

**Great Basin Native Plant Selection and Increase Project
2005 Annual Report**

Project Title:

- Establishment and Maintenance of Certified Generation 1 (G1) Seed
- Propagation of Native Forbs and Native Plant Display Nursery
- 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 – Original seed field established May 2002 was plowed out due to declining production and increasing weed competition. Established a new 3.2 acre field on May 23, 2005. Shipped 280 pounds of Certified seed to commercial growers in 2005.

Anatone Germplasm bluebunch wheatgrass – Established new 1.8 acre field on May 24, 2005. Currently 5.2 acres are in production. Estimated seed yield from 2005 seed

crop is 865 pounds. Shipped 250 pounds of Certified seed to commercial growers in 2005.

Snake River Plains Germplasm fourwing saltbush – Estimated seed yield from 2005 crop is 35 pounds. Shipped 16 pounds of Certified seed to commercial growers in 2005.

Northern Cold Desert Germplasm winterfat – Estimated seed yield from 2005 crop is 9 pounds. Shipped 20 pounds of Certified seed to commercial growers in 2005.

Propagation Studies

The project plan was to propagate 8,000 plants total of *Lomatium dissectum* (LODI), *Lomatium grayii* (LOGR), *Lomatium triternatum* (LOTR), *Eriogonum umbellatum* (ERUM), *Penstemon deustus* (PEDE), *Penstemon acuminatus* (PEAC) and *Penstemon speciosus* (PESP). 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 and direct dormant seeding of *Lomatium* and *Penstemon* accessions were completed at the PMC in November 2005.

On December 13, 2004 LODI, LOGR, LOTR, PEAC, PEDE and PESP seed was placed in cloth bags which were then placed in 1 gallon Ziploc bags filled with wet sand. Ziploc bags were placed in secure outdoor location for natural winter temperature stratification for 10 weeks. On February 24, 2005 seed was planted into 20 in.³ conetainers and placed in PMC greenhouse. By March 2, ERUM and LOGR seedlings were beginning to emerge. By mid-March, there was little or no emergence of the *Penstemon* species and LOGR seedlings were dying from unknown causes. *Penstemon* seed leftover from the original planting in the greenhouse was treated with 500 ppm GA₃, planted into trays and as plants emerged, transplanted into conetainers.

On May 10, 2005 a plant count was taken in the greenhouse:

<u>Species</u>	<u>No. Plants</u>
ERUM	1500
PEDE	750
PESP	70

On June 22, 2005 eight hundred twenty four (824) ERUM plants were transplanted to field 12 at the PMC. Weed barrier fabric was installed and plants were transplanted into weed barrier fabric with 9 x 9 inch spacing. Approximately 675 ERUM plants were not well enough developed for transplanting.

On August 9, 2005 the remaining ERUM, PEDE PEAC and PESP plants in the greenhouse were transplanted to field 12 with weed barrier fabric and 9 x 9 inch spacing.

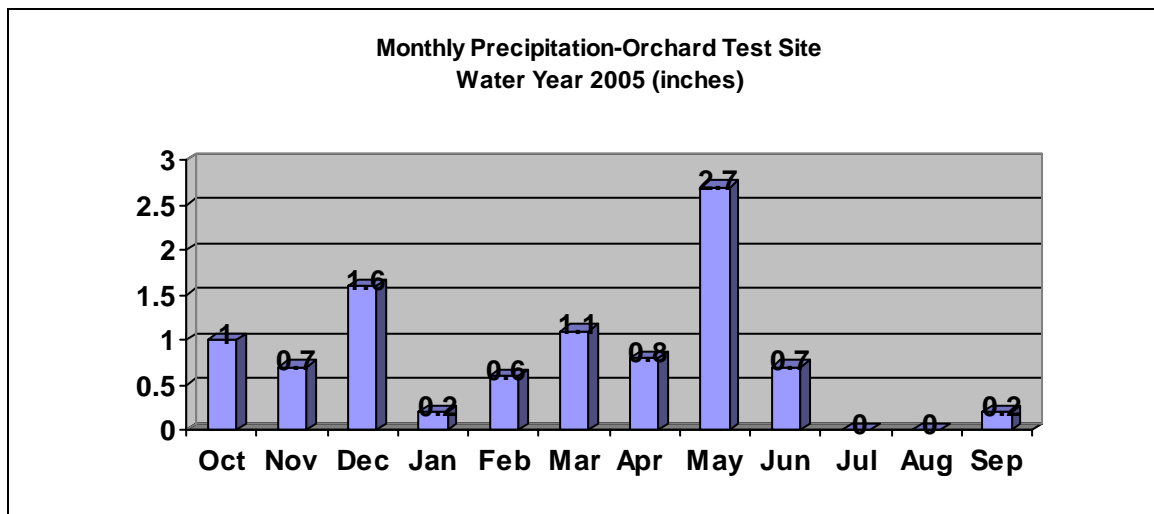
On October 7, 2005 transplants were evaluated:

