Upper Colorado Environmental Plant Center
Meeker, Colorado

2011
Annual Technical Report

2011 Annual Technical Report
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Upper Colorado Environmental Plant Center

Fiscal Year 2011

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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.

Project 08S213
Report - 2011
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 l2 inches of precipitation.

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

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

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

An Advanced Evaluation for *Leymus salinus,* 08Al58, was installed by UCEPC in 1987. One block of 12 plants per accession was established in Field 25 using 27 accessions. Forage tendencies, as well as general notes concerning vigor, were taken for the planting from 1987 to 1992. Similar to the Initial Evaluation accession 9043501 was judged to be superior. Evaluation 08A158 was removed in 1994 from UCEPC.
As result of its superior performance in the Initial and Advanced Evaluations, a seed and plant increase for accession 9043501 was initiated in 1993 and 1994. In addition, in 1993 vegetative

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

OBJECTIVE

To increase seed (pre-cultivar with seed increase and technology development) for foundation material as well as field plantings, Off-Center trials, and Field Evaluation 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 one-acre field was planted on 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).

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Evaluations for 2005

On June 7, 2005, the herbicide section was evaluated. Glyphosate worked very well leaving spaced grass bunches at about 3 x 3 ft as expected, however, no seed set difference was observed between the treated and untreated plants, perhaps because the treatment was done when the plants had already spent a lot of energy in spring growth. The burned area showed a more vigorous regrowth 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, 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 on 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.

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.

2011

The one-acre field produced 31 clean pounds of seed on what should be its most productive year. There was ample natural precipitation after the third week in June, but may have come too late for seed yield benefit. The Breeder and Foundation fields were removed, but sprigs were dug from the Breeder Field and transplanted to field 20A on June 3, 2011. Approximately 25 sprigs were transplanted by hand and watered in with some supplemental irrigation during the year. No evaluation was conducted on sprig survival nor was any additional seed produced.

CONCLUSION

Seed production, along with a space planting study are being conducted to substantiate seed production potential. 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, if warranted, eventual release.

Project COPMC-F-0601-CR
Report-2011
By: Steve Parr

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.
Upper Colorado Environmental Plant Center (UCEPC)

Common Name	Scientific Name	Release Name or Accession No.
Natives		
Arizona fescue	*Festuca arizonica*	Redondo
Blue grama	*Bouteloua gracilis*	Bad River
Bluebunch wheatgrass	*Pseudoroegneria spicata* spp. spicata	Anatone
Bluebunch wheatgrass	*Pseudoroegneria spicata* spp. spicata	Goldar

Common Name	Scientific Name	Release Name or Accession No.
Bluegrass	*Koeleria macrantha*	9092261
Bottlebrush squirreltail	*Elymus elymoides spp. brevifolius*	Pueblo
Bottlebrush squirreltail	*Elymus elymoides*	Tusas
Bottlebrush squirreltail	*Elymus elymoides spp. brevifolius*	Wapiti
Columbia needlegrass	*Achnatherum nelsonii*	9024804
Columbia needlegrass	*Achnatherum nelsonii*	9040137
Indian ricegrass	*Achnatherum hymenoides*	Paloma
Indian ricegrass	*Achnatherum hymenoides*	Rimrock
Mountain brome	*Bromus marginatus*	Garnet
Sandberg bluegrass	*Poa secunda*	High plains
Streambank wheatgrass	*Elymus lanceolatus*	Sodar
Western wheatgrass	*Pascopyrum smithii*	Arriba
Western wheatgrass	*Pascopyrum smithii*	Rosana
Introduced or Manipulated		
Basin wildrye-hybrid	*Leymus cinereus*	Continental
Crested wheatgrass	*Agropyron cristatum*	Douglas
Crested wheatgrass	*Agropyron cristatum*	Nordan
Crested-desertorum hybrid	*Agropyron cristatum x A. desertorum*	Hycrest
Intermediate wheatgrass	*Thinopyrum intermedia*	Rush
Meadow brome	*Bromus biebersteinii*	Regar
Pubescent wheatgrass	*Thinopyrum intermedia*	Luna
Russian wildrye	*Psathyrostachys juncea*	Bozoisky
Siberian wheatgrass	*Agropyron fragile spp. sibiricum*	Vavilov
Smooth brome	*Bromus inermis*	Liso
Wheatgrass-hybrid	*Elymus hoffmannii*	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 overrun 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 Average[1]**	**Plant Vigor Average[1]**
Arizona fescue	Redondo	0.25	2.0
Blue grama	Bad River	32.0	3.5
Bluebunch wheatgrass	Anatone	18.2	3.5
Bluebunch wheatgrass	Goldar	10.5	3.7
Bluegrass	9092261	1.0	2.6
Bottlebrush squirreltail	Pueblo	2.7	2.2
Bottlebrush squirreltail	Wapiti	0.5	2.0
Bottlebrush squirreltail	Tusas	0.25	2.0
Columbia needlegrass	9024804	2.5	2.3
Columbia needlegrass	9040137	1.7	2.3
Indian ricegrass	Rimrock	14.5	3.5
Indian ricegrass	Paloma	7.2	3.5
Mountain brome	Garnet	2.0	3.2
Sandberg bluegrass	High plains	1.2	2.0
Streambank wheatgrass	Sodar	0.7	2.5
Western wheatgrass	Rosana	12.5	3.2
Western wheatgrass	Arriba	5.5	2.7
Introduced or Manipulated			
Basin wildrye-hybrid	Continental	12.5	3.7
Crested wheatgrass	Nordan	11.5	3.7
Crested wheatgrass	Douglas	5.0	2.5
Crested-desertorum hybrid	Hycrest	7.7	3.2
Intermediate wheatgrass	Rush	8.7	3.7
Meadow brome	Regar	17.7	3.2
Pubescent wheatgrass	Luna	7.5	3.2
Russian wildrye	Bozoisky	14.5	3.7
Siberian wheatgrass	Vavilov	7.2	3.2
Smooth brome	Liso	23.0	2.7
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.

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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.

Results for 2011
The evaluations of the plots occurred on August 3, 2011, and were conducted by Steve Parr. Best native performers were both ′Arriba′ and ′Rosana′ western wheatgrasses, although the native western wheatgrass is encroaching into the plots to the point where discerning planted from native western is not achievable. Other good native performers were Anatone bluebunch wheatgrass, ′Bad River′ blue grama and ′Redondo′ Arizona fescue. The best non-native products were Bozoisky, Nordan and ′Continental′, but other than ′Luna′, Rush and Newhy, all the non-native products have maintained better cover than Redondo, the third best native. The data for the evaluation are presented in Table 5 and Analysis of Variance and a Pair Wise Comparison of all entries across 4 replications are presented after Table 5.

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

Native Species							
Common Name	**Release or Accession**		**Percent Plant Stand[1]**				
		2007	**2008**	**2009**	**2010**	**2011**	**Average**
Western	Rosana	35.2	65	77.5	70*	93.75	68.29
Western	Arriba	9	34	43	70*	85.0	48.20
Bluebunch	Anatone	33.7	37.5	33.75	30	22.75	31.54
Blue grama	Bad River	20	39	41.25	27	14.25	28.30
Bluebunch	Goldar	14.7	16.8	21.75	9	4.75	13.40
Az. fescue	Redondo	3.2	14.8	17.5	17.25	12.0	12.95
C. needlegrass	9040137	3.7	7.5	8.25	8.75	3.0	6.24
Sandberg	High Plains	6	8.5	9.25	3.75	1.0	5.70
C. needlegrass	9024804	2	5.5	7	7.5	5.5	5.50
Bluegrass	9092261	2.5	3.7	6.5	5	5.25	4.59
Ricegrass	Rimrock	10.7	2.5	6	0.75	2.0	4.39
Bottlebrush	Pueblo	5	1.8	1.5	1.75	1.0	2.21
Streambank	Sodar	1.3	2	3	1.25	3.0	2.11
Mt. brome	Garnet	2.7	2.8	1	1.5	2.0	2.00
Bottlebrush	Tusas	1	1	1	1	1.0	1.00
Bottlebrush	Wapiti	1	1	1.0	1.0	1.0	1.00
Ricegrass	Paloma	1	1	1	1	1.0	1.00

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**	**Percent Plant Stand[1]**					
		2007	**2008**	**2009**	**2010**	**2011**	**Average**
Russian wildrye	Bozoisky	30.2	37	51.25	48.75	41.25	41.69
Crested	Nordan	41.2	40	44.25	40.75	37.25	40.69
Basin hybrid	Continental	11	37	40	38.25	36.75	32.60
Meadow brome	Regar	31	27	35.5	38.75	29.25	32.30
Crested	Douglas	32.7	35.8	32.5	21.75	18.0	28.15
Siberian	Vavilov	29	47	23.25	23.25	11.25	26.75
Crested-desertorum	Hycrest	26.2	27.3	24.25	23.75	15.75	23.45
Smooth brome	Liso	20	6.5	12.25	12.25	12.5	12.70
Intermediate	Rush	11.2	10.3	14.5	9.75	3.25	9.80
Wheatgrass-hybrid	Newhy	12.2	7.5	9	12.5	7.0	9.64
Pubescent	Luna	11.2	10	9.25	6.25	1.25	7.59

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**	**2011**	**Average**
AZ. Fescue	Redondo	3.2	2	4.75	3.75	3.25	3.39
Bluebunch	Anatone	2.5	2.3	3.75	3.25	3.5	3.06
C. needlegrass	9024804	3.2	3	3.5	2.75	2.5	2.99
Western	Arriba	2.7	2.8	3.5	3	2.75	2.95
Western	Rosana	2.5	1.8	3.75	3	3.0	2.81
Blue grama	Bad River	3	2	3.75	2.75	2.5	2.80
C. needlegrass	9040137	2.7	2.5	3	3	2.25	2.69
Bluebunch	Goldar	2.2	2.5	4.5	2	1.75	2.59
Mt. brome	Garnet	3	3	2.75	2	2.0	2.55
Streambank	Sodar	4.2	2.5	2.25	1.75	2.0	2.54
Bluegrass	9092261	1.5	1.5	3.75	2.75	2.5	2.40
Indian ricegrass	Rimrock	2	2.3	3.5	1	1.75	2.11
Sandberg	High Plains	2.5	1.5	3.25	1	1.0	1.85
Bottlebrush	Pueblo	1.5	3	1	2	1.0	1.70
Bottlebrush	Tusas	3	1.5	1	1.25	1.5	1.65
Indian ricegrass	Paloma	1.5	2	1	1	1.25	1.35
Bottlebrush	Wapiti	1.8	1	1.5	1	1.0	1.26

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

Table 4. Continued

Introduced or Manipulated Species							
Common Name	**Release or Accession**	**Plant Vigor[1]**					
		2007	**2008**	**2009**	**2010**	**2011**	**Average**
Russian wildrye	Bozoisky	2	1.5	5	4.75	5	3.65
Basin wildrye-hybrid	Continental	2.5	2	4.75	4.5	3.0	3.35
Meadow brome	Regar	2.2	2.3	5	3.75	3.25	3.30
Wheatgrass-hybrid	Newhy	3.2	3.3	3	3.25	2.25	3.00
Crested wheatgrass	Nordan	1.7	2	4.5	4	2.25	2.89
Crested hybrid	Hycrest	2.0	2.8	3.0	Missing	3.0	2.70
Smooth brome	Liso	3	3.5	1.75	2.25	2.75	2.65
Siberian wheatgrass	Vavilov	1.7	2.3	3	3.25	2.25	2.50
Intermediate	Rush	3	2.3	2.5	2.25	2.25	2.46
Crested wheatgrass	Douglas	2.7	2.8	2.5	2	1.75	2.35
Pubescent wheatgrass	Luna	3.2	3.3	1.75	1.5	1.5	2.25

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

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Table 5. Evaluation Data for South Park 2011

CultAcc	Cover	Vigor	Ht.	CultAcc	Cover	Vigor	Ht.	CultAcc	Cover	Vigor	Ht.	CultAcc	Cover	Vigor	Ht.
Bad River	10	3	27	9040137	5	3	22	Goldar	1	1	1	Vavilov	12	2	40
Sodar	5	3	36	Luna	1	1	1	Paloma	1	1	1	Rimrock	1	2	28
Wapiti	1	1	1	Bozoisky	30	5	70	Vavilov	2	3	32	Liso	15	2	17
9040137	5	4	44	Anatone	10	3	35	Douglas	1	1	1	Bad River	15	2	9
Douglas	35	3	40	Rosana	100	3	25	Pueblo	1	1	1	Hycrest	8	3	44
Rimrock	5	3	35	909226	10	4	56	Bozoisky	45	5	63	Goldar	12	2	37
Continental	35	3	75	Arriba	100	3	25	Sodar	1	1	1	Douglas	35	2	20
Arriba	100	3	22	Regar	40	4	44	Luna	1	1	1	Anatone	25	3	37
Redondo	18	4	40	Liso	18	3	50	Regar	27	3	37	Redondo	10	3	30
Vavilov	30	3	45	Newhy	5	2	33	Hycrest	18	3	37	Continental	32	3	92
Liso	2	3	17	Wapiti	1	1	1	Anatone	16	3	31	9040137	1	1	1
Nordan	40	3	52	Garnet	1	2	30	909226	4	2	24	Luna	1	1	1
9024804	10	4	59	Rush	5	2	41	Rosana	75	3	23	Bozoisky	50	5	73
Anatone	40	5	53	Redondo	5	3	51	Liso	15	3	17	Rush	1	1	1
Luna	2	3	45	Sodar	5	3	32	Rimrock	1	1	1	Garnet	1	1	1
Newhy	20	3	24	Bad River	15	2	13	Arriba	40	3	28	Wapiti	1	1	1
Rosana	100	3	22	Douglas	1	1	1	Redondo	15	3	32	Sodar	1	1	1
Paloma	1	1	1	Hycrest	7	3	43	Garnet	1	2	17	High Plains	1	1	1
909226	6	3	43	Vavilov	1	1	1	Bad River	17	3	17	Tusas	1	1	1
Pueblo	1	1	1	Paloma	1	2	25	Rush	2	3	4	Rosana	100	3	27
Hycrest	30	3	39	Goldar	1	1	1	Wapiti	1	1	1	9024804	1	1	1
Garnet	5	3	27	Continental	45	3	83	Newhy	2	2	28	Newhy	1	2	41
Tusas	1	3	10	High Plains	1	1	1	Continental	35	3	6	Arriba	100	2	26
Goldar	5	3	36	Rimrock	1	1	1	9040137	1	1	1	Paloma	1	1	1
Regar	20	3	45	9024804	1	2	25	High Plains	1	1	8	909226	1	1	1
Rush	5	3	37	Tusas	1	1	1	9024804	10	3	56	Regar	30	3	41
High Plains	1	1	8	Pueblo	1	1	1	Nordan	26	2	46	Pueblo	1	1	1
Bozoisky	40	5	##	Nordan	8	2	52	Tusas	1	1	1	Nordan	75	2	31

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Analysis of Variance is presented below for Cover, Vigor and Height across 4 replications for 2011 evaluations.

Randomized Complete Block AOV Table for Cover

Source	DF	SS	MS	F	P
Rep	3	1033.8	344.60		
Cult	27	61012.7	2259.73	21.76	0.0000
Error	81	8411.9	103.85		
Total	111				

Note: SS are marginal (type III) sums of squares

Grand Mean 16.848 CV 60.49

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	1194.12	1194.12	13.24	0.0005
Remainder	80	7217.81	90.22		

Relative Efficiency, RCB 1.06

Means of Cover for Cult

Cult	Mean	Cult	Mean	Cult	Mean
9024804	5.500	Goldar	4.750	Regar	29.250
9040137	3.000	High Plai	1.000	Rimrock	2.000
909226	5.250	Hycrest	15.750	Rosana	93.750
Anatone	22.750	Liso	12.500	Rush	3.250
Arriba	85.000	Luna	1.250	Sodar	3.000
Bad River	14.250	Newhy	7.000	Tusas	1.000
Bozoisky	41.250	Nordan	37.250	Vavilov	11.250
Continent	36.750	Paloma	1.000	Wapiti	1.000
Douglas	18.000	Pueblo	1.000		
Garnet	2.000	Redondo	12.000		

Observations per Mean 4
Standard Error of a Mean 5.0954
Std Error (Diff of 2 Means) 7.2059

Randomized Complete Block AOV Table for Ht

Source	DF	SS	MS	F	P
Rep	3	4573.2	1524.40		
Cult	27	34991.2	1295.97	5.92	0.0000
Error	81	17733.3	218.93		
Total	111				

Note: SS are marginal (type III) sums of squares

Grand Mean 25.643 CV 57.70

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Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	278.8	278.791	1.28	0.2617
Remainder	80	17454.5	218.181		

Relative Efficiency, RCB 1.16

Means of Ht for Cult

Cult	Mean	Cult	Mean	Cult	Mean
9024804	35.250	Goldar	18.750	Regar	41.750
9040137	17.000	High Plai	4.500	Rimrock	16.250
909226	31.000	Hycrest	40.750	Rosana	24.250
Anatone	39.000	Liso	25.250	Rush	20.750
Arriba	25.250	Luna	12.000	Sodar	17.500
Bad River	16.500	Newhy	31.500	Tusas	3.250
Bozoisky	77.250	Nordan	45.250	Vavilov	29.500
Continent	64.000	Paloma	7.000	Wapiti	1.000
Douglas	15.500	Pueblo	1.000		
Garnet	18.750	Redondo	38.250		

Observations per Mean 4
Standard Error of a Mean 7.3981
Std Error (Diff of 2 Means) 10.463

Randomized Complete Block AOV Table for Vigor

Source	DF	SS	MS	F	P
Rep	3	17.7411	5.91369		
Cult	27	84.3125	3.12269	7.44	0.0000
Error	81	34.0089	0.41986		
Total	111				

Note: SS are marginal (type III) sums of squares
Grand Mean 2.3125C V 28.02

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	0.1699	0.16985	0.40	0.5281
Remainder	80	33.8391	0.42299		

Relative Efficiency, RCB 1.35

Means of Vigor for Cult

Cult	Mean	Cult	Mean	Cult	Mean
9024804	2.5000	Goldar	1.7500	Regar	3.2500
9040137	2.2500	High Plai	1.0000	Rimrock	1.7500
909226	2.5000	Hycrest	3.0000	Rosana	3.0000
Anatone	3.5000	Liso	2.7500	Rush	2.2500
Arriba	2.7500	Luna	1.5000	Sodar	2.0000
Bad River	2.5000	Newhy	2.2500	Tusas	1.5000
Bozoisky	5.0000	Nordan	2.2500	Vavilov	2.2500
Continent	3.0000	Paloma	1.2500	Wapiti	1.0000
Douglas	1.7500	Pueblo	1.0000		
Garnet	2.0000	Redondo	3.2500		

Observations per Mean 4
Standard Error of a Mean 0.3240
Std Error (Diff of 2 Means) 0.4582

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The Pair -wise Comparisons below show the significant differences at the 5% level for the three variables of cover, vigor and height for 2011.

