

Great Basin Native Plant Selection and Increase Project 2006 Annual Report

Project Title:

- Establishment and Maintenance of Certified Generation 1 (G1) Seed
- Propagation of Native Forbs
- Plant Display Nursery Evaluation
- Develop Technology to Improve the Diversity of Introduced Grass Stands

Project Location: NRCS Aberdeen, ID Plant Materials Center

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Description of Project: Production of Certified Generation 1 (G1) seed of Maple Grove Germplasm Lewis flax, Anatone Germplasm bluebunch wheatgrass, Snake River Plains Germplasm fourwing saltbush and Northern Cold Desert Germplasm winterfat to facilitate commercial seed production. Propagation of native forbs for evaluation and seed increase. Evaluation of display nursery near Boise, ID. Assist in development of technology to improve the diversity of introduced grass stands by evaluating methods to introduce native species into established plant communities.

Project Status:

Seed Production

Maple Grove Germplasm Lewis Flax – A new seed field (3.2 acres) was planted on May 24, 2006. The seed field established in 2005 (also 3.2 acres in size) was contaminated with ‘Appar’ blue flax so harvested seed could not be certified. This field is now being used to conduct herbicide tolerance trials in cooperation with the University of Idaho. The new field established in 2006 was also contaminated with Appar. It appears that the stock seed to plant both fields was contaminated with Appar. Approximately 2/3 of the new field was plowed out and the remaining plants will be

rouged carefully to remove Appar plants. Shipped 70 pounds of Certified seed to commercial growers in 2006.

Anatone Germplasm bluebunch wheatgrass – Currently 5.2 acres are in production. Estimated seed yield from 2006 seed crop is 1,090 pounds. Shipped 350 pounds of Certified seed to commercial growers in 2006.

Snake River Plains Germplasm fourwing saltbush – Estimated seed yield from 2006 crop is 20 pounds. No seed was requested by commercial growers in 2006.

Northern Cold Desert Germplasm winterfat – Estimated seed yield from 2006 crop is 11 pounds. Shipped 5 pounds of Certified seed to commercial growers in 2006.

Propagation Studies

The original project plan in 2005 was to propagate 8,000 plants total of *Lomatium dissectum* (LODI) fernleaf biscuitroot, *Lomatium grayii* (LOGR) Grays biscuitroot, *Lomatium triternatum* (LOTR) nineleaf biscuitroot, *Eriogonum umbellatum* (ERUM) sulphurflower buckwheat, *Penstemon deustus* (PEDE) hotrock penstemon, *Penstemon acuminatus* (PEAC) sharpleaf penstemon, and *Penstemon speciosus* (PESP) sagebrush penstemon in the greenhouse. Approximately 1000 plants each of ERUM and LOTR were to be transplanted at the PMC and remaining plants were to be made available to cooperators for transplanting at field sites. Due to no plant establishment of *Lomatium* species and minimal success with greenhouse propagation of *Penstemon* species, no plants were made available to cooperators. All plants that were successfully propagated in the PMC greenhouse were transplanted at the PMC during the 2005 growing season and direct dormant seeding of *Eriogonum*, *Lomatium* and *Penstemon* accessions were completed at the PMC in November 2005. Weed barrier fabric was installed to control weeds.

On June 13, 2006 and October 27, 2006 the plants that were direct-seeded the preceding fall were evaluated for survival and the results are shown in the following table:

