

**Coffee Point Off-Center Evaluation (2006 planting)**  
**2007 Progress Report**  
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## INTRODUCTION

In the fall of 2006, the Aberdeen Plant Materials Center (PMC) installed a multi-species off-center planting at the Coffee Point test site 25 miles northwest of Aberdeen. Seed collections were assembled with the assistance of ARS Logan, UT; Bridger, MT PMC; Benson Seed Farm; University Nevada, Reno; Department of Defense; Geertson Seed Farm and Los Lunas, NM PMC. The trial contains 58 accessions of 23 species of native and introduced grasses, forbs and shrubs (table 1). Figure 1 shows a plot map of the planting. The goal of this trial is to evaluate the adaptability of numerous new conservation releases in a low precipitation environment and compare their establishment, production and longevity against older traditionally used released plant materials.

The Coffee Point test site is located in Major Land Resource Area (MLRA) 11B, Snake River Plains of the Northwestern Wheat and Range region of the Intermountain West in what historically supported a Wyoming big sagebrush/bluebunch wheatgrass plant community. Climatic conditions are very dry with mean annual precipitation from 8 to 12 inches, average air temperature is 43° F, and the frost free period is approximately 90 days. Soils at the site are a Splittop-Atomic complex with 2 to 8% slope and effective rooting depth of 20 to 40 inches. The pH of the soil complex is 7.4 to 8.4. The elevation is 4,850 ft.

## MATERIALS AND METHODS

Prior to site preparation we determined the pre-existing cover frequencies by running four 30 meter transects across randomly chosen portions of the test site on April 15, 2006. Intercept determinations were made at each meter. Pre-existing cover consisted of 38.3% litter; 28.3 % bare ground; 15.8% P-27 Siberian wheatgrass; 14.2% Hycrest crested wheatgrass and 3.3% Immigrant forage kochia.

The seed bed was prepared with chemical treatments of 16 oz 2,4-D and 64 oz Roundup per acre applied on May 2, 2005, August 1, 2005 and May 17, 2006. The site was disked on August 3, 2006. The trial was planted on November 20, 2006 with a modified Tye Drill with a width of 80 inches (8 spouts at 10" spacing). Experimental design was a randomized complete block with 4 replications. Each plot was one drill width wide (80 in) and 20 ft long. Species were arranged into blocks with the exception of introduced grasses, forbs and shrubs making up one block each. Seeding depths were dependent on species and were planted according to Ogle et al (2006). Species were seeded at a target rate of 20 to 30 pure live seeds (PLS) per ft<sup>2</sup> for large seeded species (<500,000 seeds per pound) and 40 to 50 PLS/ft<sup>2</sup> for smaller seeded species (>500,000 seeds/lb). PLS was determined by seed lab results or, when lab results were not available, PLS was estimated visually or the PLS from other accessions were averaged. All seed was mixed with rice hulls as an inert carrier for better seed flow according to St. John et al (2005) with the exception of fourwing and Gardener's saltbush. A cover crop of 50% Anatone bluebunch wheatgrass, 20% Bannock thickspike wheatgrass, 20% Magnar basin wildrye and 10% Snake River Plains fourwing saltbush was planted in the prepared areas surrounding the trial.

Plot evaluations were conducted on April 30 and May 1, 2007 and again on September 7, 2007 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 1 ft into the plot. Counts were made of the cells that contained at least one plant. Grids were subsequently advanced one grid length in the plot and evaluated four more times giving a total of 100 evaluated cells. All tables have been arranged with accessions ranked from highest plant density to the lowest at the time of the first evaluation. Data were analyzed using the Statistix 8 Analytical software and subjected to an analysis of variance with a significance level of  $p < 0.05$ . If significance was detected, means were separated using a Tukey HSD all pairwise comparison.

