Restoring Central Oregon Rangeland from Medusahead and Cheatgrass to a Sustainable Bunchgrass Environment – South Junction, 2011

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Abstract

Medusahead (*Taeniatherum caput-medusae*) and cheatgrass (*Bromus tectorum*) are annual grassy weeds capable of crowding out bunchgrasses, leaving rangelands with reduced forage for livestock and wildlife, and potentially more susceptible to fires and soil erosion. Two sets of plots were established in the fall of 2007 at two locations north of Madras, Oregon, one where bunchgrasses remained despite significant populations of medusahead, and a second where few bunchgrasses were present. The objective was to evaluate the effects of strictly herbicide based programs on bunchgrass growth after removal of annual weedy grasses, and evaluate stand establishment of six bunchgrasses species following herbicide application in areas where annual weedy grasses were predominate and few bunchgrasses remained. Treatments consisted of herbicide-only and herbicide followed by planting of six bunchgrass species. Herbicide-only applications controlled medusahead and cheatgrass, releasing completion from these species that allowed bunchgrass size to increase. Inadequate moisture following applications of Matrix® and Landmark® resulted in poor weed control and poor establishment of bunchgrass species during the spring of 2008. Moderate stands were established during the spring of 2009, with a continued increase in stand establishment during 2010 and 2011 when precipitation was favorable. Bunchgrasses that established best following herbicide applications were crested wheatgrass, intermediate wheatgrass, Sherman big bluegrass, and bluebunch wheatgrass. During the second year follow treatment, residual herbicide efficacy diminished, but continued to significantly reduce competition from weedy annual grasses in both the herbicide-only plots and herbicide followed by planting of bunchgrasses for a second year. By the third season following herbicide application, no residual effect was visible with the exception of the herbicide-only plots at the bench location. Reduced populations of medusahead in the Plateau and Journey plots at the bench location continued into the fourth season, 2011.

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 cheatgrass, *Bromus tectorum*). Medusahead and cheatgrass often out-compete bunchgrasses that stabilize the soil and provide forage for livestock and wildlife. Furthermore, medusahead and cheatgrass dramatically increase the fuel load, therefore altering fire frequency and changing the established plant community to species more adapted to frequent 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. The two objectives of this project were to evaluate the effects of strictly herbicide based programs on bunchgrass growth after removal of medusahead and cheatgrass, and evaluate stand establishment of six bunchgrasses species following herbicide application in areas where medusahead and cheatgrass were predominate and few bunchgrasses remained.

Materials and Methods

Plots were established in the fall of 2007 at two locations on the Big Cove Ranch near South Junction, north of Madras, Oregon. Each location included two sites, one where bunchgrasses were coexisting with high infestations still present despite high populations of medusahead, and a second nearby location where the plant community was dominated by medusahead, with no signification presence of bunchgrasses.

Herbicide-Only Plots

During the fall of 2007 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 4 times. Plateau and Journey were applied October 13, 2007 and Matrix and Landmark were applied November 21, 2007. Application equipment was a CO_2-pressurized hand-held boom sprayer outfitted with TeeJet 8002 nozzles on a 9-ft boom operated at 40 psi and applying 20-gal water/acre.

During September of 2008, plots were evaluated visually for herbicide efficacy. In addition plant height measurements were taken on established crested wheatgrass at the bench location and intermediate wheatgrass at the meadow location to evaluate herbicide injury and increased growth related to competitive release. Plots were re-evaluated for herbicide efficacy and bunchgrass growth in August, 2009, July, 2010 and June, 2011.

Herbicide Application Followed by Planting Bunchgrass

The same treatments were applied in the study where herbicide applications were combined with the seeding of grasses. Herbicides were applied in single large plots 20 ft by 180 ft at the bench location and 40 ft by 480 ft at the meadow location. Applications were made using a 4-wheeler outfitted with a single Floodjet nozzle with an application width of 20 ft Plateau and Journey were applied October 12, 2007 and Matrix and Landmark were applied December 28, 2007.

Six species of bunchgrasses were planted following application of Plateau and Journey on December 12, 2007 in 10 ft-wide plots at the bench location replicated 3 times, and on 20 ft-wide plots at the meadow location replicated 4 times. Seeding rate was 15 lb/acre using a 10 ft-wide Truax Rough Rider Rangeland drill with a planting pattern of 10 rows on 12 inch centers.

Bunchgrasses included crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa sandbergii*), Sherman big bluegrass (*Poa secunda*), and smooth brome (*Bromus inermis*).