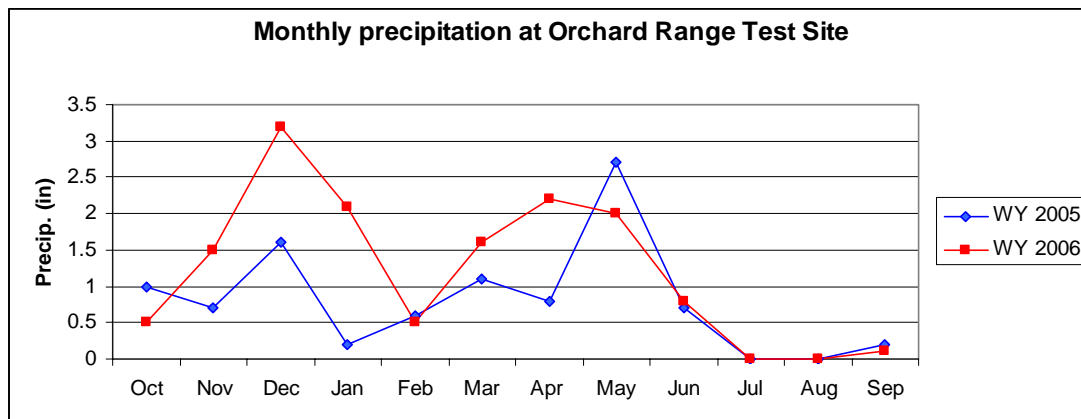
Species	6/13/06 Survival (percent)	10/27/06 Survival (percent)	10/27/06 Plant Height (cm)	Clean seed (grams)
ERUM	40	40	10-15	31.8
LODI	25	dormant		
LOGR	65	dormant		
LOTR	70	dormant		
PEAC	60	68	20-25	1362.0
PEDE	50	58	20-25	1180.0
PESP	60	60	10-20	0.0

The evaluation conducted in June was an estimate of survival and the October evaluation was an actual plant count. By early July, the *Lomatium* plants had gone completely dormant. There was no sign of green-up this fall, so survival of these plants is unknown and will be evaluated in the spring of 2007. Seed was harvested from ERUM, PEAC and PESP and cleaned.

Orchard Display Nursery Evaluation Summary

Introduction

The Orchard Display Nursery was planted on November 16, 2004 in cooperation with the Great Basin Native Plant Selection and Increase Project. The nursery contains 82 accessions of 27 native and introduced grass, forb and shrub species. Each accession was planted in 7 X 60 foot plots. See Tilley et al (2005) for descriptions of the species and accessions planted. The remaining area was planted to a cover crop mix of 50% Anatone bluebunch wheatgrass, 20% Bannock thickspike wheatgrass, 20% Magnar basin wildrye and 10% Snake River Plains fourwing saltbush. The test site is located on a loamy 10-12 inch precipitation ecological site that historically supported a Wyoming big sagebrush - bluebunch wheatgrass – Thurber’s needlegrass plant community. Total precipitation at the Orchard Test Site for water year 2005 was 9.6 inches, and total accumulated precipitation for water year 2006 was 14.4 inches (USDA 2006).



The Bureau of Land Management (BLM) burned the site in the fall of 2002. The site was later sprayed by PMC staff in May 2003 and May 2004 with a Roundup and 2, 4-D herbicide mix to create a weed free seedbed. Due to limited breakdown of dead grass clumps that would inhibit proper seed placement with a drill and to ensure a clean seedbed, the decision was made to cultivate the site with a culti-packer just prior to seeding. Plots were evaluated for initial establishment on April 27 and May 5, 2005. During the first evaluation most plots contained high numbers of Russian thistle (*Salsola* sp.) and moderate amounts of bur buttercup (*Ranunculus testiculatus* Crantz) plants. Russian thistle plants were approximately two to three inches tall and the buttercup plants had already flowered. At the time of the second evaluation, there was a heavy infestation

of tumble mustard (*Sisymbrium altissimum* L.). Plots were consequently sprayed again on June 9, 2005 with 16 oz. 2, 4-D and 8 oz. Clarity per acre to control the mustard.