## ZEBA

Also included in the planting are single observational plots of Appar blue flax, Goldar bluebunch wheatgrass, Magnar basin wildrye and Nezpar Indian ricegrass treated with ZEBAs coating. ZEBAs is a super-absorbent cornstarch based polymer. When saturated, the ZEBAs molecules form a hydrogel that is able to absorb up to 400 times its original weight and holds and releases water for use by plants as needed. The reported result is faster germination, quicker emergence, consistent growth and higher, better-quality yields using less water. ZEBAs plots will not be included in any statistical analysis but is only for observational purposes.

**Table 1**

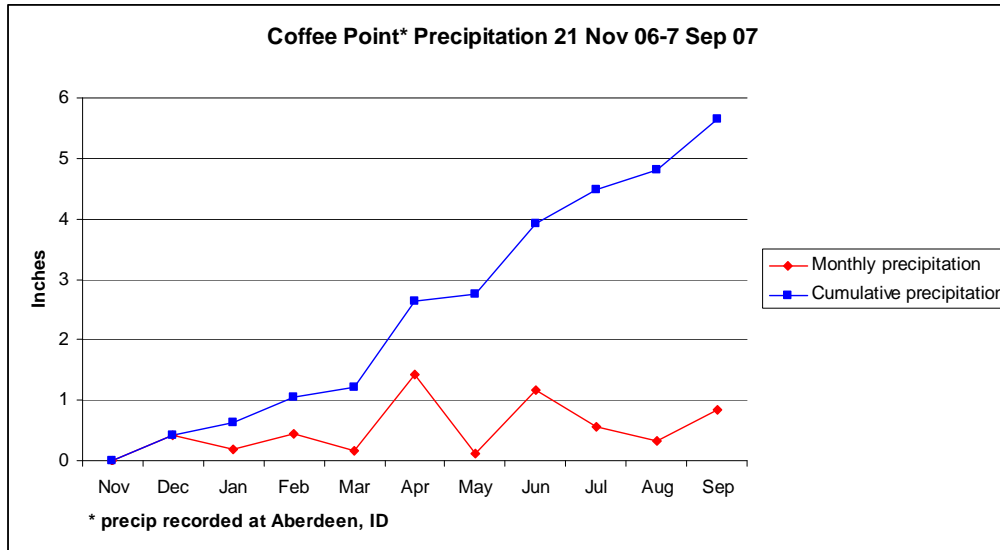
<b>Species</b>	<b>Accession</b>	<b>Seed source</b>
<b>Basin wildrye</b>	Trailhead	MTPMC
	Washoe	MTPMC
	Topinish	Benson Seed Farm
	Jim Creek	Benson Seed Farm
	Gund	UNR
	Magnar	IDPMC
	L-45	ARS
	L-46	ARS
<b>Sandberg bluegrass</b>	High Plains	MTPMC
	Mountain Home	FS
	Duffy Creek	Benson Seed Farm
	Wallowa	Benson Seed Farm
	9081633	MTPMC
<b>Bluebunch wheatgrass</b>	P-7	ARS
	P-32	ARS
	Wahluke	Benson Seed Farm
	9081636	MTPMC
	Anatone	IDPMC
	Goldar	IDPMC
	P-19	ARS
	P-24	ARS
	P-22	ARS
	P-27	ARS

<b>Snake River wheatgrass</b>	SERDP	ARS
	E-45	ARS
	E-46	ARS
	E-51	ARS
<b>Thickspike wheatgrass</b>	Critana	MTPMC
	Bannock	IDPMC
	Sodar	IDPMC
<b>Western wheatgrass</b>	Rosana	MTPMC
	9081630	MTPMC
	9076517	DOD/ARS
<b>Slender wheatgrass</b>	Pryor	MTPMC
	9076516	DOD/ARS
	Copperhead	MTPMC
<b>Bottlebrush squirreltail</b>	9019219	MTPMC
	Toe Jam Creek	ARS
<b>Shrubs</b>	Wytana fourwing saltbush	MTPMC
	SRP fourwing saltbush	IDPMC
	9016134 Gardner saltbush	MTPMC
	N. Cold Desert winterfat	IDPMC
	Open Range winterfat	MTPMC
	Wyoming big sagebrush	BLM
<b>Forbs</b>	Great Northern w. yarrow	MTPMC
	Eagle w. yarrow	Geertson
	Antelope P. clover	MTPMC
	Stillwater coneflower	MTPMC
	9081632 Phacelia	MTPMC
	Old works penstemon	MTPMC
	Cedar penstemon	NMPMC
	Maple Grove flax	IDPMC
	Richfield penstemon	IDPMC
	<b>Intro. Grasses</b>	Bozoisky Russian wildrye
Bozoisky II		ARS
Vavilov Siberian wheatgrass		ARS
Vavilov II		ARS
Mustang Altai wildrye		ARS
<b>ZEBA</b>	Nezpar Indian ricegrass	IDPMC
	Magnar	IDPMC
	Goldar	IDPMC
	Appar blue flax	IDPMC