Species	No. Planted	Percent survival	Canopy width (inches)
ERUM	992	89	1-8
PEDE	464	91	2-8
PEAC	392	96	1-6
PESP	68	87	1-6

In early November 2005, ERUM, Lomatium accessions and Penstemon accessions were direct seeded into weed barrier fabric in field 12 at the PMC.

Orchard Display Nursery Establishment Year (2005) Evaluations

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 planted in 7 X 60 foot plots. See Tilley et al (2005) for descriptions of the species and accessions used. 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 (USDA 2005).



The Bureau of Land Management (BLM) burned the site in the fall of 2002. The site was later sprayed by the PMC in May 2003 and May 2004 with a Roundup/2, 4-D 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 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 thus the total number of cells containing at least one plant divided by four. The second evaluation occurred on May 25, 2005. The methods followed were the same as above, but the frame was evaluated five times for a total of 100 cells in 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. Some actual densities, therefore, may be (and almost certainly are) 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.

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. Especially good stands were seen in the bluebunch and Snake River wheatgrass plots. 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" precipitation during that period and/or from a lack of pressure by black grass bugs (*Labops* sp.).

The best performing Indian ricegrass accession was White River, having a plant density of 0.56 plants/ft² at the first evaluation and 0.17 plants/ft² at the second evaluation. Rimrock had the best density at the second evaluation with 0.20 plants/ft². Fish Creek was the highest rated squirreltail accession with 0.97 plants/ft² in April and 0.54 plants/ft² in May. Bannock thickspike wheatgrass had a density of 1.04 plants/ft² and increased slightly to 1.07 plants/ft² at the second evaluation. Of the slender wheatgrass accessions, Revenue performed best with 1.00 plants/ft² recorded at the first evaluation and 0.93 plants/ft² at the second evaluation. Western wheatgrass accessions were all doing poorly during the first evaluation with the best performing accession being Rodan at 0.28

plants/ft². By the second evaluation plant density for Rodan had risen to 0.35 plants/ft². In April, bluebunch wheatgrass accession P-12 rated highest at 1.34 plants/ft² followed by Columbia (1.30) and Wahluke (0.97). At the second evaluation both P-12 and Wahluke had increased in density (1.59 and 1.26 plants/ft² respectively) while Columbia had decreased to 1.23 plants/ft². The best Snake River wheatgrass was Expedition with 1.27 plants/ft² which increased to 1.44 plants/ft² at the second evaluation. Trailhead was the highest rated basin wildrye accession at the first evaluation with 0.60 plants/ft²; however, by the second evaluation it had decreased to 0.52 plants/ft² and was surpassed by U108-02 at 0.57 plants/ft². Accessions of sheep fescue did poorly with Initial Point and Covar being respectively rated at 0.04 and 0.00 plants/ft² at the second evaluation. The single accession of Thurber's needlegrass had zero germinants recorded at both evaluations. Sandberg bluegrass accessions had zero emergence with the exception of High Plains which had 0.25 plants/ft² in April. At the second evaluation no bluegrass accession germinants were recorded.

