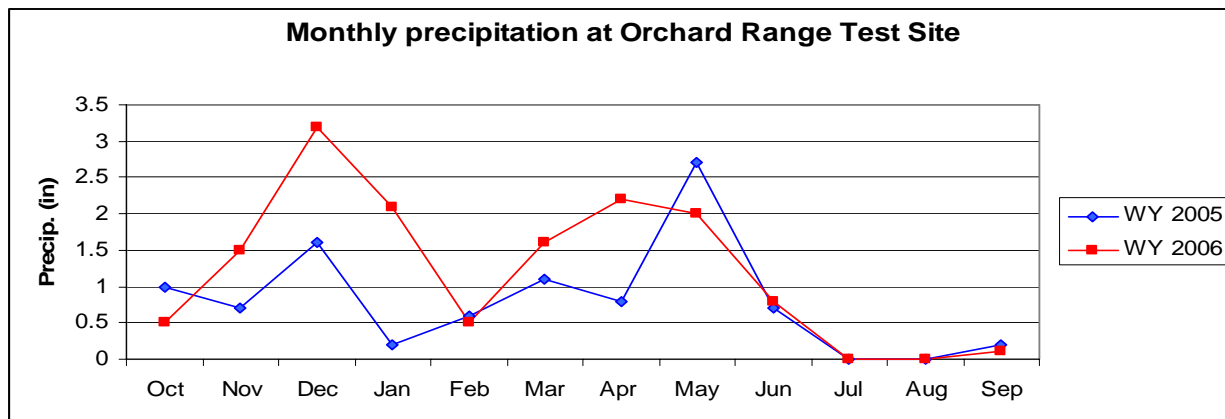


**Orchard Display Nursery
Evaluation Summary (2005-2006)
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Introduction

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).



Orchard display site in September 2004 prior to final mechanical seedbed preparation

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/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 31.. 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



Columbia bluebunch wheatgrass, May 2006

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. 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 wheatgrasses 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/ft respectively. Sheep fescue stands remained poor from 2005 to 2006 with Covar slightly increasing from 0.00 to 0.07 plants/ft. 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/ft.

		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 wheatgrasses 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/ft. 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/ft.

		4/27/05	5/25/05	5/30/06
Species	Name or accession	Plants/ft ²	Plants/ft ²	Plants/ft ²
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
Siberian wheatgrass	Douglas	0.28	0.04	0.09
	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/ft ²	Plants/ft ²	Plants/ft ²
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.

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