlight. On May 28, 2009, a sprinkler was placed in the plot for irrigation.

July 31, 2009, the plot was evaluated to see how the plot was after spraying and mowing. Some purple mustard remained, but was hand weeded and thrown out of the plot. Some of the treatments were damaged from the tractor, so no official evaluation was conducted. Instead, a plant count was taken to determine how many plugs needed to be replaced. A total of 72 plugs were necessary to replace those lost during establishment. On September 2, 2009, one hundred plugs were started in the UCEPC greenhouse.

2010

In early March 2010, Terri Blanke and Johnnie Barton planted and transplanted several trays of salina wildrye in the greenhouse. On May 10, 2011, Terri, Heather Plumb and seasonal help transplanted the plugs of salina from the greenhouse into the space planting plot. Approximately

Project COPMC-T-0802-RA
Report-2010
By: Terri Blanke and Heather Plumb

79 plugs were used to replace materials lost because of tractor tire and brush hog damage from the prior year.

The field was watered and weeded as needed; no evaluation was conducted this year because of the new transplants being planted. However, seed was hand harvested from the plot on July 20, 2010. The harvest was conducted to get additional foundation seed from accession 9043501. The seed was mixed with the foundation seed from Field 4.

Currently in the greenhouse we have 21 plugs of salina wildrye available for transplanting if needed for the 2011 growing season.

CONCLUSION

It was observed during the harvest this year that seed heads looked healthy and were abundant in the plot. The first real seed yield evaluation will be conducted during the 2011 growing season since an evaluation could not be conducted during the 2010 growing season. The weeds will be monitored on the plot to help prevent an infestation and prevent further plot damage.

Project COPMC-T-0803-RI

Report-2010

By: Terri Blanke

Native Shrub Propagation for Rawlins, Wyoming BLM

INTRODUCTION

Upper Colorado Environmental Plant Center (UCEPC) has been in partnership with the Rawlins, Wyoming, Bureau of Land Management (BLM) for many years. Through this partnership, UCEPC and Rawlins, BLM, have met common objectives of helping to bring conservation, development and wise use to the land, water, and related resources. In September 2007, a one year informal purchase agreement was drafted between UCEPC and Rawlins, BLM. This agreement was for UCEPC to produce 500 containerized riparian shrubs for wildlife habitat restoration and riparian enhancement projects. The shrubs were to be ready for delivery in the fall of 2008. This report covers the activities by UCEPC for the collection, cleaning, and the propagation of native riparian shrubs.

OBJECTIVE

Produce native riparian shrubs for restoration work, demonstration field planting trials, cutthroat trout habitat enhancement, and propagation protocol development.

ACCOMPLISHMENTS

Four materials were selected by Rawlins, BLM, for propagation: dogwood *Cornus sericea*, water birch *Betula occidentalis*, golden currant *Ribes aureum*, and bearberry honeysuckle *Lonicera involucrata*. Table 1 below lists contract specie, targeted amounts, and delivered quantities.

Table 1.

Materials picked up in 2008 & 2009			
Specie	Accession	Targeted Qty	Delivered Qty
RI AU	9030913	100	103
LO IN	CO Collection	100	180
CO SE	9070966	100	133
BE OC	WY Collection	200	125
Total		500	541

This agreement is complete.

Project COPMC-T-0803-RI

Report-2009

By: Terri Blanke

In February of 2010, UCEPC was contacted by Shawn Anderson, Fisheries Biologist, with interest in riparian materials that would be available for a spring delivery. On May 13, 2010, Cody Waldruff, Rawlins BLM seasonal worker, picked up *Shepherdia argentea* silver buffaloberry, *Ribes aureum* golden current, and *Lonicera involucrata* bearberry honeysuckle for Patrick Lionberger, Fisheries Biologist and Andy Warren, Rawlins BLM. The native material was for riparian restoration projects in Wyoming. Table 2 lists the species and quantity delivered.

Table 2.

UCEPC Distribution and Delivery Record # COPMC-10-004				
13-May-10				
Specie	Accession	Qty	U/M	Delivery to
RI AU	9030913	25	Plants	P. Lionberger
SH AR	9008027	30	Plants	A. Warren
LO IN	RBC Clctn	5	Plants	A. Warren
RI AU	9030913	2	Plants	A. Warren

In March of 2010, Andy Warren expressed his interest in UCEPC propagating *Cornus sericea*, redosier dogwood for Rawlins BLM to be used in a river restoration project. UCEPC dug, rooted and continues to maintain the dogwood. They are available for delivery upon request by Rawlins BLM.

CONCLUSION

UCEPC looks forward to the continued production of native materials for Rawlins, BLM. These projects enable UCEPC to continue the technology development studies needed to propagate and provide a continuous supply of native plant materials to the public.

Project: COPMC-T-0904-WL

Report- 2010

By: Heather Plumb

Germination, Establishment, and Production of Plants for Sage Grouse

INTRODUCTION

Conserving what remains of Greater Sage Grouse populations has been and still remains a major challenge for the 11 Western states. Greater sage-grouse are found in California, Oregon, Washington, Idaho, Montana, Nevada, Utah, Colorado, North Dakota, South Dakota, Wyoming, and the Canadian provinces of Alberta and Saskatchewan. They currently occupy approximately 56 percent of their historical range. Sage grouse inhabit a complex sagebrush ecosystem, which is home to a multitude of plant species. During the growing season of 2008, in an effort to aid in this conservation act, Upper Colorado Environmental Plant Center (UCEPC) began collecting known preferred sage grouse plant materials.

OBJECTIVE

To determine commercial production potential of important components of sage-grouse habitat.

METHODS

In the growing season of 2008, UCEPC began collecting known preferred sage-grouse plant materials. Plants collected were based off of observed sage grouse diet habits and shelter needs. Materials that were concentrated on by the UCEPC collection team were; blue flax *Linum lewisii*, false dandelion *Agoseris glauca*, sego lily *Calochortus nuttallii*, sulfur buckwheat *Eriogonum umbellatum*, wild onion *Allium ascalonicum*, bluebunch wheatgrass *Pseudoroegneria spicata*, Sandberg bluegrass *Poa secunda* and basin wildrye *Leymus cinereus*.

In September 2008, a germination test was performed on all the collected material by UCEPC staff to be used in the sage grouse study. The germination test results for all materials were excellent. In July 2009, UCEPC staff made the final decisions on what plant materials were going to be used in the small scale plot planting. Staff decided to use shrubs, grasses, and forbs; big sagebrush, silver sagebrush, basin wildrye, bluebunch wheatgrass, Sandberg bluegrass, Utah sweetvetch Lewis flax, sulfur buckwheat, and wild onion.

During the first week of August 2009, the plot was measured out and sprayed with Roundup to kill any living weeds around the plot. On August 13, 2009, the 15 by 54 foot plot was planted with the nine plant materials. Each material had two rows that were five feet long and three feet wide. Irrigation was applied directly after planting to help with germination. The grasses were the first observed materials to germinate followed by a few of the forbs.

Project: COPMC-T-0904-WL

Report- 2010

By: Heather Plumb

RESULTS

2009

On October 22, 2009, Terri Blanke and Heather Plumb evaluated the plot, measured and took pictures of the materials. All grasses had established as well as the sweetvetch and flax. The other four plant materials had no plants visible during the fall evaluation. The sages prior to planting were known species that would not germinate until the following year so their lack of presence was expected.