LSD All-Pairwise Comparisons Test of Cover for Cult

Cult	Mean	Homogeneous Groups
Rosana	93.750	A
Arriba	85.000	A
Bozoisky	41.250	B
Nordan	37.250	B
Continent	36.750	BC
Regar	29.250	BCD
Anatone	22.750	CDE
Douglas	18.000	DEF
Hycrest	15.750	DEFG
Bad River	14.250	EFGH
Liso	12.500	EFGH
Redondo	12.000	EFGH
Vavilov	11.250	EFGH
Newhy	7.000	FGH
9024804	5.500	FGH
909226	5.250	FGH
Goldar	4.750	FGH
Rush	3.250	GH
9040137	3.000	GH
Sodar	3.000	GH
Garnet	2.000	GH
Rimrock	2.000	GH
Luna	1.250	H
High Plai	1.000	H
Paloma	1.000	H
Pueblo	1.000	H
Tusas	1.000	H
Wapiti	1.000	H

```
Alpha                0.05    Standard Error for Comparison  7.2059
Critical T Value     1.990   Critical Value for Comparison  14.338
Error term used: Rep*Cult, 81 DF
There are 8 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

LSD All-Pairwise Comparisons Test of Ht for Cult

Cult	Mean	Homogeneous Groups
Bozoisky	77.250	A
Continent	64.000	AB
Nordan	45.250	BC
Regar	41.750	CD
Hycrest	40.750	CDE
Anatone	39.000	CDEF
Redondo	38.250	CDEFG
9024804	35.250	CDEFGH
Newhy	31.500	CDEFGHI
909226	31.000	CDEFGHI
Vavilov	29.500	CDEFGHI
Arriba	25.250	CDEFGHIJ
Liso	25.250	CDEFGHIJ
Rosana	24.250	DEFGHIJ
Rush	20.750	EFGHIJK
Garne	18.750	FGHIJK
Goldar	18.750	FGHIJK
Sodar	17.500	GHIJK
9040137	17.000	HIJK
Bad River	16.500	HIJK
Rimrock	16.250	HIJK
Douglas	15.500	HIJK
Luna	12.000	IJK
Paloma	7.000	JK
High Plai	4.500	JK
Tusas	3.250	K
Pueblo	1.000	K
Wapiti	1.000	K

Alpha	0.05	Standard Error for Comparison	10.463
Critical T Value	1.990	Critical Value for Comparison	20.817

Error term used: Rep*Cult, 81 DF
There are 11 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Vigor for Cult

Cult	Mean	Homogeneous Groups
Bozoisky	5.0000	A
Anatone	3.5000	B
Redondo	3.2500	BC
Regar	3.2500	BC
Continent	3.0000	BCD
Hycrest	3.0000	BCD
Rosana	3.0000	BCD
Arriba	2.7500	BCDE
Liso	2.7500	BCDE
9024804	2.5000	CDEF
Bad River	2.5000	CDEF
909226	2.5000	CDEF
9040137	2.2500	DEFG
Newhy	2.2500	DEFG
Nordan	2.2500	DEFG
Rush	2.2500	DEFG
Vavilov	2.2500	DEFG
Sodar	2.0000	EFGH
Garnet	2.0000	EFGH
Douglas	1.7500	FGHI
Goldar	1.7500	FGHI
Rimrock	1.7500	FGHI
Luna	1.5000	GHI
Tusas	1.5000	GHI
Paloma	1.2500	HI
High Plai	1.0000	I
Pueblo	1.0000	I
Wapiti	1.0000	I