## RESULTS

At the time of the first evaluation in the spring of 2007, there was major crusting of the soil surface to about 0.5 in depth. Soil moisture conditions below the soil crust were good and most species had managed to break through the crust or had germinated inside the cracks in the soil. Most species had reached 1 to 4 true leaves by the first evaluation. Weed control from the

chemical and mechanical treatments was excellent. Young plants of prickly lettuce (*Lactuca serriola*), white-stem blazing star (*Mentzelia albicaulis*), flixweed (*Descurainia sophia*), lupine (*Lupinus* sp.), tumble mustard (*Sisymbrium altissimum*) and Russian thistle (*Salsola kali*) were common throughout the test site, but were not in such numbers as would present a problem with competition.



Rainfall during the establishment year was lower than normal. In the 2007 water year, less than 6 inches of precipitation accumulated at Aberdeen. Spring rains in April helped establishment, but sparse summer rains caused many germinants to die by September.

### SPECIES DISCUSSION

In the spring evaluation basin wildrye densities ranged from 0.06 plants/ft<sup>2</sup> (Topinish and Jim Creek) to 0.24 plants/ft<sup>2</sup> (Trailhead). Densities dropped to 0.00 to 0.06 plants/ft<sup>2</sup> at the time of the fall evaluation.

#### Basin wildrye

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Trailhead	86.6	0.24 <sup>a</sup>	0.06 <sup>a</sup>
L-46	74.4	0.22	0.03
L-45	81.7	0.21	0.01
Magnar	89.6	0.15	0.01
Washoe	83.9	0.08	0.02
Gund	89.9	0.08	0.01
Jim Creek	83.6	0.06	0.01
Topinish	85.8	0.06	0.00

<sup>a</sup>Not significant at p<0.05

Although no significant differences were detected between the Sandberg bluegrass accessions, at the spring evaluation, 9081633, an accession being investigated by the Bridger, MT PMC had better overall establishment than all other accessions. 9081633 continued to have the highest density in the fall evaluation, 0.06 plants/ft<sup>2</sup>, which was significantly higher than all other accessions.

Sandberg bluegrass			
Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
9081633	86.0	0.13 <sup>a</sup>	0.06 a
High Plains	95.0	0.07	0.00 b
Wallowa	83.2	0.02	0.05 b
Duffy	79.0	0.05	0.00 b
Mt. Home	85.0	0.05	0.00 b
Critical value (0.05)			0.05

<sup>a</sup>Not significant at p<0.05

In the bluebunch wheatgrass trial no significance was detected between density means for the spring or fall evaluation. Plant densities in the spring ranged from 0.1 plant/ft<sup>2</sup> to 0.37 plants/ft<sup>2</sup>. The top performer was P-19, a test accession from the ARS (0.37 plants/ft<sup>2</sup>). Plant densities generally stayed the same between the spring and fall evaluations indicating good adaptability of the species to the site conditions.