2010

In late August 2009, a cold stratification experiment for sego lilies was started. The goal of the experiment was to have natural cold stratification to help break seed dormancy of the sego lilies. A soil mixture of Sunshine Mix #4 and collected Maybell sand was blended 50:50, rocks were layered evenly in the bottom and middle of a pot. The soil mixture was placed over the rocks. Fourteen seeds were then randomly placed in the large pot and lightly covered with the soil mixture. The pot was watered and set out in the Lathe House floor to naturally cold stratify during the winter months. On May 20, 2010, the Lathe House was cleaned and twelve sego lilies had germinated as a result of the cold stratification process.

May 21, 2010, five Lewis flax, two sulphur buckwheat, and the twelve sego lilies were transplanted into the plot to help improve percent stand. The Lewis flax and sulphur buckwheat were grown in the greenhouse in tubes.

On July 20, 2010, Terri Blanke and Heather Plumb evaluated and took photographs of the plot. Plants were measured for their height and were evaluated on seed production, percent stand and vigor. All materials with the exception of the big sagebrush had germinated during the 2010 growing season. Evaluation data can be seen in Table 1. At the time of the July evaluation the wild onion had already gone dormant, but had put top growth on during the month of May. No evaluation was done in May on the onion.

Table 1. July 20, 2010, evaluation data for sage-grouse plot.

Species	Height (cm)	Seed Production	% Stand	Vigor
Basin Wildrye (Yellow Creek Piceance)	52	5	87	3
Big Sagebrush (Cedar Springs)	0	5	0	5
Silver Sagebrush (Cedar Springs)	38	5	2	3
Bluebunch wheatgrass (Cnty Rd 20 Piceance)	88	2	100	1
Sandberg's (Cnty Rd 73)	44	2	95	3
Sweetvetch (Pinto Gulch Piceance)	30	4	80	3
Flax (Piceance Cnty Rd 5)	22	5	5	4
Sulfur buckwheat (Pinto Gulch Piceance)	6	5	70	3
Wild onion (Little Snake River W Y)	0	5	0	5

1. Plant stand: Visual estimate per plot: Two complete rows = 100 percent
2. Plant vigor and Seed Production: Visual estimate per plot:
1 = Excellent; 2 = Good, 3 = Fair ; 4 = Poor; 5 = None in appearance

Project: COPMC-T-0904-WL

Report- 2010

By: Heather Plumb

CONCLUSION

The 2010 growing season was the last year of evaluations for the Piceance Basin source sage-grouse materials. A final report and propagation protocols were written for the respective materials. Protocols for the materials can be found on the Native Plants Network. This report is the final report for this project.

A new project will be planted in the spring of 2011. The new project will be a seed increase plot for the Utah sweetvetch, Lewis flax, sego lily, wild onion, and sulphur buckwheat. The new project will have two rows, 25 feet long of each material.

Other Reports

BRYCE CANYON NATIONAL PARK

FY2010 Annual Report Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER MEEKER, COLORADO

INTRODUCTION – Upper Colorado Environmental Plant Center (UCEPC) signed Interagency Agreement 1211-08-010 with Bryce Canyon National Park (BCNP), USDA Natural Resources Conservation Service, Colorado, and NPS Denver Service Center, in July 2008. The agreement called for the establishment of a 0.5 acre field of nodding brome grass *Bromus anomalus* with continued production through September 30 of 2011. The seed source for the project is material previously produced for BCNP by UCEPC.

ACCOMPLISHMENTS – In August of 2008, a 0.5 acre field of *Bromus anomalus* was hand planted. The summer planting allowed for good establishment in the spring of 2009 and the field produced 25 pounds bulk seed. After July's harvest, five rows in the field received a chemical treatment of Metsulfuron (Escort) to help reduce competition from prostrate pigweed. The Escort treatment negatively affected the bromes' vigor/survival, with 60-90% mortality. UCEPC planted six additional rows of nodding brome in June of 2010 to keep the field at 0.5 acre. On August 5, 2010, the field was harvested. Production was very good for the field's second year of growth and considering the loss of production from the five chemically treated rows. The nodding brome field produced 87 pounds of bulk seed. The seed was sent to the Wyoming Seed Laboratory for analysis and those results are listed below. It was noted that the five chemical damaged rows appear to be re-establishing. The field received a fertilizer application of 30-10-5-5, @ 17 gallons per acre. An herbicide treatment of Buctril, 2-4D and methylated seed oil was applied in the spring to help fight annual invasives. The final year of this contract will be 2011.

The table below lists the information for the *Bromus anomalus* 2008 – 2011 contract.

Bryce Canyon National Park Inventory 01/15/2011						
<i>Bromus anomalus</i>						
Species	Lot #	Field size	Bulk lb	PLS %	PLS lb	Test Date
NoBr	2004	NA	31	61.00% TZ	18.61	9/24/04
NoBr	2009	0.5	25	43.21%	10.80	2/8/10
NoBr	2010	0.5	87	29.57%	25.73	2/8/11

TECHNOLOGY DEVELOPMENT – There is the possibility that the application of the herbicide, Metsulfuron (Escort) had some effect on the seed's germination process. The test results from the Colorado Seed Laboratory were comparable to those discovered in the UCEPC greenhouse. Although a different herbicide treatment was applied in the field in 2010, germination percentages remain low. UCEPC will investigate alternative methods for the chemical treatment process. Possible application timing, application techniques, and experiments with different

materials will be necessary for understanding prostrate pigweed control in perennial native grasses. The prostrate pigweed was suppressed in the nodding brome field but with adverse effects.

UCEPC has on inventory the following materials for BCNP:

Bryce Canyon National Park Inventory 01/15/2011						
<i>Elymus trachycaulus / slender wheatgrass</i>						
Species	Lot #	Field size	Bulk lb	PLS %	PLS lb	Test Date
EITr	2004	2.0	7.7	58.00%	4.47	9/4/04
EITr	2005	2.0	9.0	61.81%	5.56	3/3/06
EITr	2006	2.0	267.0	86.26%	230.31	1/23/07
EITr	2007	2.0	499.0	74.16%	370.06	2/8/08
EITr	2008	2.0	137.5	61.18%	84.12	2/19/09

UCEPC continues to maintain the following BCNP collections:

Bryce Canyon National Park Miscellaneous Materials				
Inventory 16-Feb-11				
Symbol	Common name	year	Accession #	Amount
AR PA	Green leaf Manzanita	1990	9024854	291 g
		1992		84 g
		1993		665 g
		1997	9024854	97 g
PU TR	Bitterbrush	1990	9024865	81 g
BR AN	Nodding brome	1989	9024815	15 g
		1989	9024816	21 g
		1990	9024816	275 g
LE SA	Salina wildrye			34 g
EL TR	Slender Wheatgrass	1989	9024815	38 g
BE HA	Red barberry	1989	9024817	88 g
ST CO	Needle & Thread	2005	Park collection	10 g
		2005		238 g
CH NA	Rabbitbrush	2007		12 g
CH VI	Douglas rabbitbrush	2007		13 g
CH spp	Rabbitbrush specie	2008		4 g
AR NO	Black sagebrush	2007		17 g
EL EL	Squirreltail	2008		8 g
OR HY	Indian Ricegrass	2005		54 g
		2005	Park Collection	3 g
		2006	Park Collection	6 g
AR AR	Low sage	1990	9024879	170 g
		1991	9024879	65 g

CANYON de CHELLY NATIONAL MONUMENT

FY2010 Annual Summary Report

Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER MEEKER, COLORADO

INTRODUCTION – This report is in reference to sub agreement IA No-1211-08-003 (South Rim). In February of 2008, an interagency agreement was signed between the National Park Service, Canyon de Chelly National Monument (CDCNM) of the U. S. Department of Interior and Upper Colorado Environmental Plant Center (UCEPC). The agreement calls for UCEPC to produce seed of two native species, Indian ricegrass *Achnatherum hymenoides* and western wheatgrass *Pascopyrum smithii*, from seed stock collected at the monument. The agreement stipulates that UCEPC will produce 50 pounds of Pure-Live-Seed (PLS) of Indian ricegrass and 50 PLS pounds of western wheatgrass. This agreement remains in effect through December 31, 2012.