```
Alpha                0.05    Standard Error for Comparison  0.4582
Critical T Value    1.990    Critical Value for Comparison  0.9116
Error term used: Rep*Cult, 81 DF
There are 9 groups (A, B, etc.) in which the means
```

CONCLUSION

This past year, 2011, represents the final year of evaluations for the project before a 10 year after planting evaluation is conducted in 2015. It is noteworthy that both native and non-natives have performed on both ends of the spectrum; good and poorly. Because this was formerly irrigated ground, as was much of the South Park system, there is a desire to re-establish native materials for dryland pasture and, on favorable years, dryland hay. However, this is not likely after the evaluations of this project with the entries tested. The tallest average for a native entry is 39cm, which is very likely too little biomass for hay production. Additionally, this product, Anatone bluebunch, had less than 32 percent cover averaged over 6 years. The cover component did not change much, and the average vigor for the product was one of the higher averages at 3.06. So,

the best native in the test for cover, vigor and height for forage production is still unlikely to provide adequate biomass for economical haying operations.

Even the non-native products with greater heights and likely greater biomass, better vigor and better cover represent 4 of the top 6 in cover and vigor and 3 of the top 4 in height, may still not provide adequate biomass for a dryland haying operation on most years.

If forage production is the goal, then a combination of cool season native and non-native grasses and at least one warm season grass should be considered for mixed pasture plantings from the products tested at this site. If conversion from irrigated non-native grasses to non-irrigated native plant stands is the goal, then at least 5 products maintained stands of 12% or better over the six evaluation years, and two of those products had percent cover at over 85%.

Biomass clipping data would have been very valuable in this test to determine actual biomass, but this was not done. Somewhat surprising results were how poorly bottlebrush and Indian ricegrasses did and how well meadow brome did on this site.

Other things that have been learned from this project that should be applied to a larger scale is how important it is to incorporate the peat component into the underlying soil. Additionally, we packed the site just before planting, and the site was rototilled, but it was still very “fluffy”. Ideally, we would have used a moldboard plow, disked if necessary, done weed control for two seasons and planted in the middle of July to take advantage of monsoonal moisture which is typical for the site.

Project COPMC-F-0603-RA
Report-2011
By: Steve Parr

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	*Pascopyrum smithii*	UCEPC
2	Luna	Intermediate wheatgrass	*Thinopyrum intermedium*	UCEPC
3	San Luis	Slender wheatgrass	*Elymus trachycaulus*	UCEPC
4	Pueblo Germplasm	Squirreltail	*Elymus elymoides* spp. *brevifolius*	UCEPC
5	Wapiti Germplasm	Squirreltail	*Elymus elymoides* spp. *brevifolius*	UCEPC
6	Garnet Germplasm	Mountain brome	*Bromus marginatus*	
7	Redondo	Arizona fescue	*Festuca arizonica*	UCEPC
8	Hycrest	Crested wheatgrass	*Agropyron cristatum x A. desertorum*	UCEPC

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

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

*Added on Nov-20, 2007

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Report-2011
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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2010

One product, Sandberg bluegrass (Radio Tower source), was collected on July 20 after most seed had shattered. A total of seven 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

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

UCEPC Grass Experimentals

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

UCEPC Forbs

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

Other PMC Grasses

Cool Season grasses	Good

Warm Season Grasses

Alma	Very green
Pierre	Heavy seed production
Salado	Excellent
Switchgrass (9005439)	Excellent
Vaughn	Very green
Viva	Poor (3 plants) replant or remove

Other PMC Forbs

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

2011

Plots were maintained as is, and no further planting occurred. However, 33 grams of 'Hatch' winterfat were collected on September 30. Evaluations were conducted on July 19, 2011.

UCEPC Grass Releases

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

UCEPC Grass Experimentals

Bluebunch 9070952	Exceptional - best UCEPC plot
Columbia needlegrass (9040137)	Excellent
Junegrass/Poa/Sherman	Excellent*
Salina w.r. 9043501	Poor seed - excellent stand
Thurber's fescue	Poor (remove)

UCEPC Forbs

Bandera	Excellent
Fringed sage	Excellent
Senecio biglovii	Excellent*
Sulphur buckwheat (9024921)	Poor (replant or remove)
Summit	Excellent
Suphur buckwheat on end of plot	Poor 3 plants

Other PMC Grasses

Anatone	Fair
Cool Season grasses	Good
Rush	Excellent
Whitmar	Excellent

Warm Season Grasses

Alma	Fair^
Badlands	Poor remove
Pierre	Fair^
Salado	Fair^
Switchgrass (9005439)	Exceptional - best warm season grass
Vaughn	Fair^
Viva	Poor remove

Other PMC Forbs

Antelope white prairie clover	4 plants Remove
Appar	Good
Bismarck violet prairie clover	5 plants Remove
Great Northern yarrow	Fair
Maple Grove	Excellent
Medicine Creek	Good stand - no seed
Purple coneflower	Good*
Richfield	Excellent
San Juan	Fair
Stillwater prairie clover	Excellent

*Improvement in stand/vigor from 2010
^Decrease in stand/vigor " "

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. For 2012, eight plots need to be removed and five need to have gaps filled.

Project COPMC-F-0604-RA
Report-2011
By: Terri Blanke & Heather Woodruff

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	*Pascopyrum smithii*
2	Sodar	Streambank wheatgrass	*Elymus lanceolatus*
3	Hycrest	Crested wheatgrass	*Agropyron cristatum*
4	Whitmar	Beardless Bluebunch wheatgrass	*Pseudoroegneria spicata*
5	San Luis	Slender wheatgrass	*Elymus trachycaulus*
6	Luna	Pubescent wheatgrass	*Thinopyrum intermedium*
7	Pueblo	Squirreltail	*Elymus elymoides*

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By: Terri Blanke & Heather Woodruff

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

RESULTS

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 cheatgrass 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 cheatgrass started to die back due to mowing and hot weather. The mowing was effective in controlling cheatgrass 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

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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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 boarders 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.

On September 9, Steve Parr, Terri Blanke and Heather Plumb traveled to the plot and completed an evaluation noting weed suppression and seed production. All entries had produced seed heads or were flowering. An ATV sprayer was used to apply a pre-emergent, Pendulum, to the entire planting including the borders.

2011

On August 4, 2011, Terri Blanke and Heather Plumb traveled to Harvey Gap to photograph, evaluate and weed the demonstration planting. A tractor lawn mower and DR Brush Trimmer were used to cut down all materials in each plot. Table 2 below lists the results from this project after 5 years of monitoring. The evaluation was conducted from Plot #1 (most south) to Plot # 20 (most north)

Table 2. Harvey Gap 2011 Cover and Invasive Suppression

Plot#	Variety	% Cover	Invasive Suprsn	Seed Heads	S
1	Arriba	65	3	Yes	
2	Sodar	60	2	Yes	
3	Hycrest	95	1	Yes	
4	Whitmar	70	3	Yes	
5	San Luis	50	2	Yes	
6	Luna	98	1	Yes	
7	Pueblo	45	4	Yes	
8	Newhy	5	5	Yes	
9	Lodorm	9	5	Yes	
10	Covar	80	2	Yes	
11	Poa	78	2	Yes	
12	Wapiti	85	3	Yes	
13	Paloma	7	4	Yes	
14	Pauite	90	1	Yes	
15	Bozoisky	78	1	Yes	
16	Trailhead	50	2	Yes	
17	Mandan	6	5	Yes	
18	Appar	35	4	Yes	
19	Timp	80	4	Yes	
20	Bandera	50	4	Yes	
					N

% cover; where 8 rows = 100%

Invasive supression; 1=excellent; 2=good; 3=Fair; 4=Poor; 5=Very poor

Invasive; downy brome, filaree, stipa, prickly lettuce, Russian thistle salsify, stickweed, rabbitbrush, sagebrush,

CONCLUSION

The Harvey Gap Demonstrational Planting site has been successful in its objectives. The site provided information on which adapted perennial native grasses and forbs could survive, compete and be recommended for use in the area. It served as a stop on many tours, both private and public. Due to budget restraints this will be the final year for this project.

Project COPMC-F-0605-RA
Report-2011
By: Steve Parr

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.

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

Entry No.	Release/ Accession	Common Name	Scientific Name	Seed Source
1	Nezpar	Indian ricegrass	*Achnatherum hymenoides*	Aberdeen, ID
2	Anatone	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	Aberdeen, ID
3	Goldar	Bluebunch wheatgrass	*Pseudoroegnaria spicata*	Aberdeen, ID
4	Bannock	Thickspike wheatgrass	*Elymus lanceolatus*	Aberdeen, ID
5	Sodar	Streambank wheatgrass	*Elymus lanceolatus*	Aberdeen, ID

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

The table below shows the Plot Plan for the planting with the above entries.

Table 2. Plot Plan of Bluebell Field Evaluation Planting

↑North

Plot #	Block-I	Block-II	Block-III	Block-IV
1	Hachita	Critana	Colorado	P-24
2	Critana	Bozoisky	Hachita	Badlands
3	Hycrest	Sand Hollow	L-46	Rush
4	Rush	Niner	Sand Hollow	Simms
5	Nordan	Pueblo	Niner	Price
6	Bozoisky	Anatone	Tusas	Aldous
7	Aldous	Aldous	P-7	Maybell
8	Colorado	Ephraim	Goldar	Toe Jam Creek
9	Goldar	Star Lake	Simms	Critana
10	Volga	Alma	Price	Paloma
11	Luna	Hycrest	Aldous	Colorado
12	P-7	739	Bozoisky	Goshen
13	Paloma	Colorado	Critana	Tusas
14	Vavilov	Arriba	Nordan	Vaughn
15	Price	Tusas	Trailhead	Fish Creek
16	Niner	State Bridge	Yampa	P-7
17	Maybell	Yampa	Vavilov	Luna
18	Bannock	Nezpar	Goshen	Sand Hollow
19	Bad River	Goshen	Nezpar	P-22
20	Goshen	Price	Bad River	Ephraim
21	Yampa	Goldar	739	Trailhead
22	Rimrock	Douglas	Luna	Wapiti
23	Douglas	P-7	Continental	Sodar
24	Sand Hollow	Vavilov	Rush	Pierre
25	Toe Jam Creek	Trailhead	Vaughn	Continental
26	Simms	Nordan	Maybell	L-46
27	Nezpar	Vaughn	P-24	White River
28	Magnar	Graystone	Alma	Bad River
29	Pueblo	Bad River	Fish Creek	Bozoisky
30	Wapiti	Paloma	Paloma	Anatone
31	Continental	Rush	Anatone	Yampa
32	Trailhead	Fish Creek	Graystone	State Bridge
33	Badlands	P-24	Ephraim	Hycrest
34	Arriba	Maybell	Arriba	739
35	Tusas	Continental	Sodar	Alma
36	Ephraim	Luna	StarLake	Douglas
37	White River	L-46	Pueblo	Graystone
38	Sodar	Toe Jam Creek	State Bridge	Volga
39	Fish Creek	White River	Douglas	Vavilov
40	Vaughn	Bannock	Toe Jam Creek	Bannock
41	Pierre	Wapiti	Wapiti	Arriba
42	Graystone	Simms	White River	Goldar
43	L-46	Magnar	Bannock	Nezpar

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Plot #	Block-I	Block-II	Block-III	Block-IV
44	739	P-22	Magnar	Pueblo
45	Anatone	Pierre	P-22	Star Lake
46	Star Lake	Volga	Pierre	Niner
47	Alma	Badlands	Hycrest	Hachita
48	P-22	Sodar	Volga	Rimrock
49	P-24	Rimrock	Badlands	Nordan
50	State Bridge	Hachita	Rimrock	Magnar

Notes:
Border rows on West and South are Hycrest
Border rows on East are Douglas
Border rows on North are Vavilov

Experimental Design:
Randomized Complete block With 4-blocks(Reps)

Plot Size: 4 X 20 Feet, 80 sq feet/plot, 4-Rows/plot

A 5-feet alley was left Between Blocks
All plots are labeled with entry Name and Block No. Entire test area is fenced

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 damaged 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 3). Visual estimates of plant percent stand and vigor were recorded and statistically analyzed. Heights of plants were also recorded.

Table 3. 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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2010

On June 3, 2010, the plot was evaluated during its fourth growing season (Table 4). Evaluators included Upper Colorado Environmental Plant Center (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.

Table 4. 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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2011

The summary statistics from data analysis of 2011 evaluations are presented below. The best native entries are Fish Creek bottlebrush squirreltail, Nezpar, Paloma, White River, and 739 Indian ricegrasses, Continental basin wildrye, Arriba western wheatgrass, P7 and P24 bluebunch wheatgrasses, and Critana thickspike wheatgrass. Luna, Vavilov, Nordan, Rush and Volga were the top non-native products. From the first year of evaluations, none of the nine warm season entries persisted if they did establish. There is no indication that they even germinated, but because of such heavy rabbit use the summer after planting and before evaluations, it is not known whether any of them had any germination.

Randomized Complete Block AOV Table for Cover

Source	DF	SS	MS	F	P
Rep	3	541.3	180.418		
Accession	49	11032.8	225.159	4.51	0.0000
Error	147	7333.5	49.888		
Total	199				

Note: SS are marginal (type III) sums of squares

Grand Mean 7.9150 CV 89.24

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	1153.56	1153.56	27.25	0.0000
Remainder	146	6179.94	42.33		

Relative Efficiency, RCB 1.04

Means of Cover for Accession

Accession	Mean	Accession	Mean	Accession	Mean
739	11.500	Graystone	7.250	Rimrock	7.500
Aldous	1.000	Hachita	1.000	Rush	22.750
Alma	1.000	Hycrest	3.250	Sand holl	8.000
Anatone	9.000	L-46	2.250	Simms	4.250
Arriba	12.500	Luna	34.000	Sodar	6.500
Bad river	1.000	Magnar	2.500	Star lake	3.000
Badlands	1.000	Maybell	4.750	State Bri	3.000
Bannock	5.500	Nezpar	12.500	Toe Jam c	8.500
Bozoisky	8.250	Niner	1.000	Trailhead	9.500
Colorado	2.250	Nordan	22.500	Tusas	1.000
Continent	13.750	P-22	7.750	Vaughn	1.000
Critana	10.000	P-24	12.000	Vavilov	23.750
Douglas	17.000	P-7	12.750	Volga	14.250
Ephraim	2.250	Paloma	14.250	Wapiti	1.250
Fish cree	22.500	Pierre	1.000	White Riv	12.000
Goldar	4.000	Price	4.750	Yampa	1.000
Goshen	1.000	Pueblo	1.500		

Observations per Mean 4
Standard Error of a Mean 3.5316
Std Error (Diff of 2 Means) 4.9944

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Randomized Complete Block AOV Table for Height

Source	DF	SS	MS	F	P
Rep	3	3365	1121.82		
Accession	49	422726	8627.05	7.63	0.0000
Error	147	166292	1131.24		
Total	199				

Note: SS are marginal (type III) sums of squares

Grand Mean 66.790 CV 50.36

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	211	210.99	0.19	0.6673
Remainder	146	166081	1137.54		

Relative Efficiency, RCB 1.00

Means of Height for Accession

Accession	Mean	Accession	Mean	Accession	Mean
739	85.00	Graystone	104.00	Rimrock	86.75
Aldous	1.00	Hachita	1.00	Rush	105.00
Alma	1.00	Hycrest	60.00	Sand holl	44.00
Anatone	82.50	L-46	86.00	Simms	78.00
Arriba	96.75	Luna	91.75	Sodar	87.00
Bad river	8.25	Magnar	43.25	Star lake	69.00
Badlands	1.00	Maybell	143.00	State Bri	29.25
Bannock	88.75	Nezpar	100.75	Toe Jam c	44.00
Bozoisky	145.50	Niner	1.00	Trailhead	180.25
Colorado	45.75	Nordan	105.50	Tusas	10.75
Continent	186.00	P-22	75.25	Vaughn	1.00
Critana	84.00	P-24	90.25	Vavilov	106.75
Douglas	97.00	P-7	72.00	Volga	105.50
Ephraim	65.00	Paloma	72.00	Wapiti	15.50
Fish cree	37.75	Pierre	1.00	White Riv	78.25
Goldar	92.25	Price	78.00	Yampa	20.75
Goshen	1.00	Pueblo	34.50		

Observations per Mean 4
Standard Error of a Mean 16.817
Std Error (Diff of 2 Means) 23.783

Randomized Complete Block AOV Table for Vigor

Source	DF	SS	MS	F	P
Rep	3	7.375	2.45833		
Accession	49	203.805	4.15929	4.88	0.0000
Error	147	125.375	0.85289		
Total	199				

Note: SS are marginal (type III) sums of squares

Grand Mean 3.4150 CV 27.04

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Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	3.695	3.69463	4.43	0.0370
Remainder	146	121.680	0.83343		

Relative Efficiency, RCB 1.03

Means of Vigor for Accession

Accession	Mean	Accession	Mean	Accession	Mean
739	2.7500	Graystone	3.2500	Rimrock	3.5000
Aldous	5.0000	Hachita	5.0000	Rush	2.2500
Alma	5.0000	Hycrest	3.5000	Sand holl	3.0000
Anatone	2.7500	L-46	4.2500	Simms	3.7500
Arriba	3.0000	Luna	3.0000	Sodar	3.2500
Bad river	4.7500	Magnar	4.5000	Star lake	3.5000
Badlands	5.0000	Maybell	2.0000	State Bri	3.7500
Bannock	3.0000	Nezpar	2.5000	Toe Jam c	2.7500
Bozoisky	1.7500	Niner	5.0000	Trailhead	2.7500
Colorado	3.2500	Nordan	1.5000	Tusas	4.5000
Continent	2.5000	P-22	3.5000	Vaughn	5.0000
Critana	3.0000	P-24	2.7500	Vavilov	1.7500
Douglas	2.2500	P-7	2.7500	Volga	2.5000
Ephraim	3.7500	Paloma	3.7500	Wapiti	4.5000
Fish cree	2.7500	Pierre	5.0000	White Riv	2.5000
Goldar	2.2500	Price	3.0000	Yampa	4.5000
Goshen	5.0000	Pueblo	4.0000		

Observations per Mean 4
Standard Error of a Mean 0.4618
Std Error (Diff of 2 Means) 0.6530

LSD All-Pairwise Comparisons Test of Cover for Accession

Accession	Mean	Homogeneous Groups
Luna	34.000	A
Vavilov	23.750	B
Rush	22.750	BC
Fish cree	22.500	BCD
Nordan	22.500	BCD
Douglas	17.000	BCDE
Paloma	14.250	BCDEF
Volga	14.250	BCDEF
Continent	13.750	CDEFG
P-7	12.750	DEFGH
Arriba	12.500	EFGH
Nezpar	12.500	EFGH
P-24	12.000	EFGHI
White Riv	12.000	EFGHI
739	11.500	EFGHI
Critana	10.000	EFGHIJ
Trailhead	9.500	EFGHIJ
Anatone	9.000	EFGHIJ
Toe Jam c	8.500	EFGHIJ

Bozoisky	8.250	EFGHIJ
Sand holl	8.000	EFGHIJ
P-22	7.750	EFGHIJ
Rimrock	7.500	EFGHIJ
Graystone	7.250	EFGHIJ
Sodar	6.500	FGHIJ
Bannock	5.500	FGHIJ
Maybell	4.750	FGHIJ
Price	4.750	FGHIJ
Simms	4.250	GHIJ
Goldar	4.000	GHIJ
Hycrest	3.250	HIJ
Star lake	3.000	HIJ
State Bri	3.000	HIJ
Magnar	2.500	IJ
Colorado	2.250	IJ
Ephraim	2.250	IJ
L-46	2.250	IJ
Pueblo	1.500	J
Wapiti	1.250	J
Aldous	1.000	J
Alma	1.000	J
Bad river	1.000	J
Badlands	1.000	J
Goshen	1.000	J
Hachita	1.000	J
Niner	1.000	J
Pierre	1.000	J
Tusas	1.000	J
Vaughn	1.000	J
Yampa	1.000	J

Alpha 0.05 Standard Error for Comparison 4.9944
Critical T Value 1.976 Critical Value for Comparison 9.8701
Error term used: Rep*Accession, 147 DF
There are 10 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Height for Accession

Accession	Mean	Homogeneous Groups
Continent	186.00	A
Trailhead	180.25	A
Bozoisky	145.50	AB
Maybell	143.00	ABC
Vavilov	106.75	BCD
Volga	105.50	BCD
Nordan	105.50	BCD
Rush	105.00	BCD
Graystone	104.00	BCD
Nezpar	100.75	BCD
Douglas	97.00	CD
Arriba	96.75	CD
Goldar	92.25	DE
Luna	91.75	DE

P-24	90.25	DEF
Bannock	88.75	DEF
Sodar	87.00	DEF
Rimrock	86.75	DEF
L-46	86.00	DEF
739	85.00	DEF
Critana	84.00	DEFG
Anatone	82.50	DEFG
White Riv	78.25	DEFGH
Price	78.00	DEFGH
Simms	78.00	DEFGH
P-22	75.25	DEFGHI
Paloma	72.00	DEFGHI
P-7	72.00	DEFGHI
Star lake	69.00	DEFGHI
Ephraim	65.00	DEFGHIJ
Hycrest	60.00	DEFGHIJK
Colorado	45.75	EFGHIJKL
Sand holl	44.00	FGHIJKL
Toe Jam c	44.00	FGHIJKL
Magnar	43.25	FGHIJKL
Fish cree	37.75	GHIJKL
Pueblo	34.50	HIJKL
State Bri	29.25	IJKL
Yampa	20.75	JKL
Wapiti	15.50	KL
Tusas	10.75	L
Bad river	8.25	L
Aldous	1.00	L
Alma	1.00	L
Badlands	1.00	L
Goshen	1.00	L
Hachita	1.00	L
Niner	1.00	L
Pierre	1.00	L
Vaughn	1.00	L

Alpha 0.05 Standard Error for Comparison 23.783
Critical T Value 1.976 Critical Value for Comparison 47.000
Error term used: Rep*Accession, 147 DF
There are 12 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Vigor for Accession

Accession	Mean	Homogeneous Groups
Aldous	5.0000	A
Alma	5.0000	A
Badlands	5.0000	A
Goshen	5.0000	A
Hachita	5.0000	A
Niner	5.0000	A
Pierre	5.0000	A
Vaughn	5.0000	A
Bad river	4.7500	AB

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Magnar      4.5000  ABC
Tusas       4.5000  ABC
Wapiti      4.5000  ABC
Yampa       4.5000  ABC
L-46        4.2500  ABCD
Pueblo      4.0000  ABCDE
Ephraim     3.7500  ABCDEF
Paloma      3.7500  ABCDEF
Simms       3.7500  ABCDEF
State Bri   3.7500  ABCDEF
Rimrock     3.5000   BCDEFG
Star lake   3.5000   BCDEFG
Hycrest     3.5000   BCDEFG
P-22        3.5000   BCDEFG
Colorado    3.2500    CDEFGH
Graystone   3.2500    CDEFGH
Sodar       3.2500    CDEFGH
Arriba      3.0000     DEFGHI
Bannock     3.0000     DEFGHI
Critana     3.0000     DEFGHI
Luna        3.0000     DEFGHI
Price       3.0000     DEFGHI
Sand holl   3.0000     DEFGHI
739         2.7500      EFGHIJ
Anatone     2.7500      EFGHIJ
Fish cree   2.7500      EFGHIJ
P-24        2.7500      EFGHIJ
P-7         2.7500      EFGHIJ
Toe Jam c   2.7500      EFGHIJ
Trailhead   2.7500      EFGHIJ
Continent   2.5000       FGHIJ
Nezpar      2.5000       FGHIJ
White Riv   2.5000       FGHIJ
Volga       2.5000       FGHIJ
Douglas     2.2500        GHIJ
Goldar      2.2500        GHIJ
Rush        2.2500        GHIJ
Maybell     2.0000         HIJ
Bozoisky    1.7500          IJ
Vavilov     1.7500          IJ
Nordan      1.5000           J

Alpha              0.05     Standard Error for Comparison  0.6530
Critical T Value  1.976     Critical Value for Comparison  1.2905
Error term used: Rep*Accession, 147 DF
There are 10 groups (A, B, etc.) in which the means
are not significantly different from one another.
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CONCLUSION

The Bluebell plot has been evaluated since 2007. However, years 2007 and 2008 produced spotty data. It was an exceptional year for production in 2011. Rains produced very large, robust plants that were captured through measurement with height. Even "fair" vigor entries often contained plants over 100 cm in height. At least one year of additional data is needed for this project to obtain some separation.

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.

Project COPMC-F-0801-RA
Report-2011
By: Steve Parr

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 (UCEPC) 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.

Table 1. Thirty-eight Grass Species Planted at Snowmass

Common Name	Release Name or Accession No.	Scientific Name
Arizona fescue	Florrisant	*Festuca arizonica*
Arizona fescue	Redondo	*Festuca arizonica*
Big bluegrass	Yampa	*Poa secunda*
Big bluegrass	Sherman	*Poa secunda*
Bluebunch	Anatone	*Pseudoroegneria spicata*
Bluebunch	Colorado BLM	*Pseudoroegneria spicata*
Bluebunch	Goldar	*Pseudoroegneria spicata*
Bluebunch	P7	*Pseudoroegneria spicata*
Blue wildrye	California Park	*Elymus glaucus*

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

Table 2. Plot Plan of Snowmass Field Evaluation Planting

Rep-I	Rep-II	Rep-III	Rep-IV
Col- BLM	Arriba	715	Wapiti
Marvine	Cal-Park	Flor-Muhly	Rosana
Irish-BLM	Goldar	Colorado BLM	High Plains
12A	Sherman	Arriba	739
Rimrock*	Rimrock*	San Luis	Hi-Spring
Cal-Park	715	Wapiti	Rab- Ears
Sta-B- BLM	Wapiti	2A	Par-Range
Rosana	12A	Irish Canyon BLM	Sta-B- BLM
Hi-Spring	Yampa	Marvine	Sum-slender
2A	Irish Canyon BLM	Gypsum	Irish Canyon BLM
Rab- Ears	Flor-Muhly	Elk Creek	Regar
Pryor	Sum-spike	Garnet	12A
Uncompahgre	Uncompahgre	Price	Flat Tops
Wapiti	Redondo	Cal-Park	Pryor
Price	2A	Rimrock*	Flor-Muhly
San Luis	Garnet	Sta-B- BLM	Marvine
Goldar	Sum-slender	Pryor	Redondo
739	Price	Hi-Spring	Cal-Park
Flat Tops	Col-BLM	Rab- Ears	Tusas
Flor-Muhly	Anatone	Goldar	P7
P7	Pryor	Rosana	Sherman
Anatone	Par-Range	Flo-Fescue	Price
Garnet	Tusas	Anatone	Flo-Fescue
Sum-Spike	739	741	Anatone
Redondo	Sta-B- BLM	Regar	Goldar
Flo-Fescue	Regar	Par-Range	741
Gypsum	Hi-Spring	Redondo	715
Regar	Elk Creek	739	Yampa
Elk Creek	Hiner Spring	12A	Uncompahgre
Sum-slender	Gypsum	Tusas	2A
Sherman	Rab- Ears	Uncompahgre	Arriba
Arriba	San Luis	Sherman	San Luis
Tusas	P7	Yampa	Rimrock*
715	P7	Flat Tops	Elk Creek
Yampa	Rosana	Sum-Spike	Colorado BLM
Hi-Plains	741	P7	Garnet
741	Marvine	Sum-slender	Sum-Spike
Par-Range	Flo-Fescue	High Plains	Gypsum

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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 3).

Table 3. 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
Florrisant 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
Florrisant 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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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 4).

Table 4. 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

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2011

Terri Blanke and Steve Parr evaluated the plots on September 2, 2011. Much blue leaf aster has invaded the plots and will definitely need to be treated next year prior to the onset of spring growth. Fences will also need to be repaired as there are two additional years of evaluations remaining on this project before the 10 year after planting evaluation is done in 2017. Overall, the plots looked pretty good as evidenced by the percent cover of 18 entries out of 38 having values over 15% and of those, 14 had better than 30% cover.

There are 16 released products in the test, and 22 experimentals. Of the releases, all but Regar are native and all of the experimentals are UCEPC collections or have been coordinated by UCEPC such as the Florrisant entries, Summitville entries or Medicine Bow – Routt entries. Three experimentals have performed especially well at this planting. Elk Creek mountain brome continues to out perform Garnet in both cover and vigor, and State Bridge BLM bottlebrush is doing better than Wapiti thus far. Irish Canyon western, while the third best western, is doing quite well when compared to all other products in the test.

Randomized Complete Block AOV Table for Cover

Source	DF	SS	MS	F	P
Rep	3	3566	1188.71		
Accession	37	103183	2788.72	18.28	0.0000
Error	111	16937	152.58		
Total	151				

Note: SS are marginal (type III) sums of squares

Grand Mean 25.329 CV 48.77

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	2748.4	2748.36	21.31	0.0000
Remainder	110	14188.5	128.99		

Relative Efficiency, RCB 1.13

Means of Cover for Accession

Accession	Mean	Accession	Mean	Accession	Mean
12A	28.750	Garnet	58.750	Regar	61.250
2A	22.750	Goldar	69.500	Rimrock	5.500
715	10.750	Gypsum	1.000	Rosana	77.500
739	4.750	High Plai	1.000	San Luis	42.500
741	10.000	Hiner Spr	1.000	Sherman	8.250
Anatone	37.500	Irish Can	48.750	Sta-B-BLM	45.000
Arriba	77.250	Marvine	3.500	Sum-slend	18.750
Cal-Park	6.250	P7	60.750	Sum-Spike	1.000
Col-BLM	31.750	Par-Range	7.250	Tusas	1.000
Elk Creek	74.750	Price	16.750	Uncompahg	1.750
