Restoring Central Oregon Rangeland from Ventenata and Medusahead to a Sustainable Bunchgrass Environment – Warm Springs and Ashwood

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Abstract

Medusahead (*Taeniatherum caput-medusae*), ventenata (*Ventenata dubia*), and downy brome or cheatgrass (*Bromus tectorum*) are annual grassy weeds that degrade range and wildlands of the Pacific Northwest. Trials were established in 2008 at two locations in Oregon, one on the Warm Springs Reservation and the other near Ashwood. Each location consisted of trials at two sites, one where bunchgrasses remained despite significant populations of medusahead or ventenata and a second nearby location where few to no bunchgrasses remained. Treatments consisted of herbicide-only and herbicide followed by planting of different bunchgrass species. In 2009, herbicide-only applications provided 100 percent control of medusahead and ventenata at both locations. A moderate stand of bunchgrass species was established at the Warm Springs location in the Plateau®- and Journey®-treated plots, but not at Ashwood. During 2010, residual efficacy for the four herbicides decreased at both locations, providing only moderate control. Stand establishment in the Landmark®- and Matrix®-treated plots planted in the fall of 2009 was strong for Sandberg's bluegrass, Sherman big bluegrass, smooth brome, and intermediate wheatgrass at the Warm Springs location. There has been no establishment of bunchgrass species at Ashwood.

Introduction

Medusahead (*Taeniatherum caput-medusae*) is predominant on millions of acres of semi-arid rangeland in the Pacific Northwest. It is extremely competitive and crowds out all other vegetation on infested rangeland, including such undesirable species as downy brome or cheatgrass (*Bromus tectorum*). A new species of concern in the region is ventenata (*Ventenata dubia*), which is currently increasing its expansion across the Pacific Northwest. These weedy annual grasses often out-compete bunchgrasses that stabilize the soil and provide forage for livestock and wildlife. These grassy weeds, due to their fine fuel composition, can also potentially dramatically increase the fuel load, creating hotter, more destructive range and forest fires. They also allow soil structure to deteriorate due to their reduced root structure compared to perennials. This in turn encourages an increase in soil erosion.

Methods and Materials

Plots were established in the fall of 2008 at two locations on the Warm Springs Reservation north of Madras and near the town of Ashwood, Oregon. The Warm Springs location is a clay-dominated site that stays saturated in early spring, at a moderate elevation, while the Ashwood location is at a relatively high elevation near the top of a ridge with extremely shallow soil. Each location included two sites, one where bunchgrasses were still present despite high populations of ventenata or medusahead, and

a second nearby location where few to no bunchgrasses remained due to domination by grassy weed species. The objective of this project was to evaluate herbicide-only applications on bunchgrass growth when competition from ventenata and medusahead are removed, and stand establishment of six bunchgrasses following herbicide application where few bunchgrasses remained.

Herbicide Only

During the fall of 2008, small plots were established at two locations where bunchgrasses remained. The herbicides Plateau® (imazapic), Journey® (imazapic + glyphosate), Matrix® (rimsulfuron), and Landmark® (sulfometuron + chlorsulfuron) were applied to 10-ft by 25-ft plots replicated four times. Application was on November 17, 2007 using a CO_2-pressurized hand-held boom sprayer outfitted with TeeJet 8002 nozzles on a 9-ft boom operated at 40 psi with 20 gal water/acre applied.

During June 2009, plots were evaluated visually for herbicide efficacy. Height measurements were taken of established bluebunch wheatgrass plants at the Warm Springs location and intermediate wheatgrass at the alternate Ashwood site. In 2010 plots were reevaluated during July and August for residual efficacy.

Herbicide Followed by Planting Bunchgrass

The four herbicides were also applied where few to no bunchgrasses remained in single large plots 20 ft by 288 ft at both the Warm Springs and Ashwood sites. Applications were made on December 11 at Ashwood and December 12 at Warm Springs using the same methodology as the herbicide-only plots. Application was made just prior to planting at Warm Springs and immediately following planting at Ashwood.