ACCOMPLISHMENTS – At the end of the 2009 growing season, 1.73 acres of Indian ricegrass and 1.27 acres of western wheatgrass had been established in fields. The 2010 growing season was the first year of harvest for both materials. The Indian ricegrass cleaned seed weight was 41 pounds and seed test results came back with an 8.43 percent pure live seed (PLS). The western wheatgrass produced 321 pounds of clean seed and its seed test results came back with 77.55 percent PLS. Seed lab test results can be provided from UCEPC upon request. Seed inventory for Canyon de Chelly is listed in Table 1 below.

Species Symbol	Harvest Year	Field Size	Amount Cleaned Seed (Bulk)	PLS %	Amount PLS on Hand	Date Tested
AcHy	2010	1.73 acres	41 lb	8.43	3 lb	12/9/2010
PaSm	2010	1.27 acres	321 lb	77.55	249 lb	1/10/2011

Table 1. Canyon de Chelly National Monument seed that is available from UCEPC.

TECHNOLOGY DEVELOPMENT – Cultural practices, harvest, and cleaning protocols were utilized to handle the Indian ricegrass and western wheatgrass seed.

The Indian ricegrass field still is not at optimal condition to produce high amounts of seed. Plants, while they are present, are small in stature and lack an overall healthy vigor. The additional planted rows from 2009 have not established very well. Some small plants have emerged, but the majority of the field is still sparse. The source of Indian ricegrass chosen for increase may be an inferior producer of both seed and plants. Seed from the 2010 growing season may be needed to re-seed the empty spaces in the field to see if production can be increased.

The western wheatgrass field has done extremely well for its first year of seed production. The direct seeded part of the field and the plugged portion of the field have both established well. With seed production being so high in its first year of production, the field should continue to produce well in the future.

CANYON de CHELLY NATIONAL MONUMENT

FY2010 Annual Summary Report Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT MATERIALS CENTER MEEKER, COLORADO

INTRODUCTION – This report is in reference to sub agreement IA No-F739008005/ Requisition Reference No. R7390100032.

In June of 2008, an interagency agreement was signed between the National Park Service, Canyon de Chelly National Monument (CDCNM) of the U. S. Department of Interior and the Natural Resources Conservation Service (NRCS). The agreement calls for Upper Colorado Environmental Plant Center (UCEPC) to produce seed of two native species; Indian ricegrass *Achnatherum hymenoides* and western wheatgrass *Pascopyrum smithii*, from native seed stock collected at the monument. The agreement stipulates that UCEPC will establish two acres of Indian ricegrass and one acre of western wheatgrass. This agreement will remain in effect until December 31, 2012.

ACCOMPLISHMENTS – At the end of the 2009 growing season 1.27 acres of western wheatgrass had been established through plugs and direct seeding. The Indian ricegrass had 1.73 acres established. The 2010 growing season was the first year of harvest for both materials. The Indian ricegrass cleaned seed weight was 41 pounds. The Indian ricegrass seed test results were 8.43 percent pure live seed (PLS). The western wheatgrass cleaned seed weight was 321 pounds and seed test results came back with a 77.55 percent PLS. Seed lab test results can be provided from UCEPC upon request. Seed inventory for Canyon de Chelly is listed in Table 1 below.

Species Symbol	Harvest Year	Field Size	Amount Cleaned Seed (Bulk)	PLS %	Amount PLS on Hand	Date Tested
AcHy	2010	1.73 acres	41 lbs	8.43	3 lbs	12/9/2010
PaSm	2010	1.27 acres	321 lbs	77.55	249 lbs	1/10/2011

Table 1. Seed available at UCEPC for Canyon de Chelly National Monument.

TECHNOLOGY DEVELOPMENT – Cultural practices, harvest, and cleaning protocols were utilized to handle the western wheatgrass and Indian ricegrass seed.

The western wheatgrass field has done extremely well for its first year of production. The direct seeded portion of the field and the plugged portion of the field have both established well. With seed production being so high in its first year of production, the field should continue to produce well in the future.

The Indian ricegrass field still has not established well. Plants, while they are present, are small in stature and lack an overall healthy vigor. The additional 14 planted rows from 2009 have not established very well. Some small plants have emerged, but the majority of the field is still sparse. The source of Indian ricegrass chosen for increase may be an inferior producer of both seed and plants. Seed from the 2010 growing season may be needed to re-seed the empty spaces in the field to see if production can be increased.

DINOSAUR NATIONAL MONUMENT

FY2010 Annual Summary Report Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER MEEKER, COLORADO

INTRODUCTION - This report covers the activities conducted by Upper Colorado Environmental Plant Center (UCEPC) for the Dinosaur National Monument (Dinosaur) Plant Materials Agreement in 2009. The agreement involves collecting and increasing grass species native to Dinosaur. These grasses will be used for restoration and to prevent non-indigenous weedy plants from invading. In 2010, all fields produced seed; western wheatgrass, Indian ricegrass, basin wildrye and bluebunch wheatgrass. Additionally, one seed shipment was made of gram quantities of all species except western wheatgrass on October 5, 2010.

ACCOMPLISHMENTS - Seed fields were planted on November 5 and 6, 1997. A field of western wheatgrass (9092278) was planted in 2008. Table 1 lists the seed from Dinosaur stored at UCEPC. The following updates the seed fields through 2010.

1. Indian ricegrass - November 5, 1997 - planted 0.24 acre at rate of about 30 seeds per foot of row - total seed lot (1.42 lb) used. Harvested July 8, 2010, produced 22 pounds of clean seed.
2. Bluebunch wheatgrass - November 5, 1997 – planted 0.24 acre at rate of about 30 seeds per foot of row. Harvested July 12, 2010, produced 6 pounds of bluebunch wheatgrass seed.
3. Western wheatgrass - New field, 0.3 acre, planted September 8, 2008, with a seed source collected from Irish Canyon. Harvested 145 pounds of seed off of 1.3 acre-field shared with BLM Colorado.
4. Basin wildrye - November 6, 1997 - planted at rate of about 30 seeds per foot of row. Harvested July 28, 2010, produced 45.5 pounds of clean seed.
5. Gram quantities of seed of bluebunch, Indian ricegrass, Alkali sacaton, and basin wildrye were supplied to Cindy Heyd of Dinosaur National Monument in October of 2010.

TECHNOLOGY DEVELOPMENT – Seeding rates, irrigation, fertilization, harvest and cleaning records can be provided upon request. Below, Table 1 identifies pure live seed inventory by species and seed lot.

Table 1. A listing of seed from Dinosaur by species and year of harvest stored at UCEPC.