Bluebunch wheatgrass			
Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
P-19	92.9	0.37 <sup>a</sup>	0.37 <sup>a</sup>
Anatone	88.1	0.33	0.29
P-24	91.2	0.28	0.28
9081636	92.0	0.27	0.17
P-22	85.3	0.24	0.28
Wahluke	87.3	0.24	0.25
Goldar	90.6	0.13	0.13
P-27	87.4	0.11	0.09
P-7	89.4	0.11	0.12
P-32	86.5	0.01	0.12

<sup>a</sup>Not significant at p<0.05

Snake River wheatgrass densities were generally higher than those of bluebunch wheatgrass indicating, at least in this trial, greater adaptation to low precipitation conditions. The highest establishment density was 0.50 plants/ft<sup>2</sup> achieved by SERDP, and the lowest was 0.32 from E-46. Densities decreased between the spring and fall evaluations. SERDP continued to have the highest density (0.35 plants/ft<sup>2</sup>).

Snake River wheatgrass

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
SERDP	90.0	0.50 <sup>a</sup>	0.35 <sup>a</sup>
E-51	91.1	0.39	0.29
E-45	94.5	0.33	0.18
E-46	96.3	0.32	0.27

<sup>a</sup>Not significant at p<0.05

Thickspike and streambank wheatgrass exhibited good drought tolerance and seedling vigor with spring plant densities between 0.84 and 0.98 plants/ft<sup>2</sup>. No significant differences were detected between means. Densities remained high through the fall evaluation, with all accessions having densities between 0.66 and 0.78 plants/ft<sup>2</sup>.

Thickspike and streambank wheatgrass

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Sodar	96.5	0.98 <sup>a</sup>	0.78 <sup>a</sup>
Critana	90.0	0.86	0.67
Bannock	94.3	0.84	0.66

<sup>a</sup>Not significant at p<0.05

Western wheatgrass is typically recommended for use in sites receiving 12 inches or more annual precipitation and is not well adapted to the conditions faced at Coffee Point. Although some plants did germinate from each of the accessions tested. Densities were very low, 0.03 to 0.05 plants/m<sup>2</sup> in the spring and slightly lower in the fall.

Western wheatgrass

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Rosanna	90.0	0.05 <sup>a</sup>	0.02 <sup>a</sup>
9076517	90.0	0.03	0.03
9081630	85.0	0.03	0.03

<sup>a</sup>Not significant at p<0.05

Among the slender wheatgrass accessions, 9076516 slender wheatgrass from the Department of Defense and ARS had significantly greater plant densities than Copperhead from the MT PMC. 9076516 was developed for superior traits in germination and establishment for use on Army training grounds. The other tested accession, Pryor did not differ significantly in establishment from of the other accessions. At the fall evaluation, the ranking remained constant, although densities decreased for all accessions.

Slender wheatgrass

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
9076516	90.0	0.53 a	0.37 a
Pryor	95.9	0.46 ab	0.30 ab
Copperhead	85.0	0.23 b	0.08 b
Critical value (0.05)		0.28	0.28

In the bottlebrush squirreltail trial, accession 9019219, test material from the MT PMC had a density of 0.65 plants/ft<sup>2</sup> and was significantly greater than the plant density of Toe Jam Creek (0.20 plants/ft<sup>2</sup>). Fall densities remained essentially the same as spring. Accession 9019219 is likely the subspecies *elymoides* and is currently being tested by the Bridger PMC in Montana, while Toe Jam Creek is subspecies *californicus* and was collected in a higher precipitation area near Elko, Nevada.

Bottlebrush squirreltail

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
9019219	85.0	0.65 a	0.57 a
Toe Jam Creek	92.2	0.20 b	0.15 b
Critical value (0.05)		0.32	0.37

Shrub densities were low and were not separable statistically in the spring evaluation. Most accessions had meager amounts of germinants; however Snake River Plains fourwing saltbush and the accession of Gardner's saltbush from the MT PMC both had fair establishment with 0.17 and 0.15 plants/ft<sup>2</sup> respectively. In the fall evaluation the saltbush accessions continued to have relatively good densities (0.19 for Gardner's and 0.13 for Snake River Plains). Other accessions had negligible establishment.