Materials and Methods

The first evaluation of the plots was conducted on April 27, 2005 using a frequency grid based on that described by Vogel and Masters (2001). The grid measured approximately 40x41 inches, having four ten inch columns (to incorporate 1 drill row per column) and five rows, totaling 20 cells. The first grid was laid on the rows approximately two grid lengths (80 inches) into the plot. Counts were made of the cells that contained at least one plant. Grids were subsequently flipped and evaluated three more times giving a total of 80 evaluated cells. Total area for one grid is approximately 1m². Total area evaluated is therefore approximately 4m². A conservative estimate of plant density (plants/m²) is the total number of cells containing at least one plant divided by four. The second evaluation of 2005 occurred on May 25, 2005. The 2006 evaluation was conducted on May 30. The methods followed for 2006 were the same as described above; however, the frame was evaluated five times for a total of 100 cells or 5m². Total counts were then divided by five for approximate plants/m². Numbers for approximate plants/m² were then divided by 10.8 to calculate approximate plants/ft². It is important to note that because cells with plants were counted and not number of plants per cell, the best possible score is 100 hits per five frames which converts to 20 plants/m² or 1.85 plants/ft². Actual plant density may be higher than the numbers indicated below. All tables have been arranged with accessions ranked from highest plant density to the lowest at the time of the second evaluation in 2005. Data were not analyzed for significance.

Native Grasses

There were forty-seven accessions of native grasses planted. Overall the native grasses established well considering the limited amount of precipitation received over the winter and early spring of 2005. Especially good stands were seen in the bluebunch wheatgrass and Snake River wheatgrass plots during 2005. There was a marked decrease in plant density between the first and second evaluations with some notable exceptions. Seven of nine bluebunch wheatgrass accessions and three of four Snake River wheatgrass accessions increased in density from the first evaluation to the second. This is possibly due to receiving 2.5 inches of precipitation during that period and/or from a lack of pressure by black grass bugs (*Labops* sp.). Most of the native grasses decreased in density from 2005 to 2006 with the exception of Covar sheep fescue and all of the Sandberg bluegrass accessions. These may have been plants that germinated late in the first growing season or, more likely, were too small to notice under the heavy growth of mustards and were more easily observed in 2006.

In 2005 the best performing Indian ricegrass accession was White River, having a plant density of 0.56 plants/ft² during the first evaluation and 0.17 plants/ft² during the second evaluation. By 2006 there were no plants of any Indian ricegrass accessions observed in the evaluation grids and very few seen within their respective plots. In 2006 all squirreltail accessions had decreased density. Fish Creek maintained the best plant density with 0.26 plants/ft². Bannock thickspike wheatgrass had a density of 1.04 plants/ft² and increased slightly to 1.07 plants/ft² at the second evaluation. In 2006

Bannock had dropped to nearly half of the original density to 0.58 plants/ft². Revenue and San Luis slender wheatgrass both showed zero plants/ft² in 2006. Pryor slender wheatgrass similarly dropped in density but had 0.02 plants/ft². The western wheatgrass accessions had less dramatic declines in density from 2005 to 2006, but still showed poor stands with Rodan having the highest density of 0.13 plants/ft².

The bluebunch wheatgrass accessions had the highest average densities of all the native grasses. All decreased slightly in density from 2005 to 2006, but still maintained good stands. P-12, Wahluke and Jim Creek all had densities over 1.00 plants/ft². Columbia, Anatone, P-7 and P-15 had densities between 0.50 and 1.00 plants/ft² while P-5 and Goldar both shared low densities. The three Snake River wheatgrass accessions dropped to just over 0.50 plants/ft². The basin wildrye accessions densities also decreased; U108-02 and Trailhead retained the highest densities at 0.24 and 0.26 plants/ft² respectively. Sheep fescue stands remained poor from 2005 to 2006 with Covar slightly increasing from 0.00 to 0.07 plants/ft². Thurber's needlegrass had no plants in the evaluated grids. All five of the Sandberg bluegrass accessions increased in density from 2005 to 2006. The best stands were observed in the High Plains and Mountain Home plots with respective stands of 0.54 and 0.35 plants/ft².