Herbicide efficacy and stand establishment of bunchgrasses were visually evaluated each year of the project. A visual evaluation of percent control was used for herbicide efficacy. Bunchgrass establishment was determined by plant counts prior to 2011, when a line transects method was used. During 2008 stand establishment was evaluated in April and June, and herbicide efficacy in September. For 2009, herbicide efficacy was re-evaluated in August and stand counts were made during late October and early November. In 2010, stand establishment was evaluated in April and June, and herbicide plots were evaluated for efficacy in May at the bench location and July at the meadow location. In 2011, stand establishment was evaluated July 1 using a line transect method to determine number of plants per plot. Three transects were randomly established in each subplot and placed perpendicular to the seeded rows. Number of plants were counted in three $30cm^2$ frames, randomly placed along each transect for a total of nine frames counted per subplot.

Results and Discussion

Herbicide-only Plots

2008: All four herbicides applied to control medusahead provided 100% control of medusahead and cheatgrass at the meadow location during 2008 (Table 1). At the bench location, Plateau and Journey provided 100% control, while Matrix provided 98% and Landmark 68% control. The variability observed in annual grass control with Landmark was probably due to the limited precipitation following the November 21 application. Intermediate wheatgrass at the meadow location had significantly increased growth. Assumable this was the result of herbicide applications reducing competition from medusahead and cheatgrass compared to the untreated plot.

2009: The year after application evaluations indicated that the annual weedy grass control was still over 90% in plots treated with Plateau and journey, but control with Landmark and Matrix had declined considerably (Table 2). A year later the previously established intermediate wheatgrass in the herbicide-only plots at the meadow location continued to be larger in size due to competitive release compared to plants in the untreated plots. There were no differences in plant height between the four herbicide treatments. Early grazing of the crested wheatgrass at the bench location prevented evaluation of that site.

2010: No residual control on medusahead was observed at the meadow location, while at the bench location Plateau and Journey continued to provide 88 and 80% control of medusahead (Table 3). This level of control the third season following application was unexpected, based on previous research in the same general area. Previously established intermediate wheatgrass in the herbicide-only plots at the meadow location increased in size each season following herbicide applications. It is difficult to determine the role of competitive release due to herbicides or the increased amount of annual precipitation. There were no significant differences in plant height between the four herbicide treatments. Early grazing of the crested wheatgrass at the bench location again prevented evaluation of that site.

2011: While there was no control from herbicide applications on medusahead at the meadow location, at the bench site we continue to observe significantly less medusahead in Plateau and Journey treated plots than the untreated check (Table 4). Intermediate wheatgrass was established on this site in the early 90's as part of the CRP program. Higher plant population at this site in combination with these two "softer" herbicides on existing bunchgrasses may be creating a situation where the intermediate wheatgrass continues to compete with medusahead in a way not observed at other locations.

Herbicide Application Followed by Planting Bunchgrass

2008: The Matrix and Landmark portions of the plots were abandoned due to poor efficacy that was likely caused by inadequate precipitation following application. Establishment of the six bunchgrasses was poor at both locations probably due to lack of moisture. Based on a visual rating, the best performers under these conditions were crested wheatgrass, followed by intermediate wheatgrass and bluebunch wheatgrass.

2009: Following increased precipitation during the spring, a modest stand established for some bunchgrasses species (Table 5). The best performers at the bench location were crested wheatgrass, Sherman big bluegrass, and bluebunch wheatgrass. At the meadow location the trend was for crested wheatgrass, intermediate wheatgrass, and Sherman big bluegrass to be better performers.

2010: An unusually wet spring and early summer resulted in increased growth and stand establishment of bunchgrasses (Table 6). At both the bench and meadow locations crested wheatgrass was the undisputed leader in its ability to establish a strong stand. Planted rows were clearly visible, with less medusahead, yellow mustard, and other annual weeds present in the plots. At the bench location, there were moderate stands of Sherman big bluegrass, with lesser stands of bluebunch wheatgrass and intermediate wheatgrass. Intermediate wheatgrass and Sherman big bluegrass continue to have modest stands. Sandberg's bluegrass and smooth brome have not been able to successfully establish at either location.

2011: Bunchgrass performance by species was consistent at both the meadow and bench location (Table 7). Crested wheatgrass provided the most numerous stand, followed by intermediate wheatgrass, Sherman big bluegrass and bluebunch wheatgrass. There was a very small stand of Sandberg's bluegrass, with essentially no smooth brome.