Six additional species of bunchgrasses were planted in 20-ft-wide plots replicated 3 times following application of Plateau and Journey in December 2008 and following application of Landmark and Matrix in mid-November 2009 for crop safety reasons. Seeding rate was 15 lb/acre using an 8-ft-wide John Deere 1500 power drill planting 10 rows on 9-inch centers. Bunchgrasses included squirreltail (*Elymus elymoides*) (Warm Springs) or crested wheatgrass (Ashwood), intermediate wheatgrass (*Agropyron intermedium*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa sandbergii*), Sherman big bluegrass (*Poa secunda*), and smooth brome (*Bromus inermis*).

Results and Discussion

Herbicide-only Plots

***2009*:** All four herbicides applied to control both ventenata and medusahead at Warm Springs and medusahead on the alternate Ashwood site provided 100 percent control (Tables 1 and 2). Incidentally, cheatgrass control at the Warm Springs location was somewhat less for Plateau and Journey, with 93 and 96 percent control. As has been observed in previous research in the area, Landmark can stunt existing bunchgrasses the first season following application. This occurred at the alternate Ashwood site but not at Warm Springs.

***2010*:** Residual efficacy for the four herbicides decreased at both locations, providing only moderate control. Ventenata control at the Warm Springs location ranged from 81 percent for Landmark to 60 percent for Journey, while medusahead control at the alternate Ashwood site ranged from 57 percent for Landmark to 40 percent for Journey (Tables 3 and 4). The only statistical difference in intermediate wheatgrass height at the alternate Ashwood site was between Landmark and Plateau, with no differences found between herbicide treatments and the untreated control.

Herbicide Followed by Planting Bunchgrass

***2009*:** All four herbicides provided near 100 percent control of medusahead and ventenata at both locations. Establishment of the six bunchgrasses was moderately successful at Warm Springs (Table 5) and unsuccessful at Ashwood. At the Warm Springs location, Sherman big bluegrass achieved the best stand establishment, followed by Sandberg's bluegrass, intermediate wheatgrass, and smooth brome. There was poor stand establishment with bluebunch wheatgrass and essentially no squirreltail plants.

There was evidence that some germination occurred at Ashwood, but the southeast-facing slope evidently dried out early, preventing stand establishment. This lack of stand establishment at Ashwood may have been affected by herbicide application after planting rather than prior to planting, as is standard procedure and was followed at Warm Springs.

***2010*:** At the Warm Springs location residual efficacy for the four herbicides on ventenata the second season following application ranged from 95 percent for Landmark and 90 percent for Matrix, to 60 percent for Journey and Plateau (Table 3). Stand establishment following the 2009 fall planting of the Landmark and Matrix plots was highest for Sandberg's bluegrass followed by Sherman big bluegrass, smooth brome, and intermediate wheatgrass. Very few bluebunch wheatgrass or squirreltail plants were observed (Table 6).

Bunchgrass stands appeared to be significantly reduced in the Journey- and Plateau-treated plots from 2009 to 2010. Cattle were in the plot area in the fall of 2009 and again from early spring to summer of 2010. Due to this high level of use at the site, it appeared that the established plants may have been significantly reduced from the 2008 fall planting. However, bunchgrasses planted in the Landmark and Matrix plots in the fall of 2009 appeared to be largely unaffected by the cattle. This may have been due to their small size during the time the cattle were present, making them inaccessible as feed.

It seems from informal observations at the Warm Springs site that the population of ventenata has spread significantly since plots were established in the fall of 2008. Ventenata was largely in the wetter areas along a draw that drains seasonal water. It is along the edge of this drainage area that the herbicide plus planting plots were placed. Ventenata appears to have spread up into the scabland areas that surround the draw where medusahead has been dominant. It is unclear whether this was an opportunistic expansion due to two wet springs, or a more natural invasive progression as ventenata expands into areas previously dominated by medusahead or cheatgrass.

No germination of bunchgrasses was observed at the Ashwood location following planting of the Landmark- and Matrix-treated plots in the fall of 2009 or from planting of the Journey and Plateau plots in the fall of 2008. It is still unclear whether this continued lack of stand establishment at Ashwood may have been caused by herbicide application after planting rather than prior to planting, as is standard procedure.

Table 1. 2009 evaluation of herbicides applied on November 19, 2008 to herbicide-only plots for control of ventenata, cheatgrass, and medusahead at Warm Springs, OR.