		4/27/05	5/25/05	5/30/06
Species	Name or accession	Plants/ft ²	Plants/ft ²	Plants/ft ²
Indian ricegrass	Rimrock	0.37	0.20	0.00
	White River	0.56	0.17	0.00
	Nezpar	0.42	0.17	0.00
	Ribstone	0.14	0.09	0.00
	Paloma	0.05	0.00	0.00
Squirreltail	Fish Creek	0.97	0.54	0.26
	Shaniko Plateau	0.81	0.52	0.06
	Sand Hollow	0.37	0.20	0.19
	Toe Jam Creek	0.58	0.17	0.00
	9019219	0.02	0.02	0.00
Thickspike wheatgrass	Bannock	1.04	1.07	0.58
	Critana	0.90	0.56	0.24
	Schwendimar	0.69	0.52	0.39
	Sodar	0.37	0.30	0.15
Slender wheatgrass	Revenue	1.00	0.93	0.00
	San Luis	0.60	0.69	0.00
	Pryor	0.30	0.30	0.02
Western wheatgrass	Rodan	0.28	0.35	0.13
	Rosana	0.05	0.20	0.04
	Arriba	0.16	0.15	0.06
Bluebunch wheatgrass	P-12	1.34	1.59	1.04
	Wahluke	0.97	1.26	1.02
	Columbia	1.30	1.23	0.84
	P-7	0.93	1.15	0.67
	Anatone	0.81	1.15	0.80
	Jim Creek	0.83	1.02	1.02
	P-15	0.60	0.93	0.54
	P-5	0.42	0.61	0.22
	Goldar	0.51	0.37	0.33
Snake River wheatgrass	Expedition	1.27	1.44	0.54

	Secar	1.00	1.11	0.76
	SERDP	1.02	0.94	0.67
	E-26	0.21	0.23	0.22
Basin wildrye	U108-02	0.56	0.57	0.24
	Trailhead	0.60	0.52	0.26
	U100-01	0.53	0.41	0.11
	U70-01	0.30	0.22	0.02
	Magnar	0.28	0.22	0.04
	Washoe	0.21	0.09	0.09
Sheep fescue	Initial Point	0.21	0.04	0.02
	Covar	0.16	0.00	0.07
Thurber's needlegrass	Thurber's	0.00	0.00	0.00
Sandberg bluegrass	High Plains	0.25	0.00	0.54
	Sherman	0.00	0.00	0.02
	Mountain Home	0.00	0.00	0.35
	Toole County, MT	0.00	0.00	0.04
	Hanford Source	0.00	0.00	0.19

Introduced Grasses

Although many of the introduced grass accessions had fair emergence, we noted an outbreak of black grass bugs at the time of the first evaluation in 2005. The infestation appeared limited to the introduced grass section of the nursery. Plants were covered with yellow spots making the plants appear yellow-green overall. Although most of the stands of the introduced grasses decreased from the first to the second evaluation, many stands had recovered and increased by 2006 indicating that many plants thought to be dead during the second evaluation in 2005 were still alive. However, the plants of the crested wheatgrass plots were very small when compared to the other wheatgrass accessions in the nursery and still appear to be recovering from black grass bug pressure.

In 2006 all of the crested wheatgrass accessions increased in density or remained approximately where they were in 2005. Ephraim rose from 0.28 to 1.23 plants/ft²; however, many of the plants were small in size due to the black grass bug infestation during the spring of 2005. Both Siberian wheatgrass accessions similarly increased from 2005 to 2006, but the three pubescent wheatgrass accessions decreased with the highest density in 2006 coming from Manska at 0.28 plants/ft². Rush intermediate wheatgrass, along with Prairieland and Eejay Altai wildrye had zero plants in 2006. Pearl Altai wildrye had 0.02 plants/ft². The Russian wildrye accessions all increased in density with the exception of Tetracan which decreased slightly. The best stand was recorded in the Bozoisky Select plot with 0.58 plants/ft².

