DOWNY BROME CONTROL AND DESIRABLE SPECIES ESTABLISHMENT AS INFLUENCED BY BURNING AND PLATEAU® APPLICATION RATE AND TIMING

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Introduction

Invasive weed species continue to spread across rangeland. Once established, invasive weeds often have a competitive advantage over native plants. Invasive grass species like downy brome *(Bromus tectorum)* quickly use the available moisture in the spring, set seed, and senesce by early to mid-summer. Once the moisture is depleted and the plants have matured and dried, they become a serious fire hazard. Areas infested with downy brome are more likely to burn on a regular basis. Native species not adapted to frequent burning are further eliminated, resulting in monocultures of downy brome.

The need for herbicides that effectively control downy brome while allowing for the establishment of desirable species is of considerable importance in reclaiming downy brome-infested pastures and rangelands. Plateau (imazapic) herbicide has shown promise for the control of noxious weeds in rangeland, having fair to excellent selectivity on several newly seeded and established desirable grass species. The ability to control downy brome without injury to newly seeded grasses would be a great tool for reclaiming badly infested sites. Plateau needs to be tested under regional conditions to determine its efficacy on downy brome in eastern Oregon and southwestern Idaho. The objectives of this trial were 1) to evaluate the influence of duff removal by burning on downy brome control with Plateau herbicide, 2) to evaluate Plateau application rate for downy brome control and desirable species establishment, and 3) to evaluate Plateau application timing on desirable species establishment.

Methods

A trial was established near Ontario, Oregon to evaluate fall applied Plateau at rates of 0.031, 0.064, 0.094, 0.125, 0.157, and 0.188 lb ai/acre applied prior to or following seeding of various desirable species. In addition, the herbicide treatments were applied to burned and unburned whole plots to compare the effect of duff removal on downy brome control and desirable species establishment. Duff was removed by burning on October 12, 2001. Plateau treatments were applied broadcast with a CO_2-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Plots measured 10 ft by 35 ft and treatments were replicated three times. The trial was designed as a randomized complete block with a split plot arrangement. Each whole plot (i.e., burned or unburned) received 13 different treatments; 6 preplant Plateau treatments, 6 postplant

Plateau treatments, and an untreated control treatment. Preplant and postplant Plateau treatments were applied on October 18, 2001. Five species were planted lengthwise across the burned and unburned whole plots using a rangeland drill. The species were Valvalov Siberian wheatgrass, Goldar bluebunch wheatgrass, Magnar Great Basin wildrye, Bozoisky wildrye, and western yarrow. Downy brome control and desirable species establishment were evaluated at various dates following trial initiation.

Results and Discussion

Downy brome control was not influenced by Plateau application timing when evaluated in 2002. Both herbicide rate and duff removal by burning influenced downy brome control (Table 1). There was a significant ($P < 0.05$) interaction between burning and Plateau rate with regard to downy brome control when evaluated 188 days after treatment (DAT) on April 24, and July 2, (257 DAT) 2002. On April 24, Downy brome control from Plateau treatments ranged from 73 to 99 percent when applied to burned plots and from 49 to 88 percent applied to unburned plots. Downy brome control was similar with Plateau applied at 0.094, 0.125, 0.157, and 0.188 lb ai/acre when applied following duff removal. In unburned plots, downy brome control was similar with Plateau at 0.125, 0.157, and 0.188 lb ai/acre. Duff removal by burning increased downy brome control from Plateau at rates from 0.031 to 0.125 lb ai/acre on April 24 and from 0.031 to 0.157 lb ai/acre on July 2. In unburned plots, 0.064 and 0.094 lb ai/acre of Plateau were required to achieve control similar to 0.031 and 0.064 lb ai/acre in burned plots when evaluated on April 24 and July 2, respectively. A full 0.157 lb ai/acre of Plateau applied to unburned plots was necessary to give downy brome control similar to 0.094 lb ai/acre applied to burned plots on April 24. By July 2, 2002, the 0.094 lb ai/acre rate of Plateau applied to burned plots gave greater downy brome control than all treatments applied to unburned plots except the 0.188 lb ai/acre rate. The increased efficacy of Plateau applied to burned versus unburned plots may be attributed to increased herbicide soil contact following duff removal. Downy brome acts as an annual or winter annual, therefore increased Plateau concentrations in the soil during germination should provide greater control. In addition, fall burning may have destroyed enough downy brome seed to noticeably reduce downy brome pressure the following spring.