Shrubs

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Snake River Plains 4-wing	44.5	0.17 <sup>a</sup>	0.13 ab
Gardener's saltbush, 9016134	30.0	0.15	0.19 a
Open Range winterfat	80.8	0.02	0.04 bc
Wytana 4-wing	45.0	0.01	0.00 c
Northern Cold Desert winterfat	85.2	0.00	0.00 c
Wyoming big sagebrush	21.3	0.00	0.01 bc

<sup>a</sup>Not significant at p<0.05

0.13

In the forb trial, only Maple Grove Lewis flax and the test accession of Phacelia, 9081632, from the MT PMC had fair establishment. Maple Grove had a plant density of 0.45 plants/ft<sup>2</sup> and was significantly greater than all other accessions with the exception of Phacelia which had a density of 0.28 plants/m<sup>2</sup>. All other accessions had essentially zero plants emerge. In the fall, Maple Grove continued to have the best density (0.20 plants/ft<sup>2</sup>). Most of the Phacelia plants had died

by the fall evaluation, and Cedar penstemon had an increase in density, from 0.00 to 0.06 plants/ft<sup>2</sup>.

Forbs			
Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Maple Grove flax	93.0	0.45 a	0.20 a
Phacelia	81.8	0.28 ab	0.00 b
Great Northern yarrow	90.0	0.01 b	0.00 b
Cedar penstemon	95.0	0.00 b	0.06 ab
Eagle yarrow	90.0	0.00 b	0.01 b
Richfield penstemon	92.2	0.00 b	0.00 b
Antelope prairie clover	98.0	0.00 b	0.00 b
Old Works penstemon	95.0	0.00 b	0.00 b
Stillwater prairie coneflower	94.5	0.00 b	0.00 b
Critical value (0.05)		0.34	0.18

As a group, the introduced grasses outperformed all others with regard to establishment densities. All performed well with the lowest density coming from Bozoisky II Russian wildrye with a density of 0.54 plants/ft<sup>2</sup>. The best density was achieved by Vavilov II, a new release of Siberian wheatgrass from the ARS, DOD and NRCS which had 1.48 plants/ft<sup>2</sup>. Fall densities were generally slightly lower than in the spring, but all accessions maintained good plant densities. Vavilov II again had a significantly higher density than all other accessions (1.46 plants/ft<sup>2</sup>).

Introduced grasses			
Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Vavilov II Siberian	90.0	1.48 a	1.46 a
Vavilov Siberian	90.0	0.74 b	0.68 b
Mustang Altai wildrye	90.0	0.75 b	0.58 b
Bozoisky Select Russian	90.7	0.70 b	0.65 b
Bozoisky II	90.0	0.54 b	0.59 b
Critical value (0.05)		3.70	0.42

### Zeba Initial Evaluation

We also included one plot each of Magnar, Goldar, Appar and Nezpar which were treated with Zeba® moisture retention seed coating. Because there was only one plot of each these could not be analyzed statistically and only general observations can be made. The treated Magnar seed had a mean density of 0.71 plants/ft<sup>2</sup> as compared with 0.15 plants/ft<sup>2</sup> achieved in the untreated plots. Likewise, the treated goldar plot had an average plant density of 0.43 plants/ft<sup>2</sup> while the untreated plots averaged only 0.13 plants/ft<sup>2</sup>. Appar and Nezpar were not included in the main trial, so a comparison cannot be made, however, the results achieved with Magnar and Goldar are favorable. Further examinations could determine more accurately the benefits and costs of using the Zeba® product. In the fall evaluation, all densities had decreased with the exception of Nezpar which increased from 0.90 to 0.15 plants/ft<sup>2</sup>.



Zeba®

Accession	% PLS	Density (plants/ft <sup>2</sup> )	
		5/07	9/07
Magnar	87.3	0.71 <sup>a</sup>	0.24 <sup>a</sup>
Goldar	92.0	0.43	0.32
Appar	91.3	0.33	0.26
Nezpar	79.3	0.09	0.15

<sup>a</sup> Means not separated

The plots will continue to be evaluated in future years. In 2008, the grass plots will be sampled for air-dry forage yield in addition to evaluation of plant density.

#### REFERENCES

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