Flat Tops	14.250	Pryor	67.000	Wapiti	33.000
Flo-Fescu	1.000	Rab- Ears	2.000	Yampa	7.250

Flor-Muhl	1.000	Redondo	1.750

Observations per Mean 4
Standard Error of a Mean 6.1763
Std Error (Diff of 2 Means) 8.7345

Randomized Complete Block AOV Table for Height

Source	DF	SS	MS	F	P
Rep	3	2855.7	951.88		
Accession	37	91206.1	2465.03	11.31	0.0000
Error	111	24193.1	217.96		
Total	151				

Note: SS are marginal (type III) sums of squares

Grand Mean 53.033 CV 27.84

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	1.9	1.862	0.01	0.9269
Remainder	110	24191.2	219.920		

Relative Efficiency, RCB 1.07

Means of Height for Accession

Accession	Mean	Accession	Mean	Accession	Mean
12A	88.000	Garnet	72.500	Regar	87.500
2A	87.000	Goldar	62.750	Rimrock	46.000
715	51.500	Gypsum	1.000	Rosana	69.000
739	43.000	High Plai	16.000	San Luis	65.500
741	52.000	Hiner Spr	21.250	Sherman	49.250
Anatone	56.000	Irish Can	56.750	Sta-B-BLM	48.750
Arriba	79.000	Marvine	68.000	Sum-slend	39.500
Cal-Park	55.250	P7	71.250	Sum-Spike	1.000
Col-BLM	56.500	Par-Range	66.500	Tusas	11.500
Elk Creek	68.500	Price	97.000	Uncompahg	55.750
Flat Tops	84.000	Pryor	57.250	Wapiti	49.750
Flo-Fescu	25.000	Rab- Ears	62.250	Yampa	60.250
Flor-Muhl	5.000	Redondo	28.250		

Observations per Mean 4
Standard Error of a Mean 7.3817
Std Error (Diff of 2 Means) 10.439

Randomized Complete Block AOV Table for Vigor

Source	DF	SS	MS	F	P
Rep	3	4.2368	1.41228		
Accession	37	96.3158	2.60313	6.84	0.0000
Error	111	42.2632	0.38075		
Total	151				

Note: SS are marginal (type III) sums of squares

Grand Mean 3.3553 CV 18.39

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Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	0.6630	0.66299	1.75	0.1882
Remainder	110	41.6002	0.37818		

Relative Efficiency, RCB 1.05

Means of Vigor for Accession

Accession	Mean	Accession	Mean	Accession	Mean
12A	2.7500	Garnet	2.7500	Regar	2.2500
2A	3.2500	Goldar	2.0000	Rimrock	3.5000
715	3.2500	Gypsum	5.0000	Rosana	3.0000
739	4.0000	High Plai	4.2500	San Luis	3.2500
741	3.5000	Hiner Spr	4.0000	Sherman	2.7500
Anatone	2.7500	Irish Can	3.2500	Sta-B-BLM	3.0000
Arriba	2.5000	Marvine	3.7500	Sum-slend	3.2500
Cal-Park	3.7500	P7	2.0000	Sum-Spike	5.0000
Col-BLM	3.0000	Par-Range	3.5000	Tusas	4.7500
Elk Creek	2.5000	Price	2.2500	Uncompahg	3.7500
Flat Tops	3.2500	Pryor	2.7500	Wapiti	3.2500
Flo-Fescu	4.2500	Rab- Ears	4.0000	Yampa	2.5000

LSD All-Pairwise Comparisons Test of Cover for Accession

Accession	Mean	Homogeneous Groups
Rosana	77.500	A
Arriba	77.250	A
Elk Creek	74.750	AB
Goldar	69.500	AB
Pryor	67.000	AB
Regar	61.250	ABC
P7	60.750	ABC
Garnet	58.750	BCD
Irish Can	48.750	CDE
Sta-B-BLM	45.000	CDEF
San Luis	42.500	DEF
Anatone	37.500	EFG
Wapiti	33.000	EFGH
Col-BLM	31.750	EFGH
12A	28.750	FGHI
2A	22.750	GHIJ
Sum-slend	18.750	HIJK
Price	16.750	HIJKL
Flat Tops	14.250	IJKL
715	10.750	JKL
741	10.000	JKL
Sherman	8.250	JKL
Yampa	7.250	JKL
Par-Range	7.250	JKL
Cal-Park	6.250	JKL

Rimrock	5.500	JKL
739	4.750	KL
Marvine	3.500	KL
Rab- Ears	2.000	KL
Redondo	1.750	KL
Uncompahg	1.750	KL
Flo-Fescu	1.000	L
Flor-Muhl	1.000	L
Gypsum	1.000	L
High Plai	1.000	L
Hiner Spr	1.000	L
Sum-Spike	1.000	L
Tusas	1.000	L

Alpha 0.05 Standard Error for Comparison 8.7345
Critical T Value 1.982 Critical Value for Comparison 17.308
Error term used: Rep*Accession, 111 DF
There are 12 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Height for Accession

Accession	Mean	Homogeneous Groups
Price	97.000	A
12A	88.000	AB
Regar	87.500	AB
2A	87.000	ABC
Flat Tops	84.000	ABCD
Arriba	79.000	ABCDE
Garnet	72.500	BCDEF
P7	71.250	BCDEFG
Rosana	69.000	BCDEFGH
Elk Creek	68.500	BCDEFGH
Marvine	68.000	BCDEFGH
Par-Range	66.500	CDEFGHI
San Luis	65.500	DEFGHI
Goldar	62.750	EFGHIJ
Rab- Ears	62.250	EFGHIJ
Yampa	60.250	EFGHIJ
Pryor	57.250	FGHIJK
Irish Can	56.750	FGHIJK
Col-BLM	56.500	FGHIJK
Anatone	56.000	FGHIJK
Uncompahg	55.750	FGHIJK
Cal-Park	55.250	FGHIJK
741	52.000	FGHIJK
715	51.500	GHIJK
Wapiti	49.750	HIJK
Sherman	49.250	HIJK
Sta-B-BLM	48.750	HIJKL
Rimrock	46.000	IJKL
739	43.000	JKLM
Sum-slend	39.500	KLMN
Redondo	28.250	LMNO
Flo-Fescu	25.000	MNOP

Hiner Spr	21.250	NOPQ
High Plai	16.000	OPQ
Tusas	11.500	OPQ
Flor-Muhl	5.000	PQ
Gypsum	1.000	Q
Sum-Spike	1.000	Q

Alpha 0.05 Standard Error for Comparison 10.439
Critical T Value 1.982 Critical Value for Comparison 20.686
Error term used: Rep*Accession, 111 DF
There are 17 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Vigor for Accession

Accession	Mean	Homogeneous Groups
Gypsum	5.0000	A
Sum-Spike	5.0000	A
Flor-Muhl	4.7500	AB
Tusas	4.7500	AB
Flo-Fescu	4.2500	ABC
High Plai	4.2500	ABC
Redondo	4.2500	ABC
739	4.0000	BCD
Rab- Ears	4.0000	BCD
Hiner Spr	4.0000	BCD
Cal-Park	3.7500	CDE
Marvine	3.7500	CDE
Uncompahg	3.7500	CDE
741	3.5000	CDEF
Par-Range	3.5000	CDEF
Rimrock	3.5000	CDEF
2A	3.2500	DEFG
715	3.2500	DEFG
Flat Tops	3.2500	DEFG
Irish Can	3.2500	DEFG
San Luis	3.2500	DEFG
Sum-slend	3.2500	DEFG
Wapiti	3.2500	DEFG
Col-BLM	3.0000	EFGH
Rosana	3.0000	EFGH
Sta-B-BLM	3.0000	EFGH
12A	2.7500	FGHI
Anatone	2.7500	FGHI
Garnet	2.7500	FGHI
Pryor	2.7500	FGHI
Sherman	2.7500	FGHI
Arriba	2.5000	GHI
Elk Creek	2.5000	GHI
Yampa	2.5000	GHI
Price	2.2500	HI
Regar	2.2500	HI
Goldar	2.0000	I
P7	2.0000	I

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By: Steve Parr

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.

As the plots recover from the extreme grazing that occurred in 2010, at least some efforts will be necessary to ensure that the project will continue to provide valuable information. Maintenance will be necessary in 2012. 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, and the fence will need to be repaired to keep the horses out this year.

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-0803-RI
Project Report-2011
By: Terri Blanke

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 from seed and remained in the greenhouse for several years.

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, redosier dogwood, river hawthorn, currant, narrow leaf cottonwood, snowberry and native silver buffaloberry. The soil was mostly sand/silt with plenty of moisture. The public access also serves as a holding pasture for cattle that are being relocated. Melissa Kindall and Mary Taylor of the White River 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 zone 2, zone 3, zone 5 and zone 6. UCEPC employees watered the shrubs periodically through the summer. The buffaloberry shrubs were fenced for protection from wildlife browsing and cattle.

Project COPMC-F-0803-RI
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By: Terri Blanke

RESULTS

In 2011, UCEPC staff visited the Beefsteak site in May and July. A third year evaluation was completed July 20. Table 1 below shows the results.

The Beefsteak project has been chosen as a successful demonstration site for the Northern Colorado Watershed Partnership. The group was coordinated through efforts supported by the Tamarisk Coalition. The groups focus is on riparian restoration to the watersheds within Northern Colorado for post removal treatments of Russian olive and tamarisk.

Table 1: Height, vigor and notes are recorded in the table below.

Plant/ Tag	Height (Inch)	Vigor	Hydrologic Zone	Protection	Notes: browsing, dry area, competition, ect.
1	NA	Dead	4	Fenced	
2	48	2	4	Fenced	Healthy/browsed on/competing well
3	64	1	3	Fenced	Healthy/browsed on/huge plant
4	40	3	3	No fence	Med size/healthy/lightly browsed
5	14	4	5	Fenced	Top dead/bottom leafing out
6	40	3	5	Fenced	Healthy/Drk green leaves/No tag
7	54	3	5	Fenced	Healthy/browsed/competing good
7a & b	*Natives	*Natives	5	No fence	2 natives between 7 & 8. Fairing well
8	65	2	5	Fenced	Healthy /Tall/some browsing
9		Dead	6	Fenced	
10	41	2	6	Fenced	Browsed/healthy/dry site/tough plant
11			3	No fence	(Could not find 2011)
* Natives are in understory					

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

Hydrologic Zone 3=shallow water/fringe 0-2" deep/fluctuating water/regularly inundated
4=Shoreline fringe/permanent moisture zone/periodically inundated
5=Terrace/rarely inundated
6=Upland/seldom or never inundated

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 evaluate the silver buffaloberry plants in 2012. 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-P-0301-RA
Report - 2011
By: Steve Parr

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

INTRODUCTION

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

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

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

OBJECTIVE

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

EXPERIMENTAL DESIGN

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

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Report - 2011
By: Steve Parr

METHODS

In 1988, collections of Indian ricegrass ecotypes from heavy soils were made in Colorado, Wyoming, Utah, and Nevada. Starting in 1991 up to 1998, Upper Colorado Environmental Plant Center (UCEPC) conducted initial evaluations that led to ten superior selections for an advanced study.

On September 2003, preparations were made to plant the advanced study. However, due to unforeseen circumstances, the study was postponed until 2004. On July 29, 2004, the advanced study was planted at UCEPC with a hand pushed belt seeder.

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

Indian Ricegrass
Plot Plan – Summer 2004
↑
North

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

Note: The last 3 digits of the accession numbers were used in the table.
Plot size: (20 x 12 ft) = 240 square feet
Rows/Plot = 4 (3 foot centers) **Number of entries** = 12 **Alley width** = 10 feet

Accessions/Cultivar	Collection Site
9024664	Moffat Co., CO
9024716	Colorado Springs, CO
9024818	unknown
9024715	Colorado Springs, CO

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Accessions/Cultivar	Collection Site
9024741	Pagosa, CO
9024661	Delta, CO
9024739	Pagosa, CO
9024735	Grand Junction, CO
9024749	Durango, CO
Nezpar	Whitebird, ID
Paloma	Pueblo, CO
Rimrock	Bridger, MT
A total of 12 entries were planted on July 29, 2004	

RESULTS

Year-2006

Results for 2006 are presented in the following table:

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

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

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

Note: All data is the average of three replications.

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

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Year-2007

Results for 2007 are presented in table 2. The performance of all entries for 2007 was not consistent with the results obtained for year-2006. Table 3 presents a comparison for seed yield for the year 2006 and 2007 and table 4 presents a comparison for forage production for both years.

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

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

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

Note: All data is the average of three replications.

Year -2008

This is the third year of production for this study. Overall seed production and forage production for the growing season of 2008 was about half as compared to growing seasons on 2006 and 2007. The frost-free growing season for 2008 was shorter than usual with 75 days as compared to 106 and 107 days for 2006 and 2007 respectively. The long-term average is 90 days.

Results for the 2008 growing season are presented in table 3. Summary tables for 2006 to 2008 for seed yield and forage production are presented in table 4 and 5.

Table 3. Seed Yield and Other Parameters for 12 Entries of Indian Ricegrass. UCEPC-2008

Accession/ Release	Seed Yield (Lb/acre)	Forage (dry-wt) Ton/acre[1]	Plant Height[2] (cm)	Percent Plant Stand[3]
9024741	**121.0**	0.41	63.6	95.3
9024739	66.6	0.39	54.9	88.3
Rimrock	66.1	0.39	74.8	96.0
9024661	58.1	**0.46**	59.4	92.3
9024749	51.2	**0.46**	60.6	91.0
9024735	51.2	0.31	53.2	94.3
9024715	40.5	0.31	57.2	91.0
Nezpar	38.4	0.39	71.9	93.3
Paloma	33.6	0.27	51.4	53.3
9024664	13.4	0.31	77.6	97.7
9024716	12.8	0.36	59.2	93.3
9024818	3.2	0.17	44.3	50.0
Mean	46.34	0.35	60.7	86.3
LSD (0.05)*	36.5	0.13	7.6	7.5

*Least Significant Difference at P<0.05

1. Air-dry above ground biomass (cut four inches above soil surface)
2. Plant height measure in centimeters to top of seed panicle
3. Visual estimate per plot basis.

Table 4. Seed Yield Comparison for 12 Entries of Indian Ricegrass *Achnatherum hymenoides* Grown at UCEPC (2006-2008).

Accession/ Release	**Seed Yield (Lb/acre) Year**			**Seed yield(lb/Acre) 3-year average**	**Collection Site**
	2006	**2007**	**2008**		
9024741	**191.0**	96.2	**121.0**	**136.1**	Pagosa, CO
902661	113.8	180.7	58.1	117.5	Delta, CO
9024739	165.2	117.3	66.6	116.4	Pagosa, CO
9024749	95.7	**195.3**	51.2	114.1	Durango, CO
9024715	119.9	160.7	40.5	107.0	CO Springs, CO
Rimrock	165.5	77.0	66.1	102.8	Bridger, MT
9024735	103.1	97.8	51.2	84.0	G. Junction, CO
9024664	68.2	155.1	13.4	78.9	Moffat, CO
9024716	58.4	138.6	12.8	70.0	CO-Springs, CO
Paloma	24.0	138.8	33.6	65.4	Pueblo, CO
Nezpar	83.7	57.8	38.4	60.0	Whitebird, ID
9024818	13.3	90.1	3.2	35.5	Unknown
Mean	100.15	125.45	46.34	(90.64)	
LSD (0.05)*	68.4	47.5	36.5	30.7	

*Least Significant Difference at P<0.05

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Table 5. Forage Production Comparison for 12 Entries of Indian Ricegrass *Achnatherum hymenoides* Grown at UCEPC.

Accession/ Release	Forage production[1] (tons/acre) Year			Forage production (tons/acre) 3-year average	Collection Site
	2006	2007	2008		
9024749	0.82	**1.35**	**0.46**	**0.88**	Durango, CO
9024661	0.85	1.30	**0.46**	0.87	Delta, CO
9024715	0.90	1.30	0.31	0.83	CO-Springs, CO
9024664	**0.94**	1.06	0.31	0.77	Moffat, CO
9024735	0.87	1.02	0.31	0.73	G. Junction, CO
Paloma	0.70	1.16	0.27	0.71	Pueblo, CO
9024716	0.68	1.06	0.36	0.70	CO-Springs, CO
9024741	0.77	0.92	0.41	0.70	Pagosa, CO
Rimrock	0.77	0.82	0.39	0.66	Bridger, MT
Nezpar	0.68	0.77	0.39	0.61	Whitebird, ID
9024739	0.70	0.73	0.31	0.56	Pagosa, CO
9024818	0.36	0.63	0.17	0.39	Unknown
Mean	0.75	1.01	0.35	(0.70)	
LSD*	NS**	NS	0.13	0.23	

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

- *Least Significant Difference at P<0.05
- ** NS = Not significant at P<0.05

Year – 2009

Table 6. Evaluation Results for 5 Attributes

Accession	Seed Yield (Total Grams)	Forage Production (Total pounds)	Plant Height (Average centimeter)	Percent Plant Stand	Vigor
9024661	1720	26.0	30.3	88.0	1.67
9024749	1689	28.8	31.3	88.3	2.00
9024716	1264	20.3	31.7	89.0	2.67
9024664	1213	22.6	31.3	91.3	1.67
9024715	1193	25.0	30.3	89.3	1.67
Rimrock	1150	18.0	31.0	88.7	2.00
9024735	1119	20.4	23.0	88.7	1.33
9024741	1119	16.6	28.8	87.3	2.33
9024739	1070	18.2	25.3	81.0	3.00
Paloma	692	9.6	21.7	31.7	2.33
Nezpar	621	12.1	31.3	84.3	3.33
9024818	516	6.7	19.0	28.3	3.33
Average	**1114**	**18.7**	**27.9**	**78.0**	**2.28**

The table 6 above identifies the measured and observed parameters for 2009. Seed yield was the total weight of the cleaned seed of three plots of each accession completely clipped. Forage production was determined from the total weights of each accession from complete clipping of each plot. Each replication was clipped, bagged and allowed to cure to obtain the air dry weights of all three replications for each accession.

Percent plant stand and vigor were obtained from concurrence by two evaluators, and plant height was the average of no less than three measurements per plot. Plant height, with the exception of Nezpar, had a high correlation with overall plant performance as related to seed yield and forage production. Vigor was less reliable as an indicator of performance.

The table 7 below breaks out yield into standard units that have been utilized in previous years. Total grams of clean seed and total air dry weight are further compared by pounds per acre for both seed and forage yield and for tons per acre for forage yield. Plot size is 12 x 20 ft times three replications for 720 square feet per accession.

Table 7. Conversion of Measured Units to Standard Reporting Units

Accession	Seed Yield (Total Grams)	Seed Yield (lb/Acre)	Forage Yield (Total lb)	Forage Yield (lb/Acre)	Forage Yield (Tons/Acre)
9024661	1720	229.21	26.0	1573.00	0.79
9024749	1689	225.08	28.8	1742.40	0.87
9024716	1264	168.44	20.3	1228.15	0.61
9024664	1213	161.64	22.6	1367.30	0.68
9024715	1193	158.98	25.0	1512.50	0.76
Rimrock	1150	153.25	18.0	1089.00	0.55
9024735	1119	149.12	20.4	1234.20	0.62
9024741	1119	149.12	16.6	1004.30	0.50
9024739	1070	142.59	18.2	1101.10	0.55
Paloma	692	92.22	9.6	580.80	0.29
Nezpar	621	82.75	12.1	732.05	0.37
9024818	516	68.76	6.7	405.35	0.20
Average	**1114**	**148.69**	**18.7**	**1130.81**	**0.57**

Table 8. Four Year Average Seed Yield of Indian Ricegrass Accessions

Accession	Seed Yield lb/acre 2006	2007	2008	2009	TOTAL	AVERAGE
9024661	113.80	180.70	58.10	229.21	581.81	**145.45**
9024749	95.70	195.30	51.20	225.08	567.28	**141.82**
9024741	191.00	96.20	121.00	149.12	557.32	**139.33**
9024739	165.20	117.30	66.60	142.59	491.69	**122.92**
9024715	119.90	160.70	40.50	158.08	479.18	**119.80**
Rimrock	165.50	77.00	66.10	153.25	461.85	**115.46**
9024735	103.10	97.80	51.20	149.12	401.22	**100.31**
9024664	68.20	155.10	13.40	161.64	398.34	**99.59**
9024716	58.40	138.60	12.80	168.44	378.24	**94.56**
Paloma	24.00	138.80	33.60	92.22	288.62	**72.16**
Nezpar	83.70	57.80	38.40	82.75	262.65	**65.66**
9024818	13.30	90.10	3.20	68.76	175.36	**43.84**
TOTAL	1201.80	1505.40	556.10	1780.26		
AVERAGE	100.15	125.45	46.34	148.36	420.30	105.07

Year - 2010

In 2010, no clipping for forage production was conducted nor was seed harvested from the plots for analysis and evaluation. This year, subjective values were given to the measurements of vigor and seed production with 1 being Excellent and 5 being poor. Height for each plot was taken by measuring the highest (tallest) plant in each plot, so this was not subjective, but did not represent an average either. Percent plant stand was taken for the entire plot, 4 rows three feet apart and 20 feet long. A completely full row represents 25 percent stand. Other than Paloma and accession 9024818, all entries had percent stands over 84 percent. All plant accessions were represented by tall plants, with Paloma again having the lowest average height at 65 centimeters. Vigor and seed production were subjective, but likely had a high correlation for the evaluation. Table 9 below represents the data taken on July 20, 2010, for each of the four parameters and provides averages for them. These averages are summarized in Table 10.

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Table 9.

Indian Ricegrass Evaluations 2010

	Percent Stand				Height			
Accession	Rep I	Rep II	Rep III	Average	Rep I	Rep II	Rep III	Average
9024661	93	87	87	89.0	65	89	67	73.7
9024664	90	94	94	92.7	84	91	80	85.0
9024715	95	93	93	93.7	72	95	92	86.3
9024716	95	91	88	91.3	83	98	95	92.0
9024735	92	90	94	92.0	70	70	73	71.0
9024739	87	83	83	84.3	68	72	66	68.7
9024741	88	96	95	93.0	74	92	87	84.3
9024749	88	86	90	88.0	87	90	83	86.7
9024818	72	45	22	46.3	65	70	73	69.3
Nezpar	89	90	87	88.7	81	81	89	83.7
Paloma	56	74	38	56.0	60	70	65	65.0
Rimrock	92	95	89	92.0	86	78	81	81.7

	Vigor				Seed Production			
Accession	Rep I	Rep II	Rep III	Average	Rep I	Rep II	Rep III	Average
9024661	2.0	2.0	2.0	2.0	2.0	3.0	1.0	2.0
9024664	2.0	2.0	2.0	2.0	2.0	3.0	2.0	2.3
9024715	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9024716	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.3
9024735	1.0	2.0	1.0	1.3	1.0	2.0	1.0	1.3
9024739	3.0	2.0	3.0	2.7	3.0	2.0	3.0	2.7
9024741	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0
9024749	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0
9024818	2.0	4.0	3.0	3.0	2.0	5.0	2.0	3.0
Nezpar	3.0	3.0	3.0	3.0	4.0	3.0	4.0	3.7
Paloma	1.0	3.0	3.0	2.3	1.0	3.0	2.0	2.0
Rimrock	1.0	1.0	2.0	1.3	2.0	1.0	3.0	2.0

Data below in table 10 suggests there are up to five accessions that have performed equal to or better than 'Rimrock', and consistently better than the old standards of Paloma and Nezpar. In 2011, seed production and forage production should again be compiled for additional seed sources for these improved accessions and one more year of quantitative data. Because there are a number of accessions, 9024661, 9024664, 9024715, 9024741, and 9024749 that have consistently performed well, these lines should be increased for additional off site testing. Accession 9024716, which was the top performer in the Initial Evaluation Planting, has done well, but was not among the highest performers early in this evaluation. Accession 9024739

started well, but has faded. Accession 9024735 has performed just below Rimrock in a four year average of seed yield, but comes from west central Colorado near Grand Junction, which may warrant additional attention and possibly a line increase of this product. Accessions and superior measurements for each parameter for 2010 are identified in bold below.

Table 10.

Summary of Replication Averages for Four Indian Ricegrass Parameters

	Percent Stand	**Height**	**Vigor***	**Seed Production***
Accession	Average	Average	Average	Average
9024661	89.0	73.7	2.0	2.0
9024664	92.7	85.0	2.0	2.3
9024715	**93.7**	**86.3**	**1.0**	**1.0**
9024716	**91.3**	**92.0**	**1.0**	**1.3**
9024735	**92.0**	71.0	**1.3**	**1.3**
9024739	84.3	68.7	2.7	2.7
9024741	**93.0**	84.3	**1.0**	2.0
9024749	88.0	**86.7**	**1.0**	2.0
9024818	46.3	69.3	3.0	3.0
Nezpar	88.7	83.7	3.0	3.7
Paloma	56.0	65.0	2.3	2.0
Rimrock	92.0	81.7	1.3	2.0

*Relative scale for Vigor and Seed Production 1= Excellent, 5 = poor

Year - 2011

This represents the final year of the Advanced Evaluation project. Analysis of Variance and Pair wise comparisons are provided below to show how data was used on an annual basis and how data from each year will be used to summarize results over a five year period. This year there were five variables evaluated, air dry biomass, seed yield by weight, height, percent stand and vigor. The averages for each of these parameters are presented below, with pair wise comparisons shown for statistically significant separations.

Evaluations were conducted on July 13, 2011, by Steve Parr. After evaluations were completed, plots were swathed and sacked for air drying. Weights were measured and seed was cleaned January 24 through January 30, 2012, by plot. Data was recorded and statistical analysis is presented for reference.

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Randomized Complete Block AOV Table for Biomass

Source	DF	SS	MS	F	P
Rep	2	1078521	539260		
Accession	10	1.439E+07	1439388	3.40	0.0095
Error	20	8461686	423084		
Total	32				

Note: SS are marginal (type III) sums of squares

Grand Mean 1864.6 CV 34.88

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	3104	3104	0.01	0.9343
Remainder	19	8458582	445189		

Relative Efficiency, RCB 1.02

Means of Biomass for Accession

Accession	Mean	Accession	Mean
661	1833.0	741	2586.7
664	2127.0	749	2909.7
715	2316.3	Nezpar	712.3
716	2300.0	Paloma	906.7
735	2030.7	Rimrock	1444.3
739	1343.7		

Observations per Mean 3
Standard Error of a Mean 375.54
Std Error (Diff of 2 Means) 531.09

Randomized Complete Block AOV Table for Ht

Source	DF	SS	MS	F	P
Rep	2	103.515	51.7576		
Accession	10	966.303	96.6303	2.90	0.0206
Error	20	667.152	33.3576		
Total	32				

Note: SS are marginal (type III) sums of squares

Grand Mean 70.970 CV 8.14

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	27.775	27.7754	0.83	0.3750
Remainder	19	639.376	33.6514		

Relative Efficiency, RCB 1.03

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Means of Ht for Accession

Accession	Mean	Accession	Mean
661	66.667	741	74.000
664	72.333	749	80.333
715	72.000	Nezpar	73.333
716	74.333	Paloma	60.000
735	65.333	Rimrock	75.333
739	67.000		

Observations per Mean 3
Standard Error of a Mean 3.3345
Std Error (Diff of 2 Means) 4.7158

Randomized Complete Block AOV Table for SeedWt

Source	DF	SS	MS	F	P
Rep	2	192.18	96.091		
Accession	10	6524.85	652.485	2.57	0.0348
Error	20	5081.15	254.058		
Total	32				

Note: SS are marginal (type III) sums of squares

Grand Mean 36.545 CV 43.61

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	0.23	0.226	0.00	0.9771
Remainder	19	5080.93	267.417		

Relative Efficiency, RCB 0.96

Means of SeedWt for Accession

Accession	Mean	Accession	Mean
661	43.667	741	52.667
664	25.667	749	61.000
715	30.333	Nezpar	14.333
716	53.000	Paloma	26.333
735	24.333	Rimrock	28.667
739	42.000		

Observations per Mean 3
Standard Error of a Mean 9.2025
Std Error (Diff of 2 Means) 13.014

Randomized Complete Block AOV Table for Stand

Source	DF	SS	MS	F	P
Rep	2	795.9	397.94		
Accession	10	11103.9	1110.39	8.85	0.0000
Error	20	2510.1	125.51		
Total	32				

Note: SS are marginal (type III) sums of squares

Grand Mean 80.606 CV 13.90

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Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	153.73	153.728	1.24	0.2794
Remainder	19	2356.39	124.021		

Relative Efficiency, RCB 1.14

Means of Stand for Accession

Accession	Mean	Accession	Mean
661	76.667	741	93.333
664	93.667	749	87.333
715	89.333	Nezpar	50.000
716	90.667	Paloma	36.667
735	91.667	Rimrock	91.000
739	86.333		

Observations per Mean 3
Standard Error of a Mean 6.4680
Std Error (Diff of 2 Means) 9.1472

Randomized Complete Block AOV Table for Vigor

Source	DF	SS	MS	F	P
Rep	2	0.1818	0.09091		
Accession	10	19.6364	1.96364	3.32	0.0107
Error	20	11.8182	0.59091		
Total	32				

Note: SS are marginal (type III) sums of squares

Grand Mean 2.3636 CV 32.52

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	0.2279	0.22790	0.37	0.5483
Remainder	19	11.5903	0.61001		

Relative Efficiency, RCB 0.95

Means of Vigor for Accession

Accession	Mean	Accession	Mean
661	2.3333	741	1.3333
664	1.6667	749	2.0000
715	2.0000	Nezpar	4.0000
716	2.0000	Paloma	3.3333
735	1.6667	Rimrock	2.6667
739	3.0000		

Observations per Mean 3
Standard Error of a Mean 0.4438
Std Error (Diff of 2 Means) 0.6276

LSD All-Pairwise Comparisons Test of Biomass for Accession

Accession	Mean	Homogeneous Groups
749	2909.7	A
741	2586.7	A
715	2316.3	AB
716	2300.0	AB
664	2127.0	AB
735	2030.7	AB
661	1833.0	ABC
Rimrock	1444.3	BCD
739	1343.7	BCD
Paloma	906.7	CD
Nezpar	712.3	D