SPECIES	YEAR	BULK	PLS
Basin wildrye	1997 (park collected)	10.69 lb	8.60 lb
	1999 harvest	29.00 lb	25.70 lb
	2000 "	5.50 lb	4.00 lb
	2001 "	10.80 lb	7.40 lb
	2002 "	25.00 lb	17.60 lb
	2003 "	52.00 lb	42.60 lb
	2004 "	43.00 lb	31.10 lb
	2005 "	37.00 lb	24.36 lb
	2006 "	74.00 lb	30.30 lb
	2007 "	83.00 lb	55.00 lb
	2008 "	36.00 lb	no test
Bluebunch wheatgrass	1997 (park collected)	0.46 lb	no test
	1999 harvest lot 1	10.50 lb	8.40 lb
	lot 2	6.00 lb	3.60 lb
	2000 harvest	1.40 lb	0.80 lb
	2002 (old planting)	300.00 g	215.00 g
	2003 (both plantings)	32.00 lb	25.90 lb
	2004 (both plantings)	25.50 lb	21.62 lb
	2005 (both plantings)	13.00 lb	9.50 lb
	2006 (new planting)	10.80 lb	9.10 lb
	2007 (new planting)	18.00 lb	15.32
	2008 (new planting)	18.50 lb	no test
Indian ricegrass	1997 (park collected)	8.00 g	no test
	1999 harvest	1.24 lb	0.80 lb
	2000 "	0.97 lb	0.30 lb
	2001 "	0.97 lb	0.50 lb
	2002 "	3.60 lb	1.15 lb
	2003 "	8.00 lb	3.60 lb
	2004 "	10.00 lb	3.80 lb
	2005 "	12.00 lb	5.23 lb
	2006 "	5.60 lb	3.80 lb
	2007 "	8.00 lb	4.97 lb
	2008 "	6.60 lb	no test
Western wheatgrass	2009 no harvest		
	2010 harvest	33.50 lb	26.40 lb

**GREAT SAND DUNES
NATIONAL PARK AND PRESERVE**

**FY2010 Annual Summary Report
Prepared by**

**UPPER COLORADO ENVIRONMENTAL PLANT CENTER
MEEKER, COLORADO**

INTRODUCTION - In March of 2009, an interagency agreement was signed between Great Sand Dunes National Park and Preserve (GSD) and Upper Colorado Environmental Plant Center (UCEPC) to produce seed of two species, one half acre of Indian ricegrass *Achnatherum hymenoides* and two-tenths of an acre field of ring muhly *Muhlenbergia torreyi*. This agreement was signed into effect in April of 2009 and will remain in effect until September 30, 2011.

ACCOMPLISHMENTS - Ring muhly and Indian ricegrass fields were harvested during the summer of 2010, seed was cleaned, tested at the seed lab and is being stored at UCEPC. Ring muhly cleaned seed weight was 4.6 pounds. Indian ricegrass clean seed weight was 41 pounds. Indian ricegrass and ring muhly were both sent to the Wyoming seed lab for testing. The Indian ricegrass came back with 34.77 percent pure live seed (PLS). The ring muhly seed was sent in two times to the seed lab. The first seed test came back with discrepancies and was sent in an additional time for re-testing, the PLS came back as 74 percent PLS. Seed lab test results can be provided from UCEPC upon request. Seed inventory for Great Sand Dunes is listed in Table 1 below.

Table 1. Great Sand Dunes National Park and Preserve seed inventory on hand at UCEPC.

Species Symbol	Harvest Year	Field Size	Amount Cleaned Seed (Bulk)	PLS %	Amount PLS on Hand	Date Tested
MuTo	2010	0.2	4.6 lb	74.00	3 lb	12/6/2010
AcHy	2010	0.5	41.0 lb	34.77	14 lb	12/1/2010
MuTo	2009	0.2	3.4 lb	31.35	1 lb	12/22/2009
AcHy	2009	0.5	6.2 lb	20.93	1 lb	1/14/2010

*All park materials from 2008 and prior have been shipped to the park.

TECHNOLOGY DEVELOPMENT - Cultural practices, harvest, and cleaning protocols were utilized to handle the Indian ricegrass and ring muhly.

When comparing seed lab results from the Indian ricegrass field from over the years it's been observed that PLS has remained fairly low and has fluctuated. A lack of PLS consistency from this source has been a concern. Fluctuations in seed production may perhaps be a result of various environmental elements and factors that UCEPC has no control over. However, since the Indian ricegrass field has never had high PLS results, it may be an Indian ricegrass source that is a mediocre seed producer.

The ring muhly field has been in production for four years. Its seed quantities and PLS results have fluctuated drastically over that period of time. Since the ring muhly has only been in production for a short period, at this time it is hard to determine the fluctuating seed test results.

MESA VERDE NATIONAL PARK

FY2010 Annual Report Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER MEEKER, COLORADO

INTRODUCTION – Upper Colorado Environmental Plant Center (UCEPC) and Mesa Verde National Park (MVNP) signed Interagency Agreement 1211-07-006 in August of 2007. The new agreement was for the propagation of approximately 415 PLS lbs of a native erosion seed mix. See UCEPC's Annual Technical Report, Project Number, COPMC-S-0703-CR, for additional information about this agreement.

Agreement 1211-07-006 was amended in June of 2009. The amendment revised species and PLS seed amounts for three materials. A half-acre field of salina wildrye *Leymus salinus*, UCEPC accession 43501, would be increased to one full acre substituting for the Indian ricegrass and needle and thread.

A second amendment to the agreement was signed July 28, 2010. This amendment provided a one year extension with funding for continued production of the following material: Louisiana sage *Artemisia ludoviciana*, muttongrass *Poa fendleriana*, slender wheatgrass *Elymus trachycaulus* and yarrow *Achillea millefolium*. However, the funding for the one year extension was provided by Federal Lands Highway Program dollars (FLHP) with interaction from Cam Hugie. Mr. Hugie proposed that if UCEPC would continue to produce and store the seed for a road project scheduled to begin in 2014, the FLHP would share the production costs with MVNP. All the extra seed could be used to rehabilitate around the new Curatorum, near the entrance or other small on going disturbance work the park does yearly. MVNP declined to share the cost.

ACCOMPLISHMENTS – Five materials were planted for MVNP in the fall of 2007. The table below lists the materials in the original agreement, amendment No. 1 and No. 2. Yields, test results, and PLS amounts are provided.

The substitution field of UCEPC salina wildrye accession 43501 was planted August 11 of 2009, The field established and was maintained through 2010. No further funding was provided for the salina wildrye field.

The four fields outlined for production in the second amendment were at the peak of their production in 2010. UCEPC provided MVNP an estimate for bulk pounds produced by each species. With the exception of the slender wheatgrass, the remaining three materials exceeded the original estimate. The quantities are listed in the table below. Although no funding was provided for the western wheatgrass, it could be made available via negotiation.

Inter Agency Agreement # 1211-07-006 Mesa Verde National Park												
2007-2009												
Material	Acre	**Seed			Production Amounts**			PLS %	PLS lbs	Test date	Total PLS	Trgt PLS
		2007	2008	2009	2010							
AC MI	0.02	Est.	Rplnt	0.84 g			na	na	na	na	5	
					6 lbs	39.49	2.37	1/20/2011	2.37	-2.63		
AR LU	0.02	Est.	Rplnt	5 lb			54.29	2.71	1/28/2010		5	
					7.5 lbs	69.85	5.23	12/20/2010	7.94	+2.94		
PO FE	0.5	Est.	Na	1.71 lb			na	na	na	na	5	
					23 lbs	83.75	19.26	3/24/2011	19.3	+14.3		
EL TR	0.5	Est.	618 g's				na	na	na	na	100	
				118 lb		63.50	74.92	2/24/2010				
					90 lb	75.93	68.33	12/17/2010	143.25	+43.25		
PA SM	1	Est.	343 g's				na	na	na	na	200	
				274 lb		69.43	190	3/9/2010				
					70 lb	75.38	52.77	12/27/2010	242.77	+42.77		
LE SA	1	Est.									100	
					na	na	na	na	na	-100		

On August 16, 2010, UCEPC shipped material to Horizon Environmental services, Inc. for the main road entrance rehabilitation project. Table 1 lists specie, year grown, bulk amount produced, and PLS amount shipped. Table 2 lists PLS amounts on inventory at UCEPC from project 1211-07-006.