		4/27/05	5/25/05	5/30/06
Species	Name or accession	Plants/ft²	Plants/ft²	Plants/ft²
Crested wheatgrass	Nordan	1.30	1.19	1.10
	Ephraim	0.65	0.28	1.23
	Hycrest	0.39	0.24	0.15
	CD-II	0.56	0.24	0.20
	Roadcrest	1.30	0.07	0.52
	Douglas	0.28	0.04	0.09
Siberian wheatgrass	Vavilov	0.65	0.20	0.61
	P-27	0.09	0.02	0.33

Pubescent wheatgrass	Manska	0.69	0.65	0.28
	Greenleaf	0.60	0.59	0.15
	Luna	0.79	0.54	0.13
Intermediate wheatgrass	Rush	0.60	0.56	0.00
Altai wildrye	Prairieland	0.56	0.39	0.00
	Eejay	0.16	0.28	0.00
	Pearl	0.35	0.15	0.02
Russian wildrye	Bozoisky Select	0.72	0.54	0.58
	Mankota	0.46	0.28	0.32
	Tetracan	0.42	0.20	0.17
	Syn-A (Bozoisky II)	0.21	0.13	0.24

Forbs and Shrubs

Despite some good stands in 2005, all of the forb and shrub accessions except for Eagle yarrow had zero plants during the 2006 evaluation. Eagle had 0.07 plants/ft² in the frequency grids along with a small stand of plants at one end of the seeded plot.

		4/27/05	5/25/05	5/30/06
Species	Name or accession	Plants/ft²	Plants/ft²	Plants/ft²
Western yarrow	Eagle	0.51	0.50	0.07
	Great Northern	0.19	0.09	0.00
Utah sweetvetch	Timp	0.14	0.02	0.00
Firecracker penstemon	Richfield Selection	0.02	0.02	0.00
Scarlet globemallow		0.00	0.00	0.00
Lewis flax	Maple Grove	0.42	0.15	0.00
Blue flax	Appar	0.90	0.26	0.00
Wyoming big sagebrush		0.02	0.02	0.00
Fourwing saltbush	Snake River Plains	0.00	0.00	0.00
	Wytana	0.00	0.00	0.00
	Rincon	0.00	0.00	0.00
Gardner's saltbush	9016134	0.00	0.00	0.00
Winterfat	Hatch	0.28	0.17	0.00
	Northern Cold Desert	0.00	0.00	0.00
	Open Range	0.00	0.00	0.00
Forage kochia	Immigrant	0.00	0.00	0.00

Cover Crop

The cover crop consisted of a four species mix which contained: 50% Anatone bluebunch wheatgrass, 20% Bannock thickspike wheatgrass, 20% Magnar basin wildrye and 10% Snake River Plains fourwing saltbush. Four grids were examined during the first evaluation in 2005, one on each side of the nursery, and five grids were evaluated at the time of the second evaluation in 2005 and the 2006 evaluation. Total plant density was estimated at 0.37 plants/ft² at the first evaluation and 0.57plants/ft² at the second evaluation. In 2006 the cover crop density was 0.13 plants/ft².

Discussion

Despite large amounts of Russian thistle, native and introduced grasses had fair to good emergence and plant density during the establishment year. Germination and emergence might have been increased with more precipitation during March and April, 2005 but

emergence was good with the rain that was received. The majority of the plots showed decreased stands from 2005 to 2006. The low precipitation at the site, especially the lack of moisture in July and August of 2005, seems to have eliminated many of the less drought tolerant accessions. One concern is the effect of black grass bugs on the introduced grasses. Plants subjected to black grass bug are normally affected by decreased seed yield and a reduction in palatability. Infestations rarely result in the death of established plants, but in low water years establishing plants may be under enough stress to kill the establishing seedlings (Hammon and Peairs 2001). The second evaluation in 2005 indicated a loss in plant densities; however it appears that many of the plants survived, although stunted, through 2006. Future evaluations will provide more information on plant establishment, persistence and longevity. The PMC staff will continue to evaluate plant performance at the site.

References

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Develop Technology to Improve the Diversity of Introduced Grass Stands

The PMC assisted Brigham Young University (BYU) Provo, UT and the Agricultural Research Service (ARS) Burns, OR in developing technology to improve the diversity of introduced grass stands by evaluating methods to introduce native species into established introduced plant communities. In 2005, the PMC modified a Truax Roughrider range drill, mixed the seed and rice hull mixtures and completed the first year of seedings at the sites in Utah and Oregon.