```
Alpha              0.05     Standard Error for Comparison  531.09
Critical T Value  2.086     Critical Value for Comparison  1107.8
Error term used: Rep*Accession, 20 DF
There are 4 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

From the data above, seven experimental products produced significantly more biomass than the three standards, Rimrock, Paloma and Nezpar.

LSD All-Pairwise Comparisons Test of Ht for Accession

Accession	Mean	Homogeneous Groups
749	80.333	A
Rimrock	75.333	AB
716	74.333	ABC
741	74.000	ABC
Nezpar	73.333	ABC
664	72.333	ABC
715	72.000	ABC
739	67.000	BCD
661	66.667	BCD
735	65.333	CD
Paloma	60.000	D

```
Alpha              0.05     Standard Error for Comparison  4.7158
Critical T Value  2.086     Critical Value for Comparison  9.8369
Error term used: Rep*Accession, 20 DF
There are 4 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

There is no significant difference in seven of the entries related to height, but three experimental and Paloma were significantly different as shorter products.

LSD All-Pairwise Comparisons Test of SeedWt for Accession

Accession	Mean	Homogeneous Groups
749	61.000	A
716	53.000	AB
741	52.667	ABC
661	43.667	ABCD
739	42.000	ABCD
715	30.333	BCDE
Rimrock	28.667	BCDE
Paloma	26.333	BCDE
664	25.667	CDE
735	24.333	DE
Nezpar	14.333	E

```
Alpha              0.05     Standard Error for Comparison  13.014
Critical T Value  2.086     Critical Value for Comparison  27.147
Error term used: Rep*Accession, 20 DF
There are 5 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

Five experimental lines had significantly more seed production by weight than any of the released sources.

LSD All-Pairwise Comparisons Test of Stand for Accession

Accession	Mean	Homogeneous Groups
664	93.667	A
741	93.333	A
735	91.667	A
Rimrock	91.000	A
716	90.667	A
715	89.333	A
749	87.333	A
739	86.333	A
661	76.667	A
Nezpar	50.000	B
Paloma	36.667	B

```
Alpha              0.05     Standard Error for Comparison  9.1472
Critical T Value  2.086     Critical Value for Comparison  19.081
Error term used: Rep*Accession, 20 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.
```

Two released varieties, Paloma and Nezpar, had significantly poorer percent stands than the other entries in the test.

LSD All-Pairwise Comparisons Test of Vigor for Accession

```
Accession    Mean  Homogeneous Groups
Nezpar     4.0000  A
Paloma     3.3333  AB
739        3.0000  ABC
Rimrock    2.6667   BCD
661        2.3333   BCDE
715        2.0000    CDE
716        2.0000    CDE
749        2.0000    CDE
664        1.6667     DE
735        1.6667     DE
741        1.3333      E

Alpha              0.05     Standard Error for Comparison  0.6276
Critical T Value  2.086     Critical Value for Comparison  1.3092
Error term used: Rep*Accession, 20 DF
There are 5 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

Finally, for vigor, six materials were significantly more vigorous, all experimentals, than the releases.

Table 11. Conversion of 2011 Yields to Standard Units

Accession	Seed Yield (Total Grams)	Seed Yield (lb/Acre)	Forage Yield Air Dry (Total grams)	Forage Yield (lb/Acre)	Forage Yield (Tons/Acre)
9024661	131	17.46	5499	732.80	0.37
9024749	183	24.39	8729	1163.23	0.58
9024716	159	21.19	6900	919.49	0.46
9024664	77	10.26	6381	889.37	0.45
9024715	91	12.13	6949	926.02	0.46
Rimrock	86	11.46	5412	721.20	0.36
9024735	73	9.73	6092	811.82	0.41
9024741	158	21.0	7760	1034.10	0.52
9024739	126	16.79	4031	537.17	0.27
Paloma	79	10.53	2720	362.47	0.18
Nezpar	43	5.73	2137	284.78	0.14
Average	**109.64**	**14.61**	**5692**	**758.52**	**0.38**

Table 12. Evaluation Results: Averages of Three Replications in 2011

Accession	Plant Height (Average centimeter)	Percent Plant Stand	Vigor
9024661	66.67	76.67	2.33
9024749	80.33	87.33	2.0
9024716	74.33	90.67	2.0
9024664	72.33	93.67	1.67
9024715	72.0	89.33	2.0
Rimrock	75.33	91.0	2.67
9024735	65.33	91.67	1.67
9024741	74.0	93.33	1.33
9024739	67.0	86.33	3.0
Paloma	60.0	36.67	3.33
Nezpar	73.33	50.0	4.0
Average	**70.97**	**80.61**	

The products that showed the best performance in 2011 when considering, percent stand, forage yield and seed yield were 741 as the top performer, 749, 716, 715, and 664 as the fifth best product in 2011. The best commercial source, Rimrock, tied for sixth best this year. Evaluations have been done since 2005 on this project. Analysis of Variance was conducted for **Percent Stand** and **Height** for six years, **Biomass** and **Seed Yield** for five years and **Vigor** for three years. However, since there was no Vigor recorded the first three years of evaluations, it will not be used as a selection criteria for materials to move into increase. Below, **Pair Wise Comparisons** are provided for **Biomass, Percent Stand,** and **Seed Yield** from 2006 through 2011.

```
LSD All-Pairwise Comparisons Test of Biomass for Acc

Acc         Mean  Homogeneous Groups
749       0.8280  A
661       0.7500  AB
715       0.7480  AB
664       0.6960  ABC
716       0.6420   BCD
735       0.6420   BCD
741       0.6180   BCDE
Rimrock   0.5720    CDE
Paloma    0.5240     DE
739       0.5180     DE
Nezpar    0.4700      E

Alpha              0.05     Standard Error for Comparison  0.0750
Critical T Value  2.021     Critical Value for Comparison  0.1515
Error term used: Year*Acc, 40 DF
There are 5 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

LSD All-Pairwise Comparisons Test of Percent Stand for Accession

Accession	Mean	Homogeneous Groups
664	94.133	A
Rimrock	93.133	AB
735	93.067	AB
741	92.867	AB
716	91.717	AB
715	91.667	AB
749	89.483	ABC
661	87.883	ABC
739	86.933	BC
Nezpar	83.667	C
Paloma	48.783	D

```
Alpha              0.05     Standard Error for Comparison  3.2905
Critical T Value  2.009     Critical Value for Comparison  6.6092
Error term used: Year*Accession, 50 DF
There are 4 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

LSD All-Pairwise Comparisons Test of Seed Yield for Accession

Accession	Mean	Homogeneous Groups
661	119.85	A
749	118.33	A
741	115.66	A
739	101.70	AB
715	98.26	AB
Rimrock	94.66	ABC
735	82.19	ABC
664	81.72	ABC
716	79.89	ABC
Paloma	59.83	BC
Nezpar	53.68	C

```
Alpha              0.05     Standard Error for Comparison  22.037
Critical T Value  2.021     Critical Value for Comparison  44.538
Error term used: Year*Accession, 40 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

While there are a number of good performing products, no single source is the best performer, through time, in each of the selection categories. Hence, it is ultimately the projected demand and economical attributes that will carry these materials on. Recommendations are provided in the Conclusion section below.

SUMMARY

The data indicates that there are at least five accessions from the advanced test that have potential for plant releases to be used in clayey soils sites. Accession **9024661**, collected in **Delta County**, Colorado, had the highest **five year average for seed yield** and is **second** for **forage production** while accession **9024749** from **La Plata County**, Colorado, had produced the **greatest forage amounts** for the five years forage production was measured and is **second in seed yield**. The

collection **9024664** from **Moffat County,** Colorado, has consistently had one of the best **Percent Stands** through time, and was the number one accession in years 2007, 2008, 2009, and 2011. Accession **9024741**from **Archuleta County**, Colorado, has also been a superior performer as has accession **9024715** from **El Paso County**, Colorado. The best performing commercial variety, Rimrock, has been about the sixth best product in this trial.

Additional off Center testing will need to be continued to determine range of adaptation and performance in multiple sites through time. It is conceivable that one to five releases will come out of this project as the best commercial source, Rimrock, was the sixth best in seed yield and eighth best in biomass even though it ranked second in height and percent stand.

It is recommended that six products be increased in the very near future. Indian ricegrass has excellent shelf life, and additional testing will help substantiate the need for specific sources. In order of priority, however, in the event of budget considerations, here is the recommendation for increase.

1. 9024749
2. 9024661
3. 9024664
4. 9024715
5. 9024741
6. 9024735

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Report-2011
By: Terri Blanke

Almanac Study

INTRODUCTION

The USDA-Natural Resources Conservation Service (NRCS) uses various conservation planning tools to plan conservation systems and implement conservation practices on public and private lands. The Agricultural Land Management Alternative with Numerical Assessment Criteria (ALMANAC) is one example of the conservation planning tools developed for NRCS to enhance the conservation planning process. For these models to effectively provide conservation management information, plant growth parameters are required for a variety of plants and different management scenarios. Most NRCS conservation practice standards require plant architecture and stem properties to effectively address resource concerns. Therefore, vegetative attributes of conservation plants would be based on quantitative measurements. The Plant Material Centers would undertake additional studies to measure and quantify plant growth parameters of a wide range of herbaceous and woody plant material for various soil, plant, and water quality models. The expansion of plant materials sampled and plant parameter documentation will improve the sensitivity and responsiveness of the planning tools and models.

OBJECTIVE

Measure and collect plant growth parameters on important western rangeland species at specific growth stages for use in the conservation planning model, ALMANAC.

METHODS

This study conformed to the protocol provided by the West National Technology Support Center, Plant Material Specialist (WNTSC PMS). Parameters were measured from five plant species growing at Upper Colorado Environmental Plant Center (UCEPC) in 2010. Black chokecherry *Prunus virginiana*, Boreal sweetvetch *Hedysarum boreale*, Arizona fescue *Festuca arizonica,* western wheatgrass *Pascopyrum smithii,* and Rocky Mountain penstemon *Pestemon strictus*. Beginning in June 2010, when the selected species were near 50 percent green-up, four 1-square meter plots (per species) were evaluated and measured every two weeks. The plots were randomly chosen each period. The light measurement readings were completed using a Decagon ceptometer with an external sensor. After first, mid-season and final maturity readings – each replication was harvested. Green weight was measured, recorded, and a 40 gram sample was shipped overnight to ARS-Temple, Texas, for leaf area index analysis. All materials were allowed to dry completely and a 40 gram sample from each replication was sent to the Plant Material Center in Tucson, Arizona, for nutrient analysis. All recorded plant measurements were then sent to ARS-Temple, Texas.

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2011

In January of 2011, a UCEPC staff member attended a ceptometer training/Pollinator workshop hosted by the Plant Material Center in Lockford, California. The training focused on a more standardized procedure for taking measurements.

Four species were selected for the Almanac study in 2011, Boreal sweetvetch, Arizona fescue, Rocky Mountain penstemon and western wheatgrass. Starting in June, a total of eight readings were completed during the growing season. The same project protocol was followed in 2011.

Results

In January of 2012, a forage analysis was completed by Dairy One Cooperative Incorporated, Ithaca, New York, on all species measured by the eight western region Plant Material Centers collaborating in the 2011 study. Results for UCEPC species are listed below. A copy of the complete forage analysis can be found in the 2011 Almanac Study permanent report records at UCEPC.

Forage Analysis Results on UCEPC 2011 Species

* Percentages are an average of recordings from 4 replications.							
FEAR	6/1/2011	7.575	92.425	13.350	14.450	0.215	0.233
HEBO		11.275	88.725	29.650	33.375	0.398	0.453
PASM		8.725	91.300	19.650	21.525	0.288	0.310
PEST		10.850	89.150	20.528	23.000	0.435	0.488
	Mid Season						
FEAR	7/12/2011	5.950	94.050	12.175	12.950	0.218	0.230
HEBO		10.575	89.425	23.400	26.150	0.265	0.295
PASM		5.675	94.350	11.100	11.750	0.210	0.225
PEST		7.450	92.550	7.875	8.500	0.240	0.258
	Final Maturity						
FEAR	7/27/2011	6.650	93.350	9.675	10.375	0.180	0.193
HEBO	7/13/2011	8.200	91.800	15.725	17.150	0.145	0.160
PASM	8/3/2011	5.775	94.250	8.050	8.550	0.158	0.168
PEST	8/23/2011	6.975	93.050	6.425	6.900	0.175	0.185

UCEPC will collaborate with the USDA Natural Resources Conservation Service under the terms and conditions of the Indefinite Delivery/Indefinite Quantity (IDIQ) Contract, to perform work required for The Almanac Plant Attribute Data Collection Trial. This will be the third year of data collection.

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By: Steve Parr

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

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.

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

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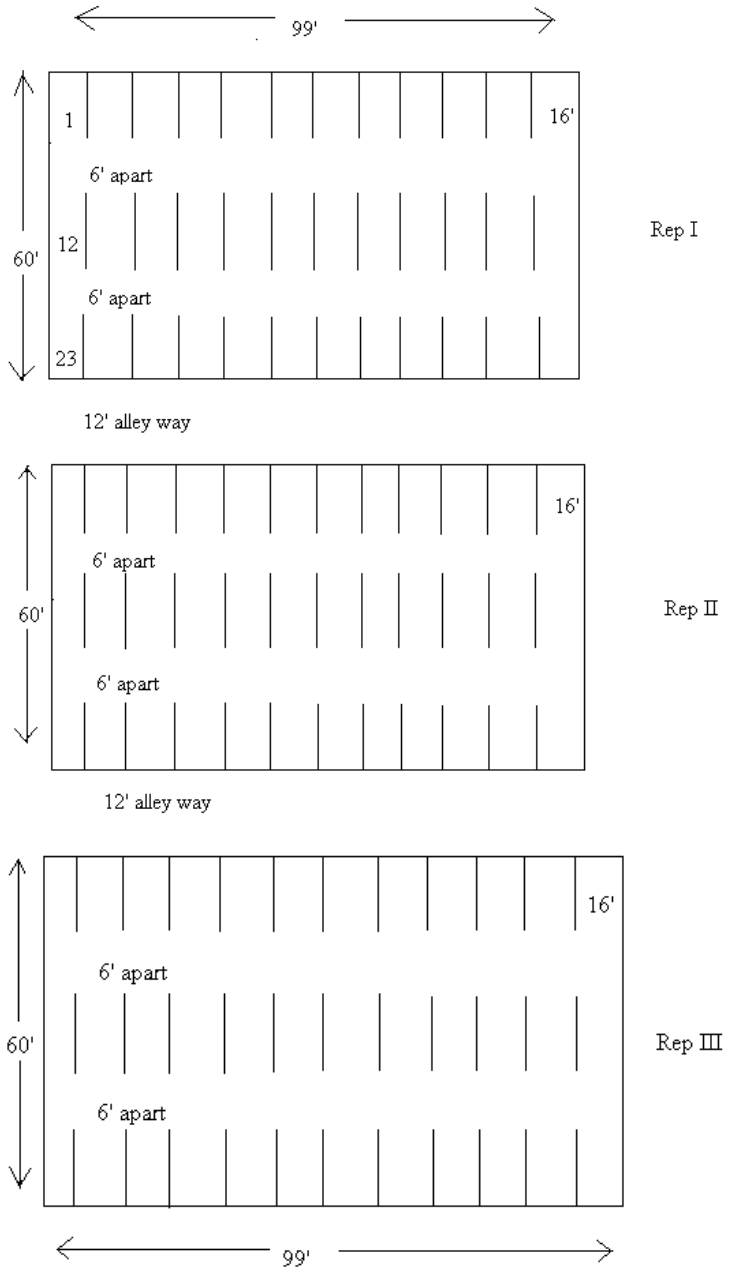
Table 2. The plot plan design for blue wildrye.



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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 percent 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.

2011

The plots were again evaluated by Terri Blanke and Heather Woodruff. Evaluations were conducted on July 26, 2011. The same variables that were evaluated in 2010 were evaluated again in 2011, with the addition of biomass. This data was analyzed statistically and is reported below.

A comparison of all the entries in the project for each parameter measured is provided below with the exception of seed weights which were not included because of seed shatter in many of the plots. Dry weight biomass, height and width were measured while vigor, percent stand, and head abundance were subjective determinations. Approximately six and one half pages follow with the data summaries for each entry. This data is provided for reference. From that data, Dry

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Weight, Vigor and Percent Stand or Cover are presented for all entries as Analysis of Variance and an all Pair wise Comparison for data summarization.

Descriptive Statistics for Accession = A

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	767.00	482.03	393.00	1311.0
HDAB	3	85.000	5.0000	80.000	90.000
Stand	3	80.000	5.0000	75.000	85.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	31.333	4.9329	28.000	37.000
Wd	3	19.333	3.2146	17.000	23.000

Descriptive Statistics for Accession = AA

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	579.67	383.57	147.00	878.00
HDAB	3	86.667	10.408	75.000	95.000
Stand	3	81.667	7.6376	75.000	90.000
Vig	3	2.6667	0.5774	2.0000	3.0000
Ht	3	33.333	2.0817	31.000	35.000
Wd	3	21.000	1.7321	19.000	22.000

Descriptive Statistics for Accession = AB

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	865.33	300.94	644.00	1208.0
HDAB	3	85.000	13.229	70.000	95.000
Stand	3	82.000	7.2111	76.000	90.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	33.667	6.0277	28.000	40.000
Wd	3	19.000	1.0000	18.000	20.000

Descriptive Statistics for Accession = AC

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	1005.7	402.40	653.00	1444.0
HDAB	3	90.000	5.0000	85.000	95.000
Stand	3	82.000	6.2450	77.000	89.000
Vig	3	2.3333	0.5774	2.0000	3.0000
Ht	3	31.667	0.5774	31.000	32.000
Wd	3	18.000	4.5826	14.000	23.000

Descriptive Statistics for Accession = AD

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	762.33	602.67	168.00	1373.0
HDAB	3	83.333	11.547	70.000	90.000
Stand	3	76.000	12.166	68.000	90.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	26.667	4.9329	21.000	30.000
Wd	3	20.333	4.6188	15.000	23.000

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Descriptive Statistics for Accession = AE

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	671.33	80.002	597.00	756.00
HDAB	3	83.333	2.8868	80.000	85.000
Stand	3	81.000	6.5574	75.000	88.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	30.000	5.1962	27.000	36.000
Wd	3	17.333	2.8868	14.000	19.000

Descriptive Statistics for Accession = AF

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	344.33	107.47	227.00	438.00
HDAB	3	60.000	26.458	30.000	80.000
Stand	3	76.000	3.6056	73.000	80.000
Vig	3	3.3333	0.5774	3.0000	4.0000
Ht	3	27.333	7.5719	22.000	36.000
Wd	3	16.000	3.0000	13.000	19.000

Descriptive Statistics for Accession = AG

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	1327.0	910.49	291.00	2000.0
HDAB	3	83.333	20.207	60.000	95.000
Stand	3	79.000	11.533	67.000	90.000
Vig	3	2.3333	0.5774	2.0000	3.0000
Ht	3	30.000	8.1854	21.000	37.000
Wd	3	16.000	6.0828	12.000	23.000

Descriptive Statistics for Accession = AH

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	412.33	193.47	249.00	626.00
HDAB	3	86.667	5.7735	80.000	90.000
Stand	3	75.667	2.0817	74.000	78.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	31.000	3.6056	27.000	34.000
Wd	3	21.667	4.1633	17.000	25.000

Descriptive Statistics for Accession = B

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	372.67	153.94	197.00	484.00
HDAB	3	66.667	15.275	50.000	80.000
Stand	3	73.000	12.530	60.000	85.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	28.333	2.0817	26.000	30.000
Wd	3	19.333	2.5166	17.000	22.000

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Descriptive Statistics for Accession = C

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	589.00	338.84	298.00	961.00
HDAB	3	83.333	5.7735	80.000	90.000
Stand	3	76.667	5.7735	70.000	80.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	32.333	3.0551	29.000	35.000
Wd	3	21.000	6.2450	14.000	26.000

Descriptive Statistics for Accession = D

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	946.00	551.52	326.00	1382.0
HDAB	3	91.667	2.8868	90.000	95.000
Stand	3	84.333	7.5056	80.000	93.000
Vig	3	2.0000	1.0000	1.0000	3.0000
Ht	3	29.667	4.0415	25.000	32.000
Wd	3	24.000	2.6458	21.000	26.000

Descriptive Statistics for Accession = E

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	482.33	271.95	249.00	781.00
HDAB	3	75.000	10.000	65.000	85.000
Stand	3	83.333	10.408	75.000	95.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	26.667	2.3094	24.000	28.000
Wd	3	17.333	2.3094	16.000	20.000