Table 1

Specie	Lot #	Bulk	PLS Shpd
PASM	2009	212.00 lb	147.00
ELTR	2009	113.00 lb	72.00
ACMI	2009	263.00 g	NA
ARLU	2009	1.14 lb	0.62
POFE	2009	1.71 lb	NA
	2010	5.00 lb	4.19

Table 2

Specie	Yr Grown	PLS Lb Avail	Yr Grown	PLS Lb Avail
PASM	2009	43.0	2010	52.70
ELTR	2009	3.2	2010	68.30
ACMI	2009	0.0	2010	2.40
ARLU	2009	2.1	2010	5.23
POFE	2009	0.0	2010	19.30

UCEPC continues to store 677 lb of previously produced seed for MVNP. As our need for more storage space continues to increase, we are asking that Mesa Verde accommodate their old material or allow UCEPC to dispose of it. One alternative might be to use some of these materials as mulch along the road project.

DISCUSSION – All actions to fulfill the terms of Interagency Agreement 1211-07-006, amendment No. 1 and amendment No. 2, have been completed. There has been no further discussion to continue with seed production for Mesa Verde National Park. Those fields are scheduled to be removed in 2011.

**ROCKY MOUNTAIN NATIONAL PARK
BEAR LAKE ROAD**

**FY2010 Annual Summary Report
Prepared by**

**UPPER COLORADO ENVIRONMENTAL PLANT CENTER
MEEKER, COLORADO**

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC), Rocky Mountain National Park (ROMO), and the USDA Natural Resources Conservation Service (NRCS), signed a cooperative plant materials agreement (IA Project No. 1211-08-001) in May 2008. This agreement involves seed production of five forbs and five grass species for revegetation of the Bear Lake Road Project. The Bear Lake Road Project involves widening Bear Lake Road by two feet for ten miles, adding pullouts and retaining walls, widening switchbacks, and expanding some of the parking lots.

ACCOMPLISHMENTS - This year, eight of the eight established materials were harvested for use in the revegetation of the Bear Lake Road Project. Three forbs, hairy goldenaster, purple locoweed, and fringed sage all produced moderate quantities of seed and accounted for 16 pounds of pure live seed. A fourth forb, rose pussytoes, produced just 74 grams. The four grasses produced 226 pounds of pure live seed. Additionally, blue grama which was not contracted this year, produced five pounds of pure live seed.

Again this year, on July 29, 2010, P at Davey, Terri Blanke, and Steve Parr provided a seed collection training for approximately 25 park service employees. Also attending the training were representatives from Boulder County.

No seed was shipped to ROMO this year.

TECHNOLOGY DEVELOPMENT - Goldenbanner was identified as the most important forb for Bear Lake Road revegetation, but seed production has not been near anticipated amounts. Bee board placement and the import of 10,000 bees to UCEPC in an effort to improve pollination and subsequent germination did not result in increased seed production of golden banner, but may have benefitted other forbs. Both goldenbanner and blue grama from the east side of Rocky Mountain National Park are not well suited for seed production at UCEPC.

Inventory for RMNP Bear Lake Road Project

SPECIES	2006	2007	2008	2009	2010
	PLS lb				
Blue grama	NA	7.90	NA	2.57	4.95
Bottlebrush Squirreltail	NA	NA	NA	NA	208.00
Fringed sage	4.75	1.89	5.70	8.50	4.36
Goldenaster	NA	3.3	4.43	5.10	3.50
Goldenbanner	NA	4.79	1.20*	1.80*	NA
Mountain muhly	5.70	4.10	8.24	9.20	7.95
Needle and thread	NA	1.00	0.65	7.64	1.75
Prairie Junegrass	NA	1.50	2.00	1.83	9.00
Purple locoweed	NA	9.00	3.00*	12.40	8.29
Rose pussytoes	NA	NA	NA	NA	0.16*

* Clean seed quantity

**ROCKY MOUNTAIN NATIONAL PARK
GENERAL EASTSIDE DISTURBANCE**

**FY2010 Annual Summary Report
Prepared by**

**UPPER COLORADO ENVIRONMENTAL PLANT CENTER
MEEKER, COLORADO**

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC), Rocky Mountain National Park (ROMO), and the USDA Natural Resources Conservation Service (NRCS), signed a cooperative plant materials agreement (IA Project No. 1211-09-003) in July 2009. This agreement extends through 2013. The agreement calls for the production of three native plant materials indigenous to the eastside of ROMO for general restoration projects. The primary focus of plant material selection for this agreement is based on those species that naturally occur on the eastside of ROMO that have attributes that will enable successful competition with cheatgrass.

ACCOMPLISHMENTS - Each planting was established from seed collected from park personnel in 2008. All fields were directly seeded, and have successfully been established. Two of the three fields produced large pls quantities of seed in 2010, while the scratch grass produced a very limited amount.

For the second year in a row, Pat Davey, Terri Blanke, and Steve Parr provided a seed collection training for approximately 25 park service employees. Also attending the training were representatives from Boulder County. The trainings are beneficial to both entities since the folks being trained are the ones who will collect the seed for the increase fields at UCEPC.

SPECIES	DATE	QTY	PROCESS
Bottlebrush			
Field Establishment	8/6/2009	2.0 acres	Planet Jr.
Harvest	2010	320 clean lb	285 pls lb
Canada wildrye			
Field Establishment	8/5/2009	1.5 acres	Planet Jr.
Harvest	2010	300 clean lb	210 pls lb
Scratch grass			
Field Establishment	8/12/2009	0.5 acre	Planet Jr.
Harvest	2010	28 grams	NA

TECHNOLOGY DEVELOPMENTS – No new technology has been produced with this project.

**ROCKY MOUNTAIN NATIONAL PARK
COLORADO RIVER POWERLINE PROJECT**

**FY2010 Annual Summary Report
Prepared by**

**UPPER COLORADO ENVIRONMENTAL PLANT CENTER
MEEKER, COLORADO**

INTRODUCTION - Upper Colorado Environmental Plant Center (UCEPC), Rocky Mountain National Park (ROMO), and the USDA Natural Resources Conservation Service (NRCS), signed a cooperative plant materials agreement (IA Project No. 1211-07-009) in August 2008. The agreement calls for the production of native plant materials indigenous to the west side of ROMO for a restoration project. The project will remove an overhead power line and install the power transmission lines underground.

ACCOMPLISHMENTS - After receiving the collected seed the fall of 2007, fields were established in 2008 and seed was produced in 2009 and 2010.

UCEPC staff produced plugs of the beauty cinquefoil for field establishment after determining that germination could be challenging in a direct seeding in the field, and we had limited seed to work with. But after several attempts, germination efforts were successful and a 0.17-acre field was established utilizing 1600 greenhouse produced plugs on June 26, 2008. The brome seed was treated with a fungicide, Dividend, as a water bath solution to reduce or prevent the transmission of head smut to the produced seed.

On July 1, 2010, a scoping session was conducted on the Grand Ditch restoration project on the west side of ROMO. Park personnel, along with Pat Davey and Steve Parr hiked upstream from the Timber Creek Campground in the park to just below the breach area for the overflow of the Grand Ditch. The site visit, along with planned activities, were discussed, and potential plant materials for increase were identified. However, no additional discussions have occurred since the scoping session.

The table below identifies the production for the past two years.

Species	Planted Acres	Year	Bulk lb	PLS lb
Blue wildrye	0.26	2009	1.6	NA
		2010	10.0	6.59
Nodding brome	1.50	2009	106.0	60.60
		2010	155.0	21.33
Beauty cinquefoil	0.17	2009	1.7	NA
		2010	8.5	5.78

TECHNOLOGY DEVELOPMENT – The treatment of nodding or wooly brome from ROMO with the fungicide, Dividend, has prevented head smut from being a concern in the production of seed. Additionally, beauty cinquefoil can be successfully propagated through standard greenhouse procedures.