In 2006, modified seed drop boots by the manufacturer were installed on the Truax drill. The Utah sites (Skull Valley and Lookout Pass) were seeded the week of October 24 and the Oregon site (Burns) was seeded the week of October 31, 2006. 12.5 acres were seeded at each site. In addition to these seedings, the PMC also seeded drill comparison trials (approximately 30 acres total) near Elko, NV during the week of November 6, 2006 on recently burned rangeland to compare the Truax drill to the Kemmerer drill, a standard range drill used by BLM. While seeding these projects, the PMC technicians met with Jim Truax (drill manufacturer) to demonstrate the modifications to the drill under field conditions.

The Truax drill is designed to both broadcast and drill seed in the same pass so species that require broadcasting or very shallow planting depth were broadcast and the deeper seeded species were drill seeded in alternating rows. The following table shows the seed and rice hull mixtures:

Utah Broadcast Mix		
Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Wyoming big sagebrush	0.20	0.94
Rubber rabbitbrush	0.25	0.75
Eagle yarrow	0.20	0.24
“OR” sandberg bluegrass	0.75	0.95
Rice Hulls		7.41

Utah Drill Mix		
Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Fourwing saltbush	1.00	3.48
Appar blue flax	0.75	0.83
Munro globemallow	0.50	0.84
Anatone bluebunch wheatgrass	3.00	3.16
Sanpete bottlebrush squirreltail	2.00	2.82
Nezpar Indian ricegrass	2.00	2.13
Rice Hulls		4.58

Oregon Broadcast Mix		
Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Wyoming big sagebrush	0.20	1.33
Rubber rabbitbrush	0.25	2.06
Eagle yarrow	0.20	0.26
Mtn. Home sandberg bluegrass	0.75	1.18
Rice Hulls		4.90

Oregon Drill Mix		
Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Fourwing saltbush	1.00	2.28
Appar blue flax	0.75	1.00
Munro globemallow	0.50	0.61
Anatone bluebunch wheatgrass	3.00	3.52
Toe Jam bottlebrush squirreltail	2.00	2.17
Nezpar Indian ricegrass	2.00	2.08
Rice Hulls		4.74

Drill Comparison Broadcast Mix

Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Wyoming big sagebrush	0.20	1.33
Rubber rabbitbrush	0.25	0.65
Eagle yarrow	0.20	0.21
Mtn. Home sandberg bluegrass	0.75	0.91
Rice Hulls		7.01

Comparison Drill Mix

Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Fourwing saltbush	0.69	1.15
Appar blue flax	0.65	0.75
Munro globemallow	0.50	0.59
Anatone bluebunch wheatgrass	3.00	3.54
Bottlebrush squirreltail	1.90	2.06
Nezpar Indian ricegrass	2.00	2.13
Rice Hulls		5.05

The drill comparison trials were seeded at rates of 75 and 125 percent of the rates listed in the table above in order to be able to compare effectiveness of the 2 different drills.

Cover crop mixes were also prepared and seeded at the drill comparison trial sites to provide perennial cover around the plots. Approximately 8 acres of cover crop were seeded at each site and are listed below:

East Humboldt Cover Drill Mix

Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Hycrest crested wheatgrass	2.50	2.78
Bozoisky Russian wildrye	1.50	1.83
Vavilov Siberian wheatgrass	3.00	3.24
Rice Hulls		6.11

Gopher Fire Cover Drill Mix

Species	Pounds PLS/ac	Pounds Bulk Seed/ac
Ladak alfalfa	0.50	0.54
Hycrest crested wheatgrass	1.00	1.11
Bozoisky Russian wildrye	1.00	1.22
Rimrock Indian ricegrass	1.50	1.55
Secar Snake River wheatgrass	2.00	2.51
Bannock thickspike wheatgrass	2.00	2.44
Rice Hulls		5.37

The drill comparison trial is planned to be repeated again the fall of 2007. Location of trial to be determined based on areas that burn during the 2007 fire season in northern Nevada.