Descriptive Statistics for Accession = F

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	388.67	275.33	203.00	705.00
HDAB	3	76.667	15.275	60.000	90.000
Stand	3	56.000	20.075	33.000	70.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	27.667	5.1316	22.000	32.000
Wd	3	18.333	5.0332	13.000	23.000

Descriptive Statistics for Accession = G

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	508.67	353.19	135.00	837.00
HDAB	3	66.667	15.275	50.000	80.000
Stand	3	74.667	14.503	60.000	89.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	28.333	4.0415	24.000	32.000
Wd	3	18.000	6.9282	10.000	22.000

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Descriptive Statistics for Accession = H

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	323.67	151.01	191.00	488.00
HDAB	3	68.333	7.6376	60.000	75.000
Stand	3	65.000	13.229	50.000	75.000
Vig	3	3.3333	0.5774	3.0000	4.0000
Ht	3	26.667	2.0817	25.000	29.000
Wd	3	16.000	1.7321	14.000	17.000

Descriptive Statistics for Accession = I

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	169.00	87.607	84.000	259.00
HDAB	3	55.000	13.229	45.000	70.000
Stand	3	61.000	19.313	40.000	78.000
Vig	3	3.6667	0.5774	3.0000	4.0000
Ht	3	25.333	3.0551	22.000	28.000
Wd	3	13.667	4.7258	10.000	19.000

Descriptive Statistics for Accession = J

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	475.67	239.79	207.00	668.00
HDAB	3	81.667	7.6376	75.000	90.000
Stand	3	73.333	2.8868	70.000	75.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	24.667	3.7859	22.000	29.000
Wd	3	16.333	1.5275	15.000	18.000

Descriptive Statistics for Accession = K

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	382.33	299.27	135.00	715.00
HDAB	3	65.000	13.229	50.000	75.000
Stand	3	73.333	7.6376	65.000	80.000
Vig	3	3.3333	0.5774	3.0000	4.0000
Ht	3	30.000	7.0000	23.000	37.000
Wd	3	15.333	6.4291	8.0000	20.000

Descriptive Statistics for Accession = L

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	499.00	130.54	360.00	619.00
HDAB	3	81.667	2.8868	80.000	85.000
Stand	3	76.667	2.8868	75.000	80.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	27.000	4.5826	23.000	32.000
Wd	3	19.667	3.5119	16.000	23.000

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Descriptive Statistics for Accession = M

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	436.00	210.54	228.00	649.00
HDAB	3	81.667	7.6376	75.000	90.000
Stand	3	53.333	7.6376	45.000	60.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	29.667	7.0946	22.000	36.000
Wd	3	20.000	2.0000	18.000	22.000

Descriptive Statistics for Accession = N

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	385.67	79.053	305.00	463.00
HDAB	3	80.000	10.000	70.000	90.000
Stand	3	63.333	20.207	40.000	75.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	28.667	6.6583	23.000	36.000
Wd	3	22.667	1.1547	22.000	24.000

Descriptive Statistics for Accession = O

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	269.33	99.077	177.00	374.00
HDAB	3	76.667	2.8868	75.000	80.000
Stand	3	76.667	2.8868	75.000	80.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	26.667	0.5774	26.000	27.000
Wd	3	17.000	4.3589	14.000	22.000

Descriptive Statistics for Accession = P

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	543.67	313.01	256.00	877.00
HDAB	3	91.667	7.6376	85.000	100.00
Stand	3	78.000	9.1652	70.000	88.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	33.333	2.0817	31.000	35.000
Wd	3	20.667	3.7859	18.000	25.000

Descriptive Statistics for Accession = Q

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	828.33	299.80	542.00	1140.0
HDAB	3	88.333	10.408	80.000	100.00
Stand	3	84.333	5.1316	80.000	90.000
Vig	3	2.6667	0.5774	2.0000	3.0000
Ht	3	32.000	1.0000	31.000	33.000
Wd	3	18.667	2.3094	16.000	20.000

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Descriptive Statistics for Accession = R

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	482.67	242.32	262.00	742.00
HDAB	3	73.333	11.547	60.000	80.000
Stand	3	67.000	2.6458	65.000	70.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	27.667	3.2146	24.000	30.000
Wd	3	17.333	3.5119	14.000	21.000

Descriptive Statistics for Accession = S

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	470.33	674.31	48.000	1248.0
HDAB	3	75.000	18.028	60.000	95.000
Stand	3	38.333	20.207	20.000	60.000
Vig	3	3.6667	0.5774	3.0000	4.0000
Ht	3	26.333	7.7675	20.000	35.000
Wd	3	19.333	4.5092	15.000	24.000

Descriptive Statistics for Accession = T

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	152.33	85.002	67.000	237.00
HDAB	3	76.667	15.275	60.000	90.000
Stand	3	21.667	7.6376	15.000	30.000
Vig	3	3.3333	0.5774	3.0000	4.0000
Ht	3	22.667	7.6376	16.000	31.000
Wd	3	13.000	7.0000	8.0000	21.000

Descriptive Statistics for Accession = V

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	355.67	209.71	178.00	587.00
HDAB	3	83.333	5.7735	80.000	90.000
Stand	3	37.000	6.9282	33.000	45.000
Vig	3	3.3333	0.5774	3.0000	4.0000
Ht	3	31.000	1.7321	30.000	33.000
Wd	3	22.000	3.0000	19.000	25.000

Descriptive Statistics for Accession = W

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	401.00	98.321	292.00	483.00
HDAB	3	80.000	8.6603	70.000	85.000
Stand	3	76.667	10.408	65.000	85.000
Vig	3	3.0000	0.0000	3.0000	3.0000
Ht	3	27.000	4.5826	22.000	31.000
Wd	3	15.667	2.0817	14.000	18.000

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Descriptive Statistics for Accession = X

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	1373.7	141.00	1221.0	1499.0
HDAB	3	98.333	2.8868	95.000	100.00
Stand	3	88.333	1.5275	87.000	90.000
Vig	3	1.6667	0.5774	1.0000	2.0000
Ht	3	33.667	5.1316	28.000	38.000
Wd	3	17.000	7.8102	12.000	26.000

Descriptive Statistics for Accession = Y

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	469.67	425.31	30.000	879.00
HDAB	3	75.000	25.000	50.000	100.00
Stand	3	68.333	11.547	55.000	75.000
Vig	3	2.6667	0.5774	2.0000	3.0000
Ht	3	21.000	1.0000	20.000	22.000
Wd	3	19.000	6.0828	12.000	23.000

Descriptive Statistics for Accession = Z

Variable	N	Mean	SD	Minimum	Maximum
Drywt	3	548.00	273.05	248.00	782.00
HDAB	3	70.000	17.321	50.000	80.000
Stand	3	79.000	10.392	67.000	85.000
Vig	3	2.3333	0.5774	2.0000	3.0000
Ht	3	22.000	4.5826	18.000	27.000
Wd	3	22.333	1.1547	21.000	23.000

Analysis of Variance is provided for Cover for each entry below.

Randomized Complete Block AOV Table for Cover

Source	DF	SS	MS	F	P
Rep	2	1038.6	519.313		
Accession	32	21487.0	671.468	7.05	0.0000
Error	64	6093.4	95.209		
Total	98				

Note: SS are marginal (type III) sums of squares

Grand Mean 70.990 CV 13.74

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	407.03	407.028	4.51	0.0376
Remainder	63	5686.35	90.259		

Relative Efficiency, RCB 1.09

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Means of Cover for Accession

Accession	Mean	Accession	Mean	Accession	Mean
A	80.000	D	84.333	O	76.667
AA	81.667	E	83.333	P	78.000
AB	82.000	F	56.000	Q	84.333
AC	82.000	G	74.667	R	67.000
AD	76.000	H	65.000	S	38.333
AE	81.000	I	61.000	T	21.667
AF	76.000	J	73.333	V	37.000
AG	79.000	K	73.333	W	76.667
AH	75.667	L	76.667	X	88.333
B	73.000	M	53.333	Y	68.333
C	76.667	N	63.333	Z	79.000

Observations per Mean 3
Standard Error of a Mean 5.6335
Std Error (Diff of 2 Means) 7.9670

Analysis of Variance is provided for Vigor immediately below, and Dry Weight (biomass) afterwards with Pair Wise Comparisons for the three variables finalizing the statistical analysis.

Randomized Complete Block AOV Table for Vigor

Source	DF	SS	MS	F	P
Rep	2	0.5051	0.25253		
Accession	32	17.1717	0.53662	3.17	0.0000
Error	64	10.8283	0.16919		
Total	98				

Note: SS are marginal (type III) sums of squares

Grand Mean 2.9293 CV 14.04

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	1.41034	1.41034	9.43	0.0031
Remainder	63	9.41794	0.14949		

Relative Efficiency, RCB 1.01

Means of Vigor for Accession

Accession	Mean	Accession	Mean	Accession	Mean
A	3.0000	D	2.0000	O	3.0000
AA	2.6667	E	3.0000	P	3.0000
AB	3.0000	F	3.0000	Q	2.6667
AC	2.3333	G	3.0000	R	3.0000
AD	3.0000	H	3.3333	S	3.6667
AE	3.0000	I	3.6667	T	3.3333
AF	3.3333	J	3.0000	V	3.3333
AG	2.3333	K	3.3333	W	3.0000
AH	3.0000	L	3.0000	X	1.6667
B	3.0000	M	3.0000	Y	2.6667
C	3.0000	N	3.0000	Z	2.3333

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Observations per Mean	3
Standard Error of a Mean	0.2375
Std Error (Diff of 2 Means)	0.3358

Randomized Complete Block AOV Table for DryWt

Source	DF	SS	MS	F	P
Rep	2	1177275	588638		
Accession	32	7916646	247395	2.40	0.0015
Error	64	6601123	103143		
Total	98				

Note: SS are marginal (type III) sums of squares

Grand Mean 563.28 CV 57.02

Tukey's 1 Degree of Freedom Test for Nonadditivity

Source	DF	SS	MS	F	P
Nonadditivity	1	507425	507425	5.25	0.0254
Remainder	63	6093698	96725		

Relative Efficiency, RCB 1.10

Means of DryWt for Accession

Accession	Mean	Accession	Mean	Accession	Mean
A	767.0	D	946.0	O	269.3
AA	579.7	E	482.3	P	543.7
AB	865.3	F	388.7	Q	828.3
AC	1005.7	G	508.7	R	482.7
AD	762.3	H	323.7	S	470.3
AE	671.3	I	169.0	T	152.3
AF	344.3	J	475.7	V	355.7
AG	1327.0	K	382.3	W	401.0
AH	412.3	L	499.0	X	1373.7
B	372.7	M	436.0	Y	469.7
C	589.0	N	385.7	Z	548.0

LSD All-Pairwise Comparisons Test of Drywt for Accession

Accession	Mean	Homogeneous Groups
X	1373.7	A
AG	1327.0	AB
AC	1005.7	ABC
D	946.0	ABCD
AB	865.3	ABCDE
Q	828.3	BCDEF
A	767.0	CDEFG
AD	762.3	CDEFG
AE	671.3	CDEFGH
C	589.0	CDEFGH
AA	579.7	CDEFGH
Z	548.0	CDEFGH
P	543.7	CDEFGH

G	508.7	CDEFGH
L	499.0	CDEFGH
R	482.7	CDEFGH
E	482.3	CDEFGH
J	475.7	DEFGH
S	470.3	DEFGH
Y	469.7	DEFGH
M	436.0	DEFGH
AH	412.3	EFGH
W	401.0	EFGH
F	388.7	EFGH
N	385.7	EFGH
K	382.3	EFGH
B	372.7	EFGH
V	355.7	EFGH
AF	344.3	EFGH
H	323.7	FGH
O	269.3	GH
I	169.0	H
T	152.3	H

Alpha 0.05 Standard Error for Comparison 262.22
Critical T Value 1.998 Critical Value for Comparison 523.85
Error term used: Rep*Accession, 64 DF
There are 8 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Stand for Accession

Accession	Mean	Homogeneous Groups
X	88.333	A
D	84.333	A
Q	84.333	A
E	83.333	AB
AB	82.000	ABC
AC	82.000	ABC
AA	81.667	ABC
AE	81.000	ABC
A	80.000	ABCD
AG	79.000	ABCDE
Z	79.000	ABCDE
P	78.000	ABCDE
C	76.667	ABCDEF
L	76.667	ABCDEF
O	76.667	ABCDEF
W	76.667	ABCDEF
AD	76.000	ABCDEF
AF	76.000	ABCDEF
AH	75.667	ABCDEF
G	74.667	ABCDEF
J	73.333	ABCDEF
K	73.333	ABCDEF
B	73.000	ABCDEF
Y	68.333	BCDEFG
R	67.000	CDEFG

```
H          65.000     DEFG
N          63.333      EFG
I          61.000       FG
F          56.000        G
M          53.333        GH
S          38.333         HI
V          37.000          IJ
T          21.667           J

Alpha              0.05     Standard Error for Comparison  7.9670
Critical T Value  1.998     Critical Value for Comparison  15.916
Error term used: Rep*Accession, 64 DF
There are 10 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

LSD All-Pairwise Comparisons Test of Vig for Accession

Accession	Mean	Homogeneous Groups
S	3.6667	A
I	3.6667	A
AF	3.3333	AB
H	3.3333	AB
K	3.3333	AB
T	3.3333	AB
V	3.3333	AB
A	3.0000	ABC
AB	3.0000	ABC
AD	3.0000	ABC
AE	3.0000	ABC
AH	3.0000	ABC
B	3.0000	ABC
C	3.0000	ABC
E	3.0000	ABC
F	3.0000	ABC
G	3.0000	ABC
J	3.0000	ABC
L	3.0000	ABC
M	3.0000	ABC
N	3.0000	ABC
O	3.0000	ABC
P	3.0000	ABC
R	3.0000	ABC
W	3.0000	ABC
AA	2.6667	BCD
Q	2.6667	BCD
Y	2.6667	BCD
AC	2.3333	CDE
AG	2.3333	CDE
Z	2.3333	CDE
D	2.0000	DE
X	1.6667	E

```
Alpha              0.05     Standard Error for Comparison  0.3358
Critical T Value  1.998     Critical Value for Comparison  0.6709
Error term used: Rep*Accession, 64 DF
```