YELLOWSTONE NATIONAL PARK

FY2010 Annual Summary Report Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER MEEKER, COLORADO

INTRODUCTION - This report is in reference to sub agreement IA No: 1211-10-002/ Requisition No. R1580100283. An interagency agreement was entered into by Yellowstone National Park and the Natural Resources Conservation Service (NRCS). The agreement calls for Upper Colorado Environmental Plant Center (UCEPC) to produce seed for a single grass species, bluebunch wheatgrass. UCEPC is to plant a one acre field and produce approximately 240 pounds pure live seed (PLS) for Yellowstone National Park. This agreement will remain in effect until September 30, 2014.

ACCOMPLISHMENTS – The seed was received from Bridger Plant Materials Center on July 23, 2010. The lot number assigned to the material was SWC-08-YNP-148. It had been previously tested in September of 2008 and had 97% viability, it was noted that the lot contained cheatgrass seed.

August 18, 2010, the acre field of Yellowstone bluebunch wheatgrass was planted in field 3 at UCEPC. Two Planet Juniors were used to plant the field. The field was watered several times to help ensure germination and to get seedling establishment before fall. It was observed that the field established well before cold temperatures occurred in late September.

TECHNOLOGY DEVELOPMENT – Standard planting, cultural practices, harvest, and cleaning protocols will be utilized to handle the bluebunch wheatgrass.

Seed Production - 2010
Upper Colorado Environmental Plant Center
by Terri Blanke

INTRODUCTION

The following plant materials had seed harvested in 2010. 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
<u>GRASSES</u>								
Smooth Brome 'Liso'	<i>Bromus inermis</i>	08S229	9030693	1996	0.01	7/22	25	2.19 lb
				1997	0.01	7/26	25	1.10 lb
				1998	0.01	8/12	25	1.25 lb Heavy shatter
				1999	0.01	No harvest	25	--
				2000	0.01	No harvest	25	--
				2001	0.01	No harvest	25	--
				2002	0.01	No harvest	25	--
				2003	0.01	7/16	25	256.00 g
				2004	0.01	No harvest	25	--
				2005	0.01	No harvest	25	--
				2006	0.01	No harvest	25	--
				2007	0.01	No harvest	25	--
2008	0.01	No harvest	25	--				
2009	0.01	8/26	25	142.00 g				
2010	0.01	No harvest	25	--				
Mountain Brome <i>Garnet - tested class</i>	<i>Bromus marginatus</i>	08S217	9005308	1989	0.20	--	17	--
				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				

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				2000	1.00	6/28	6	6.60 lb	
				2000	--	Plowed 26 rows	6		
				2000	0.18	6 rows not plowed	6		
				2001	0.18	6/27	6	43.00 lb	
				2002	0.18	6/5	6	10.00 lb	
				2003	0.18	7/1	6	41.00 lb	
				2004	0.18	7/1	6	95.00 lb	
				2004	1.10	New planting	6		
				2005	0.18	7/8	6	33.00 lb	
				2005	1.10	7/8	6	37.00 lb	
				2006	0.18	6/26	6	16.50 lb	
				2006	1.10	6/26	6	112.00 lb	
				2007	0.18	6/29	6	95.00 lb	
				2007	1.10	6/30	6	287.00 lb	
				2008	0.18	7/9	6	85.00 lb	
				2008	1.10	7/9	6	222.50 lb	
				2009	0.18	7/9	6	48.00 lb	14.7 PLS
				2009	1.10	7/9	6	487.00 lb	231.5 PLS
	Small Field			2010	0.18	7/7	6	62.00	19.95 PLS
	Large Field			2010	1.10	7/7	6	280.00	
Purple reedgrass	<i>Calamagrostis purpurascens</i>		9070968	2005	plot	Planted	20		
				2006	plot	7/26	20	1.00 g	
				2007	plot	7/31	20	5.00 g	
				2008	plot	8/12	20	471.00 g	
				2009	plot	7/31	20	43.00 g	
				2010	plot	8/3	20	35.00 g	
Bottlebrush Squirreltail	<i>Elymus elymoides</i>		9040189	2005	1.00	New planting	18		
Wapiti - selected class			Poor stand	2006	1.00	No harvest	18	--	
				2007	1.00	7/20 - 8/8	18	24.00 lb	
				2008	1.00	7/27	18	29.50 lb	
				2009	1.00	8/1	18	24.00 lb	20.7 PLS
				2010	1.00	7/23	18	61.00 lb	5.63 PLS avail.
Bottlebrush Squirreltail	<i>Elymus elymoides</i>		9040187	2006	0.50	New planting	18		
Pueblo - selected class		harvest from	demo plot	2007		8/10	20	422.00 g	
				2008	0.50	7/31	18	1.25 lb	
				2009	0.50	8/10	18	39.00 lb	31.7 PLS
	Few plants/small seed			2010	0.50	8/12	18	17.00 lb	13.09 PLS

(2)

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
'Peru creek' Foundation	<i>Deschampsia caespitosa</i>		9024403	2006	plot	7/26	20	13.00 g
				2007	plot	7/30	20	57.00 g
				2008	plot	7/29	20	153.00 g
				2009	plot	7/30	20	0.58 lb
				2010	plot	8/3	20	182.00 g
Pubescent wheatgrass 'Luna' Foundation	<i>Elytrigia intermedia</i>	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	11	--
				2001	0.66	8/16	11	24.50 lb
				2002	0.66	Field plowed	11	
				2002	0.70	Planted 7/18	11	
				2003	0.70	9/8	11	43.00 lb
				2004	0.70	8/24	11	213.00 lb
				2005	0.70	8/15	11	138.00 lb
				2006	0.70	9/27	11	10.00 lb
				2006	1.30	July (New planting)	11	
2007	1.30	8/7	11	637.00 lb				
2008	1.30	8/12	11	314.50 lb				
2009	1.30	8/11	11	228.00 lb	132.0 PLS			
2010	1.30	8/10	11	167.00 lb	76.6 PLS			
Arizona fescue 'Redondo' Foundation	<i>Festuca arizonica</i>	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	6	--

(3)

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				2004	1.00	New planting	18		
				2005	0.18	7/28	6	9.00 lb	
				2005	1.00	No harvest	18	--	Replant
				2006	0.18	No harvest	6	--	
				2006	1.00	No harvest	18	--	
				2007	0.18	7/27	6	1.00 lb	
				2008	0.18	7/30	18	18.50 lb	
				2009	0.18	7/28	18	44.00 lb	17.8 PLS
	Breeders Foundation		Good Seed Spotty & Pigweed	2010	0.18	7/26	6	15.00 lb	4.02 PLS
				2010	1.00	7/26	18	39.00 lb	19.4 PLS
Thurber fescue	<i>Festuca thurberi</i>		9024002	2007	plot	7/11	20	190.00 g	
				2008	plot	7/11	20	1.95 lb	
				2009	plot	7/8	20	0.86 lb	
				2010	plot	7/16	20	272.00 g	
Big bluegrass Name changed	<i>Poa secunda</i> Not released	08S244	9092261	2002	1.00	Planted 7/16/02	11A		
				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	
originally called Prairie junegrass	<i>Koeleria cristata</i>			2006	1.00	7/1	11A	120.00 lb	
				2007	1.00	7/2	11A	134.00 lb	
				2008	1.00	No harvest	11A	--	
				2009	1.00	Field plowed 4/24	11A		
Salina wildrye	<i>Leymus salinus</i>	08S213	9043501	1996	0.02	7/22	Hqts.	154.00 g	
				1996	0.10	7/22	4	631.00 g	
				1996	0.20	Planted	4	No harvest	Breeders
				1997	0.02	Field plowed	Hqts.	No harvest	Foundation
				1997	0.10	7/21	4	2.96 lb	Breeders
				1997	0.20	7/21	4	5.32 lb	Foundation
				1998	0.10	8/4	4	4.00 lb	Breeders
				1998	0.20	8/4	4	9.00 lb	Foundation
				1999	0.10	7/15	4	22.00 g	Breeders
				1999	0.20	7/15	4	32.00 g	Foundation
				2000	0.10	No harvest	4	--	Foundation
				2000	0.20	7/7	4	6.00 g	Breeders
				2001	0.20	7/9	4	174.00 g	Breeders
				2001	0.10	7/9	4	227.00 g	Foundation