Table 1. 2008 evaluation of herbicide applications to herbicide-only plots for control of medusahead at South Junction near Madras, Oregon.

		Meadow location		Bench location
Treatments[1]	Product /acre	Interm.wheatgrass height (inch)	Cheatgrass/Medusahead control (%)	Medusahead control (%)
Plateau	6 oz	19.6	100	100
Journey	1 pt	20.2	100	100
Matrix[2]	4 oz	17.4	100	98
Landmark[2]	0.75 oz	18.7	100	68
Untreated	-----	--	0	0

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

Table 2. 2009 evaluation of herbicide applications for herbicide-only plots for control of medusahead at South Junction near Madras, Oregon.

		Meadow location		Bench location
Treatments[1]	Product /acre	Interm.wheatgrass height (inch)	Cheatgrass/Medusahead control (%)	Medusahead control (%)
Plateau	6 oz	25.3 a[2]	90	96
Journey	1 pt	24.2 ab	90	91
Matrix[3]	4 oz	21.5 b	35	33
Landmark[3]	0.75 oz	22.4 ab	61	5
Untreated	-----	--	0	0

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

Table 3. 2010 evaluation of herbicide applications for herbicide-only plots for control of medusahead at South Junction near Madras, Oregon.

		Meadow location		Bench location
Treatments[1]	Product /acre	Interm.wheatgrass height (inch)	Cheatgrass/Medusahead control (%)	Medusahead control (%)
Plateau	6 oz	29.3 a[2]	0	88
Journey	1 pt	29.6 a	0	80
Matrix[3]	4 oz	20.3 a	0	0
Landmark[3]	0.75 oz	27.7 a	0	0
Untreated	-----	--	0	0

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

Table 4. 2011 evaluation of herbicide applications for herbicide-only plots for control of medusahead at South Junction near Madras, Oregon.

		Meadow location		Bench location	
Treatments[1]	Product /acre	Interm.wheatgrass height (inch)	Cheatgrass/ Medusahead control (%)	Interm.wheatgrass increase in plant height (%)	Medusahead control (%)
Plateau	6 oz	26.9 [2]	0	35	70
Journey	1 pt	25.9	0	35	65
Matrix[3]	4 oz	17.3	0	25	25
Landmark[3]	0.75 oz	18.3	0	-5	0
Untreated	-----	26.2	0	0	0

[1]Plateau = imazapic 2 lb ai/gal, Journey = imazapic 0.75 lb ai/gal + glyphosate 1.5 lb ai/gal, Matrix = rimsulfuron 25%, Landmark = sulfometuron 50% + chlorsulfuron 25%.
[2]No Significance at Mean separation (LSD) at $P \leq 0.05$.
[3]Treatment included a silicon surfactant at 0.25% v/v.

Table 5. Grass species establishment as number of bunches/plot for two sites at the South Junction location in 2009, following applications of Plateau and journey in the fall of 2007.

	Meadow location	Bench location
Varieties	bunches/plot	bunches/plot
Crested Wheatgrass	750	25
Intermediate Wheatgrass	96	7
Bluebunch Wheatgrass	30	10
Sandberg's Bluegrass	740	27
Sherman Big Bluegrass	358	27
Smooth Brome	6	0

Table 6. Grass species establishment as number of bunches/plot for two sites at the South Junction location in 2010, following applications of Plateau and journey in the fall of 2007.

	Meadow location	Bench location
	Plateau & Journey	Plateau & Journey
Varieties	bunches/plot	bunches/plot
Crested Wheatgrass	2021	54
Intermediate Wheatgrass	13	7
Bluebunch Wheatgrass	0	11
Sandberg's Bluegrass	1	0
Sherman Big Bluegrass	13	34
Smooth Brome	0	0

Table 7. Grass species establishment as number of bunches/plot for two sites at the South Junction location in 2011, following applications of Plateau and journey in the fall of 2007.

	Meadow location	Bench location
	Plateau & Journey	Plateau & Journey
Varieties	bunches/plot	bunches/plot
Crested Wheatgrass	1851 a[1]	86.3 a[1]
Intermediate Wheatgrass	917 ab	77.3 a
Bluebunch Wheatgrass	376 b	23.7 a
Sandberg's Bluegrass	55 b	3.0 bc
Sherman Big Bluegrass	477 b	71.8 a
Smooth Brome	0 b	0.2 c

[1]Mean separation (LSD) at $P \leq 0.05$.