```
There are 5 groups (A, B, etc.) in which the means
are not significantly different from one another.
```

From the analysis of biomass, the following entries are significantly different from the remaining entries based on dry weight.

X	1373.7	A
AG	1327.0	AB
AC	1005.7	ABC
D	946.0	ABCD
AB	865.3	ABCDE
Q	828.3	BCDEF

This follows closely with vigor where "1" is excellent and "5" is very poor. Again, of the above superior products by biomass, five of the seven were also considered to have the best vigor out of the 33 entries. Each group separated by a "lettered group" is significantly different from other lettered groups. Three groups are presented entirely, E, DE, and CDE below, and two entries from BCD.

Q	2.6667	BCD
Y	2.6667	BCD
AC	2.3333	CDE
AG	2.3333	CDE
Z	2.3333	CDE
D	2.0000	DE
X	1.6667	E

Finally, while there is no difference statistically at the five percent level, the top ten products by percent stand are listed below.

X	88.333	A
D	84.333	A
Q	84.333	A
E	83.333	AB
AB	82.000	ABC
AC	82.000	ABC
AA	81.667	ABC
AE	81.000	ABC
A	80.000	ABCD
AG	79.000	ABCDE

Only entry "AB" is missing from the top group in the Vigor category, so there is consistency with top performance across these three variables for five of the six highest biomass yielding entries. These materials have performed reasonably well in past evaluations. These past evaluations are summarized in Tables 3 and 4 from Appendices 1-4.

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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 $P<0.05$.

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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

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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 appernc.
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 appernc.
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- 2011
By: Steve Parr

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	
1= 1-15%	**2**= 16-25%
3= 26-50%	**4**= 51-75%
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- 2011
By: Steve Parr

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

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

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

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

Project: COPMC-P-0701-CR
Report- 2011
By: Steve Parr

Appendix 4. Plant vigor, percent plant stand, height, width, tallest seed head and percent seed head appearance for July 2010 evaluation.

REP I	Plant Vigor	% Stand Cover	Height (cm)	Width (cm)	Head app. %	Tallest seed Head
A	3	80	86	46	75	84
AA	3	70	66	45	65	70
AB	3	85	74	33	80	89
AC	3	80	67	40	75	83
AD	3	85	53	42	80	88
AE	4	60	73	33	40	83
AF	4	65	59	39	50	93
AG	3	70	67	37	80	103
AH	3	65	63	34	70	93
B	2	75	54	37	90	92
C	4	60	56	42	40	79
D	3	85	69	45	70	87
E	2	90	62	39	90	88
F	4	50	54	27	30	77
G	3	70	62	35	65	81
H	4	60	48	44	80	72
I	4	70	50	35	75	76
J	3	80	70	42	95	92
K	3	75	66	56	85	87
L	3	80	49	37	80	71
M	4	45	49	36	40	88
N	4	85	59	40	75	76
O	4	65	55	47	60	74
P	3	70	55	45	60	84
Q	2	90	69	48	75	90
R	3	60	53	34	70	86
S	4	20	42	18	35	79
T	4	30	34	22	40	64
V	4	25	40	37	50	73
W	2	75	55	32	85	69
X	1	95	80	37	100	97
Y	3	80	38	45	60	57
Z	2	90	38	43	70	70

REP II	Plant Vigor	% Stand Cover	Height (cm)	Width (cm)	Head app. %	Tallest Head
Z	2	85	47	45	85	80
Q	3	90	65	33	85	95
L	3	80	64	54	70	82
AD	3	65	68	44	90	86
V	4	25	55	40	50	84
K	3	70	61	36	70	80
B	1	90	66	44	95	85
H	3	65	62	39	70	85
AF	3	80	62	46	80	82
AA	3	80	69	40	84	90
S	4	33	45	25	45	71
I	4	55	59	32	80	78
R	3	65	65	37	75	78
E	2	85	70	47	85	92
J	3	65	50	29	65	76
AH	3	65	61	33	80	80
AE	2	80	67	51	90	82
AB	3	85	52	44	80	92
C	3	75	57	46	90	84
M	4	40	44	16	50	108
N	3	65	65	40	75	100
A	2	90	76	50	90	89
X	1	95	73	28	100	97
G	4	80	46	31	75	87
AG	3	70	77	40	85	110
T	4	10	39	24	3	55
P	3	75	71	37	80	79
O	4	65	39	33	50	72
D	3	80	56	41	75	75
Y	3	80	46	31	50	61
AC	2	80	55	45	90	88
F	4	75	35	22	40	84
W	3	95	55	30	70	70

REP III	Plant Vigor	% Stand Cover	Height (cm)	Width (cm)	Head app. %	Tallest Head
N	4	40	70	36	75	84
X	1	95	91	32	100	98
F	4	20	54	24	55	73
H	4	65	48	29	50	67
Y	3	75	44	36	85	63
P	3	85	65	31	85	92
O	4	80	41	29	70	76
L	3	90	57	33	85	93
J	3	80	61	39	80	97
AH	3	85	62	40	80	90
Z	1	95	64	48	100	76
AF	3	65	48	42	50	91
D	3	75	57	31	80	87
M	4	35	61	42	50	82
V	4	45	56	31	45	82
C	3	85	70	38	80	95
K	3	70	60	33	80	92
I	3	80	68	34	70	87
G	3	90	64	33	80	92
AC	2	85	82	39	80	96
AA	3	80	63	41	80	92
AD	3	75	68	42	80	102
AB	4	60	66	29	70	77
T	4	20	50	21	50	66
S	4	60	52	21	40	71
AG	4	75	60	31	55	99
Q	3	90	65	36	85	87
AE	3	80	64	36	80	92
E	3	75	62	41	80	82
A	3	75	55	41	75	109
R	4	50	58	42	40	91
W	4	85	43	32	75	73
B	3	60	61	34	80	81

*'X' no visible bug damage at all

Vigor
5-none
4- Poor
3- Fair
2- Good
1- Excellent

* 'I' heavy seed heads

* 'B' tractor damage

Blue Wildrye Project
Evaluations

Date Evaluated: 7/14/2010

Person(s) Evaluating: H P, TB and CT

Project: COPMC-P-0701-CR
Report- 2011
By: Steve Parr

CONCLUSION

The Initial Evaluation of Medicine Bow-Routt blue wildrye is completed. From the planting of the project in 2007 until its completion in 2011, there are a number of products that have surfaced as being well adapted to the testing site at UCEPC. Four standards for comparison were included in the project; two releases from the Corvallis, Oregon, Plant Materials Center and two that were experimental products that were subsequently released from the Pullman, Washington, Plant Materials Center. Only product "X" exhibited superior performance, through time, at this site. From Medicine Bow-Routt National Forest collections, products AB, AC, AG, and D were consistently good materials. Products E, L, and A were also reasonably good, but not as consistent. The only other entry that was good through time was product Q, a UCEPC collection.

At the conclusion of the project, Marti Aitken, Medicine Bow – Routt Botanist, suggested testing the seed of the better performing materials to determine if there were major differences in germination quality. As a result, entries AC, AG and D were submitted for laboratory analysis. Those results were also excellent with germinations of 90, 98, and 96 percent, respectively for each of the above materials. The above collections also represent three different seed zones, which provides some options for future development. Entry AC is from seed zone 215 near the California Park – Slater Park perimeter. AG is from seed zone 214 on Rabbit Ears Pass. D is from the eastern end of Road 285.2 from seed zone 481. Also, collection AB is from the border of California – Slater Park as well, and has been a good performer as has AE, seed zone 214 from Coulton Creek.

Blue wildrye is a relatively short lived, understory product of aspen forests. At least four collections representing three different seed zones have done reasonably well in an open, agronomic setting without any supplemental irrigation for four years. These collections performed better through time than three of four released products that originated from Washington and Oregon. The potential commercial utilization of a north-central Colorado blue wildrye release seems promising. Seed increase of one or more of these products is a logical next step. However, USFS Medicine Bow-Routt and NRCS will need to verify interest and need before the project is moved into seed increase.

Project COPMC-S-9105-RI
Report-2011
By: Terri Blanke

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, ⅜-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 ¼ 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.

2006

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.

2007

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.

Project COPMC-S-9105-RI
Report-2011
By: Terri Blanke

2008

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

2009

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.

2010

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 seed 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.

2011

In 2011, demand for the silver buffaloberry continued. Ten potted silver buffaloberry plants were delivered in March to Soren Nielsen, USDA-NRCS, Manti, Utah, for a comparison planting.

Project COPMC-S-9105-RI
Report-2011
By: Terri Blanke

Twenty potted plants were delivered to Brock Benson, USDA-NRCS, Ogden, Utah, for a riparian restoration project with cooperator Lyle Holmgren.

Patrick Lionberger, USDI BLM, Rawlins field office, picked up eight potted silver buffaloberry plants for the Muddy Creek Enhancement Project in Wyoming.

The silver buffaloberry produced seed in 2011. It was noted that two more of the shrubs appear to be females. High winds caused damage to some of the branches and light pruning was done to keep the trunks from splitting. The row received supplemental watering twice during the growing season and glyphosate was applied to help control invasive weeds.

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

RESULTS

Silver buffaloberry shrubs remain in Field 19 at UCEPC. The shrubs have multiple trunks and have grown from 8 to10 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
2011	169 g

Buffaloberry seed is easily germinated in the greenhouse. A 30 day cold stratification period increases germination percentages. 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. 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.

Project COPMC-S-9901-CR
Report 2011
Report by: Steve Parr

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 produces 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 0.6-5 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.

Project COPMC-S-9901-CR
Report 2011
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 percent. 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.

2011

Johnnie Barton and seasonal help transplanted materials into six condensed rows for seed production.

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.

2011

On August 5, there were 3.5 pounds harvested by hand. The field is quite clean and much improved over the last several years. Additionally, upon plant green-up, samples were submitted to the ARS Noxious Weed Laboratory in Logan, Utah for analysis. This species, along with

several other species of the genus *Senecio* and *Packera* were identified to harbor toxic compounds and collectively are not suitable for range revegetation recommendations where livestock grazing could encounter the planted materials.

CONCLUSION

Seed production of Bigelow's groundsel will continue in 2012 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. Although the samples were positive for toxic compounds, there is still a great upside for the use of this species. Specifically, this particular species may have enough of a unique application on very high elevation disturbances and provide a higher benefit than the use of other products, that continued development may be warranted. In discussions with Colorado State University about the potential uses for this product, there was enthusiastic support. As such, development will continue without the partnership of NRCS at least in the short term.

Project COPMC-T-0901-RA
Report 2011
By: Steve Parr

Regional Comparative Evaluation of Bottlebrush Squirreltail

Excerpted, in part, from James Briggs and Loren St. John

Objective

The purpose of this study is to document performance differences of the selections in common gardens located at sites representing diverse western habitats.

Introduction

Bottlebrush squirreltail (*Elymus elymoides* ssp. *elymoides*, ssp. *brevifolius* and ssp. *californicus* and big squirreltail *Elymus multisetus*) are short-lived, drought tolerant, cool season, native bunchgrasses. They are short to medium sized (6 to 22 inches tall), tufted and have fair forage value in winter and spring and poor forage value in summer when seed heads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. These species are often increasers on poor condition to improving rangelands. They are adapted to a wide variety of soils including saline soils in the 8-18 inch precipitation zones (Barkworth 2009). It is hoped these species will have attributes that will enable them to establish a foothold in annual rangelands dominated by cheatgrass (*Bromus tectorum*) or medusahead (*Taeniatherum caput-medusae*). ARS and NRCS have released three squirreltail accessions; Toe Jam Selected Germplasm (*E. elymoides* ssp. *californicus*) in 2003; Fish Creek Selected Germplasm (*E. elymoides* ssp. *elymoides*) in 2003; and Sand Hollow (*E. elymoides*) in 1996. Sand Hollow is best adapted to sandy foothill rangelands receiving 12 inches or more annual precipitation in the lower Snake River Plains (Monsen 2004). Toe Jam is best adapted to loam to sandy loam soils in the Great Basin and lower to middle Snake River Plains receiving 8-14 inches of precipitation (Monsen 2004). Fish Creek is best adapted to sandy loam to silt loam to clay loam soils receiving 10 inches or more annual precipitation in the middle to upper Snake River Plains (Monsen 2004). Tusas Germplasm (*E. elymoides* ssp. *brevifolius*) was released in 2001 by NRCS and New Mexico State University. It is intended for use in the southwestern United States (USDA1 2006). Wapiti Germplasm (*E. elymoides* ssp. *brevifolius*) and Pueblo Germplasm (*E. elymoides* ssp. *brevifolius)* were released in 2005 by Upper Colorado Environmental Plant Center (UCEPC) and ARS (USDA 2006). UCEPC also has an experimental accession (9092275) that shows promise for potential release. 9092275 was has been initially identified as *E. elymoides* ssp. *brevifolius* and comes from Eagle County, Colorado, elevation 7720 feet on a northwest aspect. Larson (2003) conducted a DNA analysis of 46 collections of squirreltail from the intermountain west and identified and plotted on a map several genetically distinct populations of *E. elymoides* ssp. *brevifolius.* Each genetically distinct population is/was associated with different ecoregions.

Sand Hollow was not included in this trial because it is no longer commercially available (USDA 2009). Pueblo was not included in the trial with the other centers because seed was not available in 2009, but was planted at UCEPC in 2011.

Project COPMC-T-0901-RA
Report 2011
By: Steve Parr

Materials and Methods

Western Plant Materials Centers

Seed of Fish Creek Germplasm, Toe Jam Creek Germplasm, Tusas Germplasm, Wapiti Germplasm, and experimental line 9092275 were planted at Aberdeen, Idaho, in spring 2009; and Los Lunas, New Mexico Plant Material Centers (PMC). The Montana PMC planted the Fish Creek and Wapiti lines at two off-center locations in the spring of 2009. Each PMC is able to evaluate performance in different habitats described by Major Land Resource Areas (MLRA) (USDA (2) 2006) and EPA eco-regions. The Aberdeen PMC is located at 4400 feet elevation and is in the Snake River Plain region (MLRA 11 and EPA Eco-region 11), Meeker PMC is located in the Colorado plateau at 6200 feet elevation (MLRA 34a and EPA Eco-region 20), Los Lunas PMC is in the Arizona and new Mexico plateau region at 4800 feet elevation (MLRA 35 and EPA Eco-region 22). The Montana PMC locations were at Havre and Moccasin which are within the North Western Great Plains (MLRAs 52 and 58a and 42 and 43 EPA-ecoregions, respectively). (Fallon, Nevada, proposed fall 2011).

At the New Mexico and Idaho sites squirreltail entries were planted into an 8 by 20 foot plot with 8-12 inch drill row spacing, replicated three times in a randomized complete block design (RCB). The plots were planted at Aberdeen on June 10, 2009. Planting dates were variable and were appropriate to the site. Seeding rate was 7 lbs Pure Live Seed (PLS) per acre. Plots were irrigated to field capacity prior to planting and were subsequently irrigated as needed to ensure establishment during the first growing season. No further irrigation was applied in subsequent years. Weeds were controlled as needed. The Montana sites were not irrigated, and were planted with 14 inch row spacing using a Kincaid single disk plot planter in plots 4.5 X 20 feet replicated four times.

In year 1, entries were evaluated for stand and vigor. In years 2-3, documented observations of green-up, anthesis, seed maturity dates, stand evaluation, and ocular evaluation of seed production were all conducted. Air-dry biomass production was determined by harvesting a 1 meter sample from the plot interior.

Upper Colorado Environmental Plant Center

Bottlebrush squirreltail accessions, Toe Jam Selected Germplasm (*E. elymoides* ssp. *californicus*; Fish Creek Selected Germplasm (*E. elymoides* ssp. *elymoides*); Tusas Germplasm (*E. elymoides* ssp. *brevifolius*); Pueblo Germplasm(*E. elymoides* ssp. *brevifolius*); Wapiti Germplasm (*E. elymoides* ssp. *brevifolius*); Little Snake source bottlebrush (*E. elymoides* ssp. *elymoides*); Masadona source (*E. elymoides* ssp. *elymoides*); and 9099275 (*E. elymoides* ssp. *brevifolius),* were planted at UCEPC in Meeker, Colorado, on August 22, 2011. The plot plan is provided below.

Project COPMC-T-0901-RA
Report 2011
By: Steve Parr

Rep IV

Little Snake	Masadona
Pueblo	Tusas
Wapiti	Fish Creek
Toe Jam	BLM

Rep V

Wapiti	BLM
Toe Jam	Masadona
Tusas	Pueblo
Little Snake	Fish Creek

Rep VI

Toe Jam	Pueblo
Wapiti	Masadona
Tusas	Fish Creek
BLM	Little Snake

Rep I

Toe Jam	Wapiti
Fish Creek	BLM
Tusas	Pueblo
Masadona	Little Snake

Rep II

Masadona	Pueblo
Toe Jam	Fish Creek
BLM	Wapiti
Tusas	Little Snake

Rep III

Tusas	Pueblo
Wapiti	Fish Creek
Toe Jam	Masadona
Little Snake	BLM

Project COPMC-T-0901-RA
Report 2011
By: Steve Parr

The project consists of six replications of eight bottlebrush squirreltail products; five released materials and three experimental lines from UCEPC. The project was irrigated to initiate germination.

Results

No evaluation was conducted in 2011, but germination was occurring as fall dormancy set in around September 20, 2011. Casual observation found that Little Snake was performing well and Wapiti was the next best established product.

Project: COPMC-T-0904-WL
Report- 2011
By: Heather Plumb & Terri Blanke

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- 2011
By: Heather Plumb & Terri Blanke

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 WY)	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- 2011
By: Heather Plumb & Terri Blanke

The 2010 growing season was the last year of evaluations for the Piceance Basin source sage grouse materials. Propagation protocols were written for the respective materials. Protocols for the materials can be found on the Native Plants Network. The information gathered from this project will be useful if efforts to continue production by seed increase plots of Utah sweetvetch, Lewis flax, sego lily, wild onion, and sulphur buckwheat.

2011

On June 10, 2011, UCEPC staff staked out five plots for the Piceance Basin source material seed increase in Field-3. Each plot was 50 feet long with a 5-foot alley dividing each specie. A hand pushed belt seeder was used for planting the material. **Table 2.** Provides the accession number for each species and the amount of seed used in each 50-foot plot.

Table 2. Accession number, specie and quantity of seed used from Piceance Basin source sage-grouse material seed increase.

Accession	Species	Amount
9092298	Utah sweetvetch	16 g
9092293	Sulpher buckwheat	16 g
9092299	Sego lily	6 g
9092292	Flax	4 g
9092297	Wild onion	8 g

Irrigation was applied to the rows immediately after they were planted. Hand rouging was done to suppress invasives and an evaluation was conducted on September 19, 2011. **Table 3.** provides information from the evaluation.

Table 3. Piceance Basin source sage grouse material evaluation

Species	Plants	Vigor	Stand	Damage
Utah sweetvetch	24	4	15%	wash out
Sulpher buckwheat	11	4	3%	
Flax	21	4	8%	wash out
Sego lily	0	5	0%	
Wild onion	0	5	0%	
Plants= actual count				
Vigor 1=Excellent 2=Good 3=Fair 4=Poor 5=No plant				
Stand=50 Ft row is 100%				

Project: COPMC-T-0904-WL
Report- 2011
By: Heather Plumb & Terri Blanke

CONCLUSION

Due to the wash out damage to the rows from irrigation, UCEPC will monitor the rows for germination in the spring of 2012 and determine then if the Piceance Basin source sage grouse materials should be replanted or relocated to another field where irrigation can be more controlled.

BRYCE CANYON NATIONAL PARK

FY2011 Annual Report
Prepared by

UPPER COLORADO ENVIRONMENTAL PLANT CENTER
MEEKER, COLORADO

INTRODUCTION – The National Park Service, Bryce Canyon National Park of the U.S. Department of Interior (BCNP) and the Natural Resources Conservation Service; Colorado (NRCS) signed Interagency Agreement 1211-11-04 in May 2011. The agreement calls for Upper Colorado Environmental Plant Center (UCEPC) to establishment a 0.5 acre field of Indian ricegrass, *Achnatherum hymenoides*, and continue to maintain the 0.5 acre field of nodding brome grass *Bromus anomalus* established in 2008. This agreement will remain in effect until September 30, 2015.

ACCOMPLISHMENTS – In July and October of 2011, UCEPC received Indian ricegrass seed that had been collected in 2008, 2009 and 2010 by BCNP personnel for the establishment of the 0.5 acre field. The collections produced 620 grams of cleaned seed. A sample was sent to the Wyoming Seed Analysis Laboratory for a TZ test. UCEPC planted 16 rows with a Planet Jr. at 40 seeds per foot based on the 82% TZ. There were 557 grams used for the planting.

The 0.5 acre of nodding brome has been producing since 2009. The table below lists yearly production information. The field receives a fertilizer application of 30-10-5-5, at 35 gallons per acre. An herbicide treatment of Buctril 2,4-D and methylated seed oil is applied in the spring to help control broad leaf weeds. Milestone is applied as a spot spray treatment targeting Canada thistle.

The table below lists the information for the *Bromus anomalus* field.

Bryce Canyon National Park Inventory 02/24/2012						
Bromas anomalus						
Species	Lot #	Field size	Bulk lb	PLS %	PLS lb	Test Date
BRAN	2009	0.5	**25**	43.21%	**10.80**	2/8/10
BRAN	2010	0.5	**87**	29.57%	**25.73**	2/8/11
BRAN	2011	0.5	**241**	31.36%	**75.50**	1/30/12

TECHNOLOGY DEVELOPMENT – There was concern that the application of the herbicide, Metsulfuron (Escort) had some effect on the nodding brome seed's germination process. The test results from the Colorado Seed Laboratory were comparable to those discovered in the UCEPC greenhouse. A different herbicide treatment was applied in the field in 2010 and 2011. Germination percentages remain low but have risen a small percent. UCEPC continues to

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. UCEPC is also investigating various seed cleaning techniques in hopes of damage reduction in the awn/hull removal process.

CANYON de CHELLY NATIONAL MONUMENT

FY2011 Annual 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. Due to poor native seed collection conditions and staff to collect native seed, the NPS was unable to provide enough seed to UCEPC to enable them to establish seed increase fields. In August of 2010, CDCNM and NRCS mutually agreed to extend the agreement to facilitate completion of the contract. T he amendment provided a two year extension, concluding December 31, 2012.