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Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2002	0.10	7/11	4	7.00 g Breeders
				2002	0.20	7/11	4	23.00 g Foundation
				2003	0.10	7/9	4	1.69 lb Breeders
				2003	0.20	7/9	4	0.60 lb Foundation
				2004	0.10	7/9	4	19.00 g Foundation
				2004	0.20	7/9	4	146.00 g Breeders
				2004	0.10	New planting	4	Foundation
				2005	0.10	7/13	4	1.40 lb Foundation
				2005	0.30	7/13	4	302.00 g Breeders
				2006	0.30	7/13	4	83.00 g Foundation
				2006	0.10	7/13	4	2.00 g Breeders
				2007	0.30	7/11	4	5.50 lb Foundation
				2007	0.10	7/13	4	296.00 g Breeders
				2008	0.10	7/28	4	1.17 lb Breeders
				2008	0.30	7/28	4	1.27 lb Foundation
				2009	0.30	7/20	4	1.00 lb Foundation
Breeders				2010	0.10		4N	437.00 g
Foundation				2010	1.00	No harvest	5	
Foundation				2010	0.33		4S	2.60 lb
Western wheatgrass 'Arriba' Foundation	<i>Pascopyron smithii</i>	08S226	432402	1996	1.00	Planted	4	
				1997	1.00	8/14	4	640.00 lb
				1998	1.00	8/22	4	238.00 lb
				1999	1.00	8/26	4	87.00 lb
				1999	0.80	New planting 10/6	6A	
				2000	0.80	No harvest	6A	--
				2000	1.00	Field plowed	4	
				2001	0.80	8/3	6A	173.00 lb
				2002	0.80	8/14	6A	100.00 lb
				2003	0.80	8/22	6A	126.00 lb
				2004	0.80	No harvest-plowed	6A	
				2004	1.30	New planting	4	
				2005	1.30	8/27	4	35.00 lb
				2006	1.30	7/28	4	273.00 lb
				2007	1.30	8/5	4	108.00 lb
				2007	1.30	Fall plowed	4	
				2007	1.13	New planting - 8/9	1A	34 rows
				2008	1.13	8/11	1A	41.00 lb
				2009	1.13	8/6	1A	263.00 lb 162.5 PLS

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
	Sold 75 lbs 3/11/11			2010	1.13	8/5	1A	84.00 lb 5.23 PLS on Inv.
Crested wheatgrass 'Hycrest' Foundation	<i>Agropyron cristatum X</i> <i>desertorum</i>		9028605	2007 2008 2009 2010	0.30 0.30 0.30 0.30	planted 8/10 8/19 8/17 8/10	17 17 17 17	17 rows 59.00 lb 83.00 lb 62.8 PLS 65.00 lb 53.4 PLS
Mammoth wildrye Volga' Foundation	<i>Leymus racemosus</i>		108491	2007 2008 2009 2010	0.13 0.13 0.13	planted 8/18 No harvest 8/5 8/5	2 2 2	 79.00 lb 57.1 PLS 58.00 lb 39.5 PLS
San Luis Columbia needlegrass	<i>Achnatherum nelsonii</i>		9040137	2010	plot	8/3	16	53.00 g
<u>FORBS</u>								
Fringed sage	<i>Artemisia frigida</i>		9021471	2006 2007 2008 2009 2010	plot plot plot plot plot	9/26 9/27 9/16 9/22 9/18	20 20 20 20 20	2.45 lb 539.00 g 277.00 g 1.80 lb 205.00 g
Louisiana sage 'Summit' Foundation	<i>Artemisia ludoviciana</i>	08S109	9021474	1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995	0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.35 0.35	-- No harvest 10/6 9/14 10/5 10/11 No harvest 9/10 9/2 9/15 9/8 9/11	2 2 2 2 2 2 2 2 2 2 2 2	 -- 2.44 g 0.96 g 0.10 g 4.00 g -- 3.43 lb 57.00 g 4.39 lb 4.38 lb 28.00 lb

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				1996	0.35	9/10	2	0.78 lb
				1997	0.35	9/8	2	0.90 lb
				1998	0.35	Stand dead-field plowed	2	
				1998	0.06	New planting	2	No harvest
				1999	0.06	Field plowed	--	
				1999	0.10	New planting	25	
				2000	0.10	No harvest	25	--
				2001	0.10	No harvest	25	--
				2002	0.10	No harvest	25	--
				2003	0.10	No harvest	25	--
				2004	0.10	No harvest	25	--
				2005	0.10	No harvest	25	--
				2006	0.10	No harvest	25	--
				2007	0.10	No harvest	25	--
				2007	plot	New planting	Hdqtrs	
				2008	plot	No harvest	Hdqtrs	--
	New planting			2009	plot	November	3	
	Replant			2010	plot	No harvest	3	Na
Utah sweetvetch 'Timp' Foundation	<i>Hedysarum boreale</i>		9024375	2005	1.00	New planting	1	
				2006	1.00	Poor stand	1	No harvest
				2007	1.00	Late July	1	45.00 g
				2008	1.00	7/17	1	1.80 lb
				2009	1.00	7/22	1	23.00 lb 11.3 PLS
	Foundation			2010	1.00	7/13	1	15.00 lb 2.39 PLS
	New Foundation			2010	0.20	7/13	17	22.00 lb 8.51 PLS
Rocky Mtn penstemon 'Bandera' Foundation	<i>Penstemon strictus</i>		9004712	2004	0.10	New planting	8A	
				2005	0.10	No harvest	8A	--
				2006	0.10	deer used heavily	8A	No harvest
				2007	0.10	8/24	8A	5.00 lb
				2008	0.10	9/24	8A	14.50 lb
				2009	0.10	8/26	8A	65.00 lb 21.4 PLS
	(Sold 1.5 lbs 2/16/11)			2010	0.10	8/25	8A	57.00 lb 36.80 PLS
Bluestem Penstemon	<i>Penstemon cyanocaulis</i>	UP	9092290	2010	0.20	7/30	2	29.00 lb

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Kura clover	<i>Trifolium ambiguum</i>		ARS-2678	2009		7/27	17	3.50 lb
				2010	plot	7/27	16	3.00 lb
Sulpher buckwheat	<i>Eriogonum umbellatum</i>		9092270	2010	Plot	7/20	20	205.00 g
Lobeleaf groundsel	<i>Packera multilobata</i>	UP	9092280	2010	0.13	6/25	3A	11.00 lb
Nodding ragwort	<i>Senecio bigelovii</i>		9070972	2010	1.50	7/28	16	5.00 lb