Treatments[1]	Product /acre	Ventenata control (%)	Cheatgrass control (%)	Medusahead control (%)	Bluebunch wheatgrass height (in)[2]
Plateau	6 oz	100	93	100	23.7 a
Journey	1 pt	100	96	100	22.5 a
Matrix[3]	4 oz	100	100	100	23.0 a
Landmark[3]	0.75 oz	100	100	100	21.7 a
Control	---	0	0	0	23.8 a

[1]Plateau = imazapic 2 lb ai/gal, Journey = imazapic 0.75 lb ai/gal + glyphosate 1.5 lb ai/gal, Matrix = rimsulfuron 25 percent, Landmark = sulfometuron 50 percent + chlorsulfuron 25 percent.
[2]Mean separation with Least Significant Difference (LSD) at $P \leq 0.05$
[3]Treatment included a silicon surfactant at 0.25 percent v/v.

Table 2. 2009 evaluation of herbicides applied onNovember 19, 2008 to herbicide-only plots for control of cheatgrass and medusahead at the alternate Ashwood, OR, location.

Treatments[1]	Product /acre	Cheatgrass/Medusahead control (%)	Intermediate wheatgrass height (in)[2]
Plateau	6 oz	100	24.7 a
Journey	1 pt	100	25.4 a
Matrix[3]	4 oz	100	26.2 a
Landmark[3]	0.75 oz	100	20.7 b
Control	---	0	25.0 a

[1]Plateau = imazapic 2 lb ai/gal, Journey = imazapic 0.75 lb ai/gal + glyphosate 1.5 lb ai/gal, Matrix = rimsulfuron 25 percent, Landmark = sulfometuron 50 percent + chlorsulfuron 25 percent.
[2]Mean separation with Least Significant Difference (LSD) at $P \leq 0.05$
[3]Treatment included a silicon surfactant at 0.25 percent v/v.

Table 3. 2010 evaluation of 2008 herbicide applications to herbicide-only and herbicide followed by planting plots for ventenata and medusahead control at Warm Springs, OR.

		Herbicide-only plots	Herbicide & planting plots
Treatments[1]	Product /acre	Ventenata control (%)	Ventenata control (%)
Plateau	6 oz	68	60
Journey	1 pt	60	60
Matrix[2]	4 oz	73	90
Landmark[2]	0.75 oz	81	95
Control	---		

[1]Plateau = imazapic 2 lb ai/gal, Journey = imazapic 0.75 lb ai/gal + glyphosate 1.5 lb ai/gal, Matrix = rimsulfuron 25 percent, Landmark = sulfometuron 50 percent + chlorsulfuron 25 percent.
[2]Treatment included a silicon surfactant at 0.25 percent v/v.

Table 4. 2010 evaluation of 2008 herbicide applications to herbicide-only plots for control of medusahead at the alternate Ashwood, OR, location.

	Product	Medusahead	Intermediate wheatgrass
Treatments[1]	/acre	control (%)	height (in)[2]
Plateau	6 oz	45	31.9 a
Journey	1 pt	40	31.0 ab
Matrix[3]	4 oz	48	30.2 ab
Landmark[3]	0.75 oz	57	29.3 b
Control	---	0	30.6 ab

[1]Plateau = imazapic 2 lb ai/gal, Journey = imazapic 0.75 lb ai/gal + glyphosate 1.5 lb ai/gal, Matrix = rimsulfuron 25 percent, Landmark = sulfometuron 50 percent + chlorsulfuron 25 percent.
[2]Mean separation with Least Significant Difference (LSD) at $P \leq 0.05$.
[3]Treatment included a silicon surfactant at 0.25 percent v/v.

Table 5. 2009 stand establishment of bunchgrass varieties planted at Warm Springs, OR, following herbicide application on December 12, 2008.

	Plateau	Journey
Varieties	Plants/plot	Plants/plot
Squirreltail	14	30
Intermediate wheatgrass	250	414
Bluebunch wheatgrass	76	26
Sandberg's bluegrass	350	406
Sherman big bluegrass	644	212
Smooth brome	214	314

Table 6. 2010 stand establishment of bunchgrass varieties planted at Warm Springs, OR, following herbicide application on December 12, 2008.

Varieties	Plateau & Journey Plants/plot	Matrix & Landmark Plants/plot
Squirreltail	0.7	1
Intermediate wheatgrass	4.0	426
Bluebunch wheatgrass	0.3	5
Sandberg's bluegrass	2.0	1402
Sherman big bluegrass	2.3	1189
Smooth brome	2.3	922