ACCOMPLISHMENTS – The Indian ricegrass and western wheatgrass fields have been established. The 2011 growing season was the second year of harvest for both materials. The Indian ricegrass cleaned seed weight was 143 pounds and seed test results came back with a 53.91 percent pure live seed (PLS). The western wheatgrass produced 611 pounds of clean seed and its seed test results came back with 61.85 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
AcHy	2011	"	143 lbs	53.91	77 lbs	10/28/2011
PaSm	2010	1.27 acres	321 lbs	77.55	249 lbs	1/10/2011
PaSm	2011	"	611 lbs	61.85	378 lbs	2/17/2012

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

The Indian ricegrass field has finally established, including the additional planted rows from 2009. UCEPC used seed produced in 2010 to fill skips in the field and production was increased. The source of Indian ricegrass chosen for increase may be an inferior producer or more dormant for seed and plants. The field was harvested two times during the 2011 season. The first harvest was conducted using a Flail-Vac harvester. Three days later it was harvested with UCEPC's combine.

The western wheatgrass field has done extremely well for its two years of seed production. The direct seeded part of the field and the plugged portion of the field have shown no variance. With seed production being high in 2010 and 2011, the field should provide ample seed quantity for the final year of the agreement.

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

GREAT SAND DUNES
NATIONAL PARK AND PRESERVE

FY2011 Annual 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 expired on September 30, 2011.

ACCOMPLISHMENTS - Indian ricegrass was harvested during the summer of 2011, but adequate ring muhly seed had been produced for park needs. The harvested seed was cleaned, and tested at the Wyoming seed lab and is on inventory at UCEPC. Indian ricegrass clean seed weight was 51 pounds. The Indian ricegrass came back with 48 percent pure live seed (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
ACHY	2011	0.5	51.0 lb	47.74	24.35 lb	1/9/2012
ACHY	2010	0.5	41.0 lb	34.77	14 lb	12/1/2010
ACHY	2009	0.5	6.2 lb	20.93	1 lb	1/14/2010
MUTO	2010	0.2	4.6 lb	74.00	3 lb	12/6/2010
MUTO	2009	0.2	3.4 lb	31.35	1 lb	12/22/2009

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

TECHNOLOGY DEVELOPMENT - Standard cultural practices, harvest, and cleaning protocols were utilized to produce seed of Indian ricegrass.

When comparing seed lab results from the Indian ricegrass field from over the years it has 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.

ROCKY MOUNTAIN NATIONAL PARK
BEAR LAKE ROAD AGREEMENT

FY2011Annual 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) had previously signed cooperative agreements for all work conducted relative to seed and plant needs for the park. However, plant materials agreement (IA Project No. 1211-10-08) signed in September of 2010 was between NRCS and Rocky Mountain National Park. UCEPC would conduct seed increase work through an agreement with NRCS to provide the needed materials. This agreement added four species for seed increase activities to previously produced materials from an earlier agreement between these same entities. This agreement involves seed production of five forbs and seven grass species for revegetation of the Bear Lake Road Project for one year, with the removal of two forbs, fringed sage and hairy golden aster, to follow the 2010 harvest. The Bear Lake Road Project involves widening Bear Lake Road by two feet for ten miles, adding pullouts and retaining walls, widening switchbacks, and expanding some of the parking lots. This will amount to 20 acres of disturbance with an elevation change of 1500 feet. The first of two phases was completed in December 2005. Seed production of the same species has been identified for use in the second phase along with the addition of four new species in 2011.

ACCOMPLISHMENTS - This year, six of the ten target production materials were harvested for use in the revegetation of the Bear Lake Road Project. Two forbs, purple locoweed, and rose pussytoes produced harvestable seed. The third forb, Louisiana sage, was produced through the greenhouse and plugs were transplanted July 4, 2011. There was no seed produced from this species in 2011.

The four established grasses produced 302 clean pounds of seed, and there was an additional 16 pounds of wooly brome that required hand collection as the result of a contaminated field. The field was established in 2010, but it was discovered during the spring and early summer of 2011, and later confirmed after seed head emergence, that the field had a high percentage of smooth brome mixed in with the wooly brome. After much inspection, and site visits from Pat Davey and Christine Taliga, it was determined without question that the field could not be salvaged without a great chance of smooth brome contamination in subsequent production years. As a result, the field would require re-establishment, but the seed to do so would need to be hand collected by UCEPC staff from the established, but contaminated field, which was conducted on August 18. No field has yet been established from the hand collected seed.

A second glitch was also evident with the cleaned seed quantity of Griffith's wheatgrass. The agreement called for the production of 2.5 acres of this product, but only 264 clean grams of seed were obtained from the wildland collection. As a result, it was determined that a field would require establishment from greenhouse produced plugs, and only an acre at that, rather than the planned acreage. Adjustments to the agreement were discussed and agreed to, and written notice

was provided to Jim Cheatham from Christine Taliga on August 16, 2011. Field sizes were switched, with 2.5 acres of wooly brome to be produced from hand collected seed and one acre of Griffith's wheatgrass to be established from greenhouse produced stock rather than one acre of brome and two acres of wheatgrass. This should be captured in the new agreement for 2012.

On August 2, 2011, a 1.5 acre field of Canada wildrye was added to the existing Eastside field as per the agreement. The first seed crop will come off in 2012.

Thus, eight of ten fields are established, six existing fields from a previous agreement and two new fields planted in 2011. Wooly brome and Griffith's wheatgrass will be planted in 2012.

SPECIES	DATE	QTY	PROCESS	PLS LB	PLANTED ACRES
Mountain muhly					**0.5**
Seed Production	September 9, 2010	22 lb	Swather	7.95 pls lb	
	September 2, 2011	539 g	Swather	NA	
Needle and thread					**0.5**
Seed Production	July 7, 2010	2.4 lb	Flail Vac	1.75 pls lb	
	July 12, 2011	19 lb	Flail Vac	6.7 pls	
Prairie Junegrass					**0.25**
Seed Production	July 22, 2010	22 lb	Kincaid Combine	9 pls lb	
	August 1, 2011	7.5 lb	Kincaid Combine	5.5 pls	
Purple locoweed					**0.5**
Seed Production	July 14, 2010	9	Hand clipped	8.29 pls	
	July 21, 2011	9 lb	Hand clipped	7.0 pls	
Rose pussytoes					**0.025**
Seed Production	June 16, 2010	74 grams	Hand clipped	NA	
	June 22 & July 14, 2011	99 grams	Hand clipped	NA	
Bottlebrush squirreltail					**0.5**
Seed Production	July 31, 2010	280 lb	Kincaid Combine	208 pls lb	
	August 16, 2011	274 lb	Kincaid Combine	250 pls	
Canada wildrye					**1.5**
Field Establishment:	August 2, 2011	Direct seeded 4.25 lb		1.5 acres	
Louisiana sage					**0.05**
Field Establishment:	July 4, 2011	300 Transplanted plugs		0.05 acre	

The table above provides a recap of the activities conducted by UCEPC as outlined in the above referenced agreement. Two new fields will be added in 2012 and two established fields in 2011 should produce seed next year.

TECHNOLOGY DEVELOPMENT - Standard seed production practices were conducted in 2011.

ROCKY MOUNTAIN NATIONAL PARK
GENERAL EASTSIDE AGREEMENT

FY2011 Annual 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 which was to have extended through 2013. This agreement called 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 provide successful competition with cheatgrass.

ACCOMPLISHMENTS - Each planting was established from seed collected from park personnel in 2008. All fields were directly seeded, and emergence and establishment was noted for each. Below, the species and acreage and date planted are listed along with the target seed quantities.

Common Name	Scientific Name	PLS Amt Goal	Proposed Acres	Planted
Grasses				
Bottlebrush squirreltail	Elymus elymoides	350 lb	2.0	8/6/2009
Canada wildrye	Elymus canadensis	550 lb	1.5	8/5/2009
Scratchgrass	Agrostis scabra	50 lb	0.5	8/12/2009

A summary of seed production by year, clean pounds and pls pounds is provided below.

Species	Production Year	Bulk Weight	PLS Pounds
Bottlebrush squirreltail	2010	320 lb	285
	2011	1096 lb	1003
Canada wildrye	2010	300 lb	210
	2011	809 lb	638
Scratchgrass	2010	28 g	NA
	2011	1.5 lb	NA

On November 15, 2011, Jim Cheatham and Scott Esser from ROMO, Pat Davey with NRCS and Scott Robertson and Steve Parr with UCEPC met to discuss each of the agreements and status of the production fields and inventory for planning purposes. This year signifies the second year of production of a five-year agreement.

TECHNOLOGY DEVELOPMENT - Yields were excellent for the bottlebrush and the Canada wildrye, but discussions about the scratchgrass will need to determine whether additional effort should be expended to improve stand and future yields in order to meet target production quantities, or whether there may be a more suitable product or location for scratchgrass production. Two of the three products have already surpassed targeted seed quantities. The third species, scratchgrass, has performed poorly at UCEPC. C onsidering the focus of the plant development is for naturally occurring products that will compete effectively with cheatgrass, the scratchgrass has been slow to establish, has displayed poor vigor and has been a very poor seed producer at UCEPC. It is our opinion that a substitute species be increased in place of scratchgrass, and that scratchgrass does not display attributes that indicate it is a vigorous, strongly competitive species.

YELLOWSTONE NATIONAL PARK

FY2011Annual 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 produce approximately 240 pounds pure live seed (PLS) for Yellowstone National Park from a one acre field. 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 one 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.

Because of the late planting date, the plants were not mature enough to produce good seed quantities in 2011. In fact, the plants look to be small statured for bluebunch plants after the first year. The second production year, 2012, should indicate whether the source is a good match at its present field location at UCEPC. In 2011, only 10 pounds of seed were harvested from the field. UCEPC will produce bluebunch through 2014 to obtain the targeted quantity of seed.

On February 9, 2011, a joint Yellowstone/Plant Materials Program meeting was held in Billings, Montana, to review accomplishments of past projects as well as to identify the capabilities of the Plant Materials Centers to provide native seed stock for restoration work in Yellowstone. Planned projects were discussed as well as updates on projects which were recently started.

TECHNOLOGY DEVELOPMENT - Standard planting, cultural practices, harvest, and cleaning protocols have been utilized to produce bluebunch wheatgrass.

Seed Production - 2011
Upper Colorado Envronmental Plant Center
by Steve Parr

INTRODUCTION

The following plant materials had seed harvested in 2011. This report does not include seed produced for special contracts. Species and planting information can be requested from the UCEPC.

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
GRASSES								
Smooth Brome	*Bromus inermis*	08S229	9030693	1996	0.01	7/22	25	2.19 lb
'Liso'				1997	0.01	7/26	25	1.10 lb
				1998	0.01	8/12	25	1.25 lb Heavy shatter
				1999	0.01	No harvest	25	--
				2000	0.01	No harvest	25	--
				2001	0.01	No harvest	25	--
				2002	0.01	No harvest	25	--
				2003	0.01	7/16	25	256.00 g
				2004	0.01	No harvest	25	--
				2005	0.01	No harvest	25	--
				2006	0.01	No harvest	25	--
				2007	0.01	No harvest	25	--
				2008	0.01	No harvest	25	--
				2009	0.01	8/26	25	142.00 g
				2010	0.01	No harvest	25	
				2011		7/29		2.20 lb
Mountain Brome	*Bromus marginatus*	08S217	9005308	1989	0.20	--	17	--
Garnet - tested class				1990	0.20	--	17	75.00 lb
				1991	0.20	--	17	92.00 lb
				1992	0.20	--	17	104.00 lb
				1993	0.20	--	17	6.20 lb
				1994	1.00	--	6	1235.00 lb
				1995	1.00	--	6	1266.00 lb
				1996	1.00	7/8	6	610.00 lb
				1997	1.00	7/8	6	473.00 lb
				1998	1.00	7/12	6	479.00 lb
				1999	1.00	7/8 - 7/9	6	607.00 lb

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	
	Small Field			2011	0.18			109.00 lb	
	Large Field			2011	1.10			507.00 lb	
Purple reedgrass	*Calamagrostis purpurascens*		9070968	2005	plot	Planted	20		
				2006	plot	7/26	20	1.00 g	
				2007	plot	7/31	20	5.00 g	
				2008	plot	8/12	20	471.00 g	
				2009	plot	7/31	20	43.00 g	
				2010	plot	8/3	20	35.00 g	
				2011				113.00 g	
Bottlebrush Squirreltail	*Elymus elymoides*		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
	Sold 54 bulk lbs 2/15/11			2010	1.00	7/23	18	61.00 lb	5.63 PLS avail.
				2011				59.00 lb	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
Bottlebrush Squirreltail	*Elymus elymoides*		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
				2011				99.00 lb	
'Peru creek'	*Deschampsia caespitosa*		9024403	2006	plot	7/26	20	13.00 g	
Foundation				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	
				2011				662.00 g	
Pubescent wheatgrass	*Elytrigia intermedia*	08S216	106831	1993	1.00	--	11		
'Luna'				1994	1.00	--	11	379.00 lb	
Foundation				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
				2011				127.00 lb	
Arizona fescue	*Festuca arizonica*	08S214	469218	1994	1.00	--	6		
'Redondo'				1995	1.00	8/7	6	191.50 lb	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
Foundation				1996	1.00	8/1	6	97.00 lb	
				1997	1.00	8/11	6	111.00 lb	
				1998	1.00	8/8	6	89.00 lb	
				1999	1.00	8/3	6	33.50 lb	
				2000	1.00	7/21	6	57.00 lb	
				2001	1.00	8/1	6	45.00 lb	
				2002	1.00	7/30	6	54.00 lb	
				2003	1.00	No harvest	6	--	Reduced to .18 ac
				2004	1.00	New planting	18		
				2005	0.18	7/28	6	9.00 lb	
				2005	1.00	No harvest	18	--	Replant
				2006	0.18	No harvest	6	--	
				2006	1.00	No harvest	18	--	
				2007	0.18	7/27	6	1.00 lb	
				2008	0.18	7/30	18	18.50 lb	
				2009	0.18	7/28	18	44.00 lb	17.8 PLS
	Breeders	Good Seed		2010	0.18	7/26	6	15.00 lb	4.02 PLS
	Foundation	Spotty & Pigweed		2010	1.00	7/26	18	39.00 lb	19.4 PLS
	Breeders			2011	0.18		6	7.00 lb	
	Foundation			2011	1.00		18	62.00 lb	
Thurber fescue	*Festuca thurberi*		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	
				2011				3.00 lb	
Big bluegrass	*Poa secunda*	08S244	9092261	2002	1.00	Planted 7/16/02	11A		
Name changed	Not released			2003	1.00	7/17	11A	47.00 lb	
				2004	1.00	7/7	11A	221.00 lb	
				2005	1.00	7/13	11A	100.00 lb	
originally called				2006	1.00	7/1	11A	120.00 lb	
Prairie junegrass	*Koeleria cristata*			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	*Leymus salinus*	08S213	9043501	1996	0.02	7/22	Hqts.	154.00 g	
				1996	0.10	7/22	4	631.00 g	
				1996	0.20	Planted	4	No harvest	Breeders

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight		
				1997	0.02	Field plowed	Hqts.	No harvest		Foundation
				1997	0.10	7/21	4	2.96	lb	Breeders
				1997	0.20	7/21	4	5.32	lb	Foundation
				1998	0.10	8/4	4	4.00	lb	Breeders
				1998	0.20	8/4	4	9.00	lb	Foundation
				1999	0.10	7/15	4	22.00	g	Breeders
				1999	0.20	7/15	4	32.00	g	Foundation
				2000	0.10	No harvest	4	--		Foundation
				2000	0.20	7/7	4	6.00	g	Breeders
				2001	0.20	7/9	4	174.00	g	Breeders
				2001	0.10	7/9	4	227.00	g	Foundation
				2002	0.10	7/11	4	7.00	g	Breeders
				2002	0.20	7/11	4	23.00	g	Foundation
				2003	0.10	7/9	4	1.69	lb	Breeders
				2003	0.20	7/9	4	0.60	lb	Foundation
				2004	0.10	7/9	4	19.00	g	Foundation
				2004	0.20	7/9	4	146.00	g	Breeders
				2004	0.10	New planting	4			Foundation
				2005	0.10	7/13	4	1.40	lb	Foundation
				2005	0.30	7/13	4	302.00	g	Breeders
				2006	0.30	7/13	4	83.00	g	Foundation
				2006	0.10	7/13	4	2.00	g	Breeders
				2007	0.30	7/11	4	5.50	lb	Foundation
				2007	0.10	7/13	4	296.00	g	Breeders
				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	
				2011	1.00			31.00	lb	
Western wheatgrass 'Arriba' Foundation	*Pascopyron smithii*	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			

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				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
	Sold 75 lbs 3/11/11			2010	1.13	8/5	1A	84.00 lb	5.23 PLS on Inv.
				2011				103.00 lb	
Crested wheatgrass	*Agropyron cristatum X*		9028605	2007	0.30	planted 8/10	17	17 rows	
'Hycrest'	desertorum			2008	0.30	8/19	17	59.00 lb	
Foundation				2009	0.30	8/17	17	83.00 lb	62.8 PLS
	shattering/fair product			2010	0.30	8/10	17	65.00 lb	53.4 PLS
Mammoth wildrye	Leymus racemosus		108491	2007	0.13	planted 8/18	2		
Volga'				2008		No harvest			
Foundation				2009	0.13	8/5	2	79.00 lb	57.1 PLS
				2010	0.13	8/5	2	58.00 lb	39.5 PLS
San Luis									
Columbia needlegrass	Achnatherum nelsonii		9040137	2010	plot	8/3	16	53.00 g	
				2011			20	2.00 lb	
FORBS									
Fringed sage	*Artemisia frigida*		9021471	2006	plot	9/26	20	2.45 lb	
				2007	plot	9/27	20	539.00 g	
				2008	plot	9/16	20	277.00 g	
				2009	plot	9/22	20	1.80 lb	
				2010	plot	9/18	20	205.00 g	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				2011				322.00 g	
Louisiana sage	*Artemisia ludoviciana*	08S109	9021474	1984	0.25	--	2		
'Summit'				1985	0.25	No harvest	2	--	
Foundation				1986	0.25	10/6	2	2.44 g	
				1987	0.25	9/14	2	0.96 g	
				1988	0.25	10/5	2	0.10 g	
				1989	0.25	10/11	2	4.00 g	
				1990	0.25	No harvest	2	--	
				1991	0.25	9/10	2	3.43 lb	
				1992	0.25	9/2	2	57.00 g	
				1993	0.25	9/15	2	4.39 lb	
				1994	0.35	9/8	2	4.38 lb	
				1995	0.35	9/11	2	28.00 lb	
				1996	0.35	9/10	2	0.78 lb	
				1997	0.35	9/8	2	0.90 lb	
				1998	0.35	Stand dead-field plowed	2		
				1998	0.06	New planting	2	No harvest	
				1999	0.06	Field plowed	--		
				1999	0.10	New planting	25		
				2000	0.10	No harvest	25	--	
				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	
				2011		No harvest			
Utah sweetvetch	*Hedysarum boreale*		9024375	2005	1.00	New planting	1		
'Timp'				2006	1.00	Poor stand	1	No harvest	
Foundation				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

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
	New Foundation			2010	0.20	7/13	17	22.00 lb	8.51 PLS
	Old Breeder			2011	1.00		1	3.50 lb	
	New Foundation			2011	0.20		17	20.00 lb	
Rocky Mtn penstemon	*Penstemon strictus*		9004712	2004	0.10	New planting	8A		
'Bandera'				2005	0.10	No harvest	8A	--	
Foundation				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
				2011	0.10			29.00 lb	
Bluestem Penstemon	*Penstemon cyanocaulis*	UP	9092290	2010	0.20	7/30	2	29.00 lb	
				2011	0.20			10.00 lb	
Kura clover	Trifolium ambiguum		ARS-2678	2009		7/27	17	3.50 lb	
				2010	plot	7/27	16	3.00 lb	
				2011				235.00 g	
Sulpher buckwheat	*Eriogonum umbellatum*		9092270	2010	Plot	7/20	20	205.00 g	
				2011				320.00 g	
Lobeleaf groundsel	*Packera multilobata*	UP	9092280	2010	0.13	6/25	3A	11.00 lb	
				2011		Field Plowed			
Nodding ragwort	*Senecio bigelovii*		9070972	2010	1.50	7/28	16	5.00 lb	
				2011				3.50 lb	

SHRUBS

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Serviceberry	*Amelanchier utahensis*	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	
				2009	0.25	No harvest		
				2010	0.25	8/10	3	206.00 g
				2011				39.00 g
Serviceberry	*Amelanchier alnifolia*	08S235	9021442	2009	0.01	8/26	19	4.00 g
Clarks				2010	0.01	7/30 & 8/10	19	24.00 g
				2011				4.00 g
Mountain mahogany	*Cercocarpus montanus*	08S035Z	477976	1979	0.02	--	17	
'Montane'				1984	0.02	9/24	17	43.00 g
Foundation				1985	0.02	9/11	17	286.00 g
				1986	0.02	10/7	17	37.00 g
				1987	0.02	8/31 - 9/15	17	2.47 lb
				1988	0.02	9/1 - 9/13	17	2.05 lb
				1989	0.02	9/15	17	0.20 lb
				1990	0.02	No harvest	17	--
				1991	0.02	10/17	17	285.00 g
				1992	0.02	9/21	17	0.83 lb
				1993	0.02	9/15	17	2.44 lb
				1994	0.02	8/12	17	2.30 lb Not all harvested
				1995	0.02	No harvest	17	--
				1996	0.02	--	17	0.82 lb Not all harvested

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				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
	All seed sent to Los Lunas			2011		No harvest		
Bitterbrush	*Purshia tridentata*	08A073J	9038521	1995	0.01	7/29	21	239.00 g
Fire tolerant				1996	0.01	8/15	21	66.00 g
				1997	0.01	No harvest	21	--
				1998	0.01	No harvest	21	--
				1999	0.01	8/6	21	27.00 g
				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
	Shrubs trimmed/pruned			2011		No harvest		
Chokecherry	*Prunus virginiana*	08S235	9024060	1997	0.01	8/15	18	11.90 lb
			EPC229	1998	0.01	8/25-8/27	18	115.00 lb
				1999	0.01	8/20	18	9.00 lb
				2000	0.01	7/28	18	30.50 lb

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight	
				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	19	74.50 lb	
	(cool dried)			2009	0.01	8/26	19	16.00 lb	
	Lots of berries			2010	0.01	8/17	19	35.00 lb	
				2011				58.00 lb	
Silver buffaloberry	*Shepherdia argentea*	08S235	9008027	1998	0.01	9/1	18	13.00 g	
			EPC476	1999	0.01	No harvest	18	--	
				2000	0.01	No harvest	18	--	
				2001	0.01	No harvest	18	--	
				2002	0.01	No harvest	18	--	
				2003	0.01	8/10	18	238.00 g	
				2004	0.01	No harvest	18	--	
				2005	0.01	No harvest	18	--	
				2006	0.01	No harvest	18	--	
	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
				2011				169.00 g	
Thinleaf alder	*Alnus tenuifolia*		9070975	2000	0.25	10/4	3	558.00 g	
				2001	0.25	10/2-10/3	3	2.13 lb	
				2002	0.25	No harvest	3	--	
				2003	0.25	No harvest	3	--	
				2004	0.25	No harvest	3	--	
				2005	0.25	No harvest	3	--	
				2006	0.25	No harvest	3	--	
				2007	0.25	No harvest	3	--	

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
				2008	0.25	No harvest	3	--
				2009	0.25	11/25	3	82.00 g
				2010	0.25	No harvest	3	
				2011				43.00 g
Bitterbrush	*Purshia tridentata*		9024373	2008		from Maybell site 7/30	N/A	5.40 lb
Maybell select class				2009		from Maybell site 7/24	N/A	440.00 g
				2010		Na		
Cliff fendlerbush	*Fendlera rupicola*	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	*Philadelphus microphyllus*	orchard	9024096	2009		11/5	15	50.00 g
				2010		Na		
Squaw apple	Peraphyllum ramosissimu	orchard	blend	2010		8/20	15	337.00 g
9007948 / 9024285 /	9024286							
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

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
Colorado barberry	*Berberis fendleri*		9024219	2010		10/1	15	10.00 g
				2011			15	18.00 g
Skunkbrush sumac	Rhus trilobata		9007993	2010		8/30	15	60.00 g
				2011			14	14.00 g
Golden current	Ribes aureum			2010		9/3	14	65.00 g
	(Collected w/ S. buckthorn)			2011				26.00 g
Golden Current	Ribes Aureum		9030913	2010		8/2	15 & 3	28.00 g
				2011				7.00 g
Single leaf ash	*Fraxinus anomala*		verify in sprng	2010		9/3	14	142.00 g
	9024145 or 9024147							
Wax current	*Ribes cereum*		9024288	2010		8/3	15	298.00 g
				2011			14	9.00 g
Snowberry	*Symphoricarpos albus*		9040106	2010		8/20	14	92.00 g
				2011			15	8.00 g
Smith's buckthorn	*Rhamnus smithii*		9024308	2010		9/3	15	293.00 g
New Mexico Privet	*Forestiera neomexicana*			2011		10/31	15	285.00 g

Common Name/ Variety	Scientific Name	Project No.	Accession No.	Year	Acres	Harvest Date	Field No.	Cleaned Weight
	Some product sold							