SHRUBS

Serviceberry	<i>Amelanchier utahensis</i>	08S078Z	9021438	1984	0.25	--	3	
Long ridge				1993	0.25	--	3	2.88 lb
selected class				1994	0.25	--	3	0.88 lb
				1995	0.25	--	3	1.77 lb
				1996	0.25	No harvest	3	--
				1997	0.25	--	3	131.00 g
				1998	0.25	7/30	3	0.18 lb
				1999	0.25	No harvest	3	--
				2000	0.25	7/20 - 8/9	3	283.00 g
				2001	0.25	No harvest	3	--
				2002	0.25	No harvest	3	--
				2003	0.25	7/10 - 8/13	3	2.64 lb
				2004	0.25	No harvest	3	--
				2005	0.25	No harvest	3	--
2006	0.25	1/6	3	0.80 lb				
2007	0.25	8/2	3	449.00 g				
not sure of harvest	2008	0.25		3				

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Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2009	0.25	No harvest		
				2010	0.25	8/10	3	206.00 g
Serviceberry Clarks	<i>Amelanchier alnifolia</i>	08S235	9021442	2009	0.01	8/26	19	4.00 g
				2010	0.01	7/30 & 8/10	19	24.00 g
Mountain mahogany 'Montane' Foundation	<i>Cercocarpus montanus</i>	08S035Z	477976	1979	0.02	--	17	
				1984	0.02	9/24	17	43.00 g
				1985	0.02	9/11	17	286.00 g
				1986	0.02	10/7	17	37.00 g
				1987	0.02	8/31 - 9/15	17	2.47 lb
				1988	0.02	9/1 - 9/13	17	2.05 lb
				1989	0.02	9/15	17	0.20 lb
				1990	0.02	No harvest	17	--
				1991	0.02	10/17	17	285.00 g
				1992	0.02	9/21	17	0.83 lb
				1993	0.02	9/15	17	2.44 lb
				1994	0.02	8/12	17	2.30 lb Not all harvested
				1995	0.02	No harvest	17	--
				1996	0.02	--	17	0.82 lb Not all harvested
				1997	0.02	No harvest	17	--
				1998	0.02	11/2	17	0.86 lb
				1999	0.02	No harvest	17	--
				2000	0.02	No harvest	17	--
				2001	0.02	No harvest	17	--
				2002	0.02	No harvest	17	--
				2003	0.02	No harvest	17	--
				2004	0.02	No harvest	17	--
				2005	0.02	No harvest	17	--
				2006	0.02	No harvest	17	--
				2007	0.02	No harvest	17	--
				2008	0.02	No harvest	17	--
				2009	0.02	8/27	17	112.00 g
				2010	0.02	9/22	17	134.00 g
Bitterbrush	<i>Purshia tridentata</i>	08A073J	9038521	1995	0.01	7/29	21	239.00 g

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Fire tolerant				1996	0.01	8/15	21	66.00 g
				1997	0.01	No harvest	21	--
				1998	0.01	No harvest	21	--
				1999	0.01	8/6	21	27.00 g
				2000	0.01	7/18	21	153.00 g
				2001	0.01	7/19	21	159.00 g
				2002	0.01	No harvest	21	--
				2003	0.01	No harvest	21	--
				2004	0.01	No harvest	21	--
				2005	0.01	No harvest	21	--
				2006	0.01	No harvest	21	--
				2007	0.01	No harvest	21	--
				2008	0.01	7/29	21	367.00 g
2009	0.01	No harvest	21					
2010	0.01	7/28	21	314.00 g				
Chokecherry	<i>Prunus virginiana</i>	08S235	9024060 EPC229	1997	0.01	8/15	18	11.90 lb
				1998	0.01	8/25-8/27	18	115.00 lb
				1999	0.01	8/20	18	9.00 lb
				2000	0.01	7/28	18	30.50 lb
				2001	0.01	--	18	21.92 lb
				2002	0.01	July - Aug.	18	Few grams
				2003	0.01	8/4	18	4.80 lb
				2004	0.01	No harvest	18	--
				2005	0.01	No harvest	18	--
				2006	0.01	No harvest	18	--
				2007	0.01	8/10	18	47.00 g
				2008	0.01	8/18	18	36.50 lb
					(hot dried)	2009	0.01	8/19
	(cool dried)	2009	0.01	8/26	19	16.00 lb		
	Lots of berries	2010	0.01	8/17	19	35.00 lb		
Silver buffaloberry	<i>Shepherdia argentea</i>	08S235	9008027 EPC476	1998	0.01	9/1	18	13.00 g
				1999	0.01	No harvest	18	--
				2000	0.01	No harvest	18	--
				2001	0.01	No harvest	18	--
				2002	0.01	No harvest	18	--

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2003	0.01	8/10	18	238.00 g
				2004	0.01	No harvest	18	--
				2005	0.01	No harvest	18	--
				2006	0.01	No harvest	18	--
	Used 345 g's for bare root plnting 2011			2007	0.01	Mid August	19	751.00 g 406 g's 3/1/11
				2008	0.01	8/19	19	2.60 lb
	(cool dried)			2009	0.01	8/1 to 12	19	96.00 g
	(hot dried)			2009	0.01	8/1 to 12	19	21.00 g
				2010	0.01	8/20	19	83.00 g Hot Dried
				2010	0.01	7/30	19	285.00 g Cool Dried
Thinleaf alder	<i>Alnus tenuifolia</i>		9070975	2000	0.25	10/4	3	558.00 g
				2001	0.25	10/2-10/3	3	2.13 lb
				2002	0.25	No harvest	3	--
				2003	0.25	No harvest	3	--
				2004	0.25	No harvest	3	--
				2005	0.25	No harvest	3	--
				2006	0.25	No harvest	3	--
				2007	0.25	No harvest	3	--
				2008	0.25	No harvest	3	--
				2009	0.25	11/25	3	82.00 g
				2010	0.25	No harvest	3	
Bitterbrush Maybell select class	<i>Purshia tridentata</i>		9024373	2008		from Maybell site 7/30	N/A	5.40 lb
				2009		from Maybell site 7/24	N/A	440.00 g
				2010		Na		
Cliff fendlerbush	<i>Fendlera rupicola</i>	orchard	9024143	1999		10/22	15	12.00 g
				2009		11/4	15	42.00 g
				2010		11/5	15	114.00 g
Littleleaf mock orange	<i>Philadelphus microphyllus</i>	orchard	9024096	2009		11/5	15	50.00 g
				2010		Na		

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Squaw apple 9007948 / 9024285 / 9024286	Peraphyllum ramosissimu	orchard	blend	2010		8/20	15	337.00 g
Red barberry	Berberis haematocarpa	orchard	9024220	2010		8/10	15	28.00 g
Redosier Dogwood	Cornus sericea		9070966	2010		9/3	5	16.00 g
Utah honeysuckle	Lonicera utahensis (possibly orange?)	orchard	9030476	2010		9/3	14	11.00 g
Colorado barberry	<i>Berberis fendleri</i>		9024219	2010		10/1	15	10.00 g
Skunkbrush sumac	Rhus trilobata		9007993	2010		8/30	15	60.00 g
Golden current	Ribes aureum (Collected w/ S. buckthorn)			2010		9/3	14	65.00 g
Golden Current	Ribes Aureum		9030913	2010		8/2	15 & 3	28.00 g
Single leaf ash	<i>Fraxinus anomala</i> 9024145 or 9024147		verify in sprng	2010		9/3	14	142.00 g

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Wax current	<i>Ribes cereum</i>		9024288	2010		8/3	15	298.00 g
Snowberry	<i>Symphoricarpos albus</i>		9040106	2010		8/20	14	92.00 g
Smith's buckthorn	<i>Rhamnus smithii</i>		9024308	2010		9/3	15	293.00 g

**Black Chokecherry
Colorow Germplasm**



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