		4/27/05	5/25/05
Species	Name or accession	Plants/ft²	Plants/ft²
Indian ricegrass	Rimrock	0.37	0.20
	White river	0.56	0.17
	Nezpar	0.42	0.17
	Ribstone	0.14	0.09
	Paloma	0.05	0.00
Squirreltail	Fish creek	0.97	0.54
	Shaniko Plateau	0.81	0.52
	Sand hollow	0.37	0.20
	Toe jam creek	0.58	0.17
	9019219	0.02	0.02
Thickspike wheatgrass	Bannock	1.04	1.07
	Critana	0.90	0.56
	Schwendimar	0.69	0.52
	Sodar	0.37	0.30
Slender wheatgrass	Revenue	1.00	0.93
	San Luis	0.60	0.69
	Pryor	0.30	0.30
Western wheatgrass	Rodan	0.28	0.35
	Rosana	0.05	0.20
	Arriba	0.16	0.15
Bluebunch wheatgrass	P-12	1.34	1.59
	Wahluke	0.97	1.26
	Columbia	1.30	1.23
	P-7	0.93	1.15
	Anatone	0.81	1.15
	Jim Creek	0.83	1.02
	P-15	0.60	0.93
	P-5	0.42	0.61

	Goldar	0.51	0.37
Snake River wheatgrass	Expedition	1.27	1.44
	Secar	1.00	1.11
	SERDP	1.02	0.94
	E-26	0.21	0.23
Basin wildrye	U108-02	0.56	0.57
	Trailhead	0.60	0.52
	U100-01	0.53	0.41
	U70-01	0.30	0.22
	Magnar	0.28	0.22
	Washoe	0.21	0.09
Sheep fescue	Initial Point	0.21	0.04
	Covar	0.16	0.00
Thurber's needlegrass	Thurber's	0.00	0.00
Sandberg bluegrass	High Plains	0.25	0.00
	Sherman	0.00	0.00
	Mountain Home	0.00	0.00
	Toole County, MT	0.00	0.00
	Hanford Source	0.00	0.00

Introduced Grasses

Although many of the introduced grass accessions had a fair percentage of germination, we noted an outbreak of black grass bugs at the time of the first evaluation. 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.

The crested wheatgrass accessions Nordan and Roadcrest both had densities of 1.30 plants/ft² at the first evaluation; however, at the time of the second evaluation Nordan had maintained a high plant density of 1.19 plants/ft² while Roadcrest had reduced dramatically to 0.07 plants/ft². Vavilov was the best Siberian wheatgrass with 0.65 and 0.20 plants/ft² for the two evaluations. The pubescent wheatgrass accessions all performed similarly with all three having densities from 0.54 to 0.65 plants/ft² at the second evaluation. Prairieland Altai wildrye was the best performer in its category with 0.56 plants/ft² in April and 0.39 plants/ft² in May. The Russian wildrye accession, Bozoisky-Select, had the best rating at 0.72 plants/ft² and 0.54 plants/ft² for the two evaluations.

		4/27/05	5/25/05
Species	Name or accession	Plants/ft²	Plants/ft²
Crested wheatgrass	Nordan	1.30	1.19
	Ephraim	0.65	0.28
	Hycrest	0.39	0.24
	CD-II	0.56	0.24
	Roadcrest	1.30	0.07
	Douglas	0.28	0.04

Siberian wheatgrass	Vavilov	0.65	0.20
	P-27	0.09	0.02
Pubescent wheatgrass	Manska	0.69	0.65
	Greenleaf	0.60	0.59
	Luna	0.79	0.54
Intermediate wheatgrass	Rush	0.60	0.56
Altai wildrye	Prairieland	0.56	0.39
	Eejay	0.16	0.28
	Pearl	0.35	0.15
Russian wildrye	Bozoisky Select	0.72	0.54
	Mankota	0.46	0.28
	Tetracan	0.42	0.20
	Syn-A	0.21	0.13

Forbs

Most of the forbs did poorly in comparison to the grasses. One notable exception was Eagle western yarrow which maintained a density of 0.50 plants/ft². Appar blue flax also began well with a density of 0.90 plants/ft², but fell to 0.26 plants/ft² by the second evaluation.

		4/27/05	5/25/05
Species	Name or accession	Plants/ft²	Plants/ft²
Western yarrow	Eagle	0.51	0.50
	Great Northern	0.19	0.09
Utah sweetvetch	Timp	0.14	0.02
Firecracker penstemon	Richfield Selection	0.02	0.02
Scarlet globemallow		0.00	0.00
Lewis flax	Maple Grove	0.42	0.15
Blue flax	Appar	0.90	0.26

Shrubs

Only two accessions of shrubs showed any germinants within the frames. Wyoming big sagebrush held a density of 0.02 plants/ft² while Hatch winterfat performed moderately better with ratings of 0.28 and 0.17 plants/ft².

		4/27/05	5/25/05
Species	Name or accession	Plants/ft²	Plants/ft²
Wyoming big sagebrush		0.02	0.02
Fourwing saltbush	Snake River Plains	0.00	0.00
	Wytana	0.00	0.00
	Rincon	0.00	0.00
Gardner's saltbush	9016134	0.00	0.00
Winterfat	Hatch	0.28	0.17

	Northern Cold Desert	0.00	0.00
	Open Range	0.00	0.00
Forage kochia	Immigrant	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, one on each side of the nursery, and five grids were used at the time of the second evaluation. Total plant density was estimated at 0.37 plants/ft² at the first evaluation and 0.57plants/ft² at the second evaluation. The increase in density was presumably due to an increase in the two wheatgrasses.

Discussion

Despite large amounts of Russian thistle, native and introduced grasses had fair to good germination and plant density. Germination and emergence might have been increased with more precipitation during March and April, but germination was good with the rain that was received. Plants that made it through April received well over average May rainfall. Of major concern is the black grass bug outbreak. Plants subjected to black grass bug are normally affected by decreased seed yield and a reduction in palatability to cattle. 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 decrease in plant density recorded for Roadcrest crested wheatgrass may be an indication of this. Future evaluations will provide more information on plant establishment, persistence and longevity. The PMC 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) 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. The PMC modified a Truax Roughrider range drill, mixed the seed and rice hull mixtures and completed the seedings at the sites in Utah and Oregon.

On September 7, 2005 a new Truax Roughrider range drill and transport trailer were delivered to the PMC. PMC Technicians Boyd Simonson and Brent Cornforth made modifications to the drill to improve seed flow and placement. They improved the design and function of the drop tubes, reconfigured the chain and sprocket assembly to improve calibration of seed delivery, made major adjustments to the drill openers and realigned the packer wheels. While seeding both in Utah and Oregon the PMC technicians met with Jim Truax (drill manufacturer) to demonstrate the modifications to the drill under field conditions. Many of the modifications that the PMC Technicians made are being incorporated into new drills by the manufacturer.

The seed and rice hulls for this project were purchased by the cooperators and delivered to the PMC in early October. Preliminary testing of seed and rice hull mixtures were conducted to determine flowability of the mixtures. Based on the preliminary tests, seed and rice hulls were mixed for the actual seedings. The 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		
<u>Species</u>	<u>Pounds PLS/ac</u>	<u>Pounds Bulk Seed/ac</u>
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		
<u>Species</u>	<u>Pounds PLS/ac</u>	<u>Pounds Bulk Seed/ac</u>
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

<u>Species</u>	<u>Pounds PLS/ac</u>	<u>Pounds Bulk Seed/ac</u>
Wyoming big sagebrush	0.20	0.91
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

<u>Species</u>	<u>Pounds PLS/ac</u>	<u>Pounds Bulk Seed/ac</u>
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

The Utah sites (Skull Valley and Lookout Pass) were seeded the week of October 17 and the Oregon site (Burns) was seeded the week of October 31, 2005. 12.5 acres were seeded at each site. The experiment will be conducted again in the fall of 2006 at these same locations. A new site near Elko, NV is also tentatively planned for seeding next fall.