Downy brome control on July 10, 2003 (630 DAT), was influenced by duff removal, Plateau rate, and Plateau application timing (Table 2). Downy brome control with Plateau ranged from 8 to 92 percent in burned plots and from 5 to 62 percent in unburned plots. In burned plots, preplant and postplant applications provided similar downy brome control at all rates except 0.031 lb ai/acre. In unburned plots, preplant applications resulted in greater downy brome control than postplant applications when Plateau was applied at 0.031 or 0.064 lb ai/acre. Conversely, downy brome control was greater with postplant Plateau at rates of 0.094 or 0.157 lb ai/acre versus preplant applications at the same rates.

Establishment of desirable species at this location was difficult due to the extremely dry conditions preceding and following planting. Of the five species that were seeded in the

trial, only Bozoisky wildrye failed to establish. The other four species established to varying degrees with the most prolific being Valvalov Siberian wheatgrass. There was a significant interaction between duff removal by burning and herbicide rate with regard to Valvalov, Goldar, Magnar, and yarrow establishment on July 2, 2002 (257 DAT) (Table 3). Valvalov establishment was greater in burned versus unburned plots at all Plateau rates except for the highest rate of 0.188 lb ai/acre. Goldar and Magnar establishment was greater in burned plots compared to unburned plots at Plateau rates of 0.031, 0.064, and 0.094 lb ai/acre. Yarrow establishment was greater in burned plots compared to unburned plots at plateau rates of 0.031 and 0.064 lb ai/acre. The treatments providing the highest rates of establishment for the various species were obtained with duff removal by burning and Plateau applied at 0.094 lb ai/acre for Valvalov, 0.031 lb ai/acre for Goldar and yarrow, and 0.064 lb ai/acre for Magnar (Table 3). Establishment of the various species in unburned plots did not differ with Plateau rate. Valvalov and Magnar establishment were greater with preplant versus postplant Plateau treatments applied to burned plots (Table 3). Establishment of these species was not influenced by Plateau application timing to unburned plots.

Valvalov Siberian wheatgrass establishment on July 10, 2003 (630 DAT), was influenced by duff removal, Plateau rate, and Plateau application timing (Table 5). Valvalov establishment with Plateau ranged from 528 to 3,408 shoots/50 ft^2 in burned plots and from 134 to 512 shoots/50 ft^2 in unburned plots. The greatest Valvalov shoot production was with Plateau applied preplant at 0.094 lb ai/acre. Preplant applications in burned plots resulted in significantly greater shoot production with Plateau applied at 0.094, 0.157, and 0.188 lb ai/acre when compared to their respective postplant applications. Although downy brome control was similar with preplant and postplant applications at these rates, Valvalov shoot production was less with the postplant applications, possibly due to direct herbicide contact with the Valvalov seed at planting. Due to poor downy brome control, there were no differences in Valvalov shoot production with regard to Plateau rate or application timing in unburned plots.

Duff removal by burning was beneficial for both downy brome control and desirable species establishment. The duff layer at the trial location was heavier than what would typically be found at a range site in eastern Oregon or southwestern Idaho. Duff removal by burning may not have as great an effect at a location with less plant biomass. Although it may differ somewhat among seeded species, Plateau applied at 0.064 to 0.094 lb ai/acre appeared to provide the best combination of downy brome control and desirable species tolerance.

Table 1. Interaction between burning and herbicide rate for downy brome control, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

	Downy brome control†			
	April 24, 2002		July 02, 2002	
Plateau rate*	Burned	Unburned	Burned	Unburned
lb ai/acre	%		%	
0.031	73	49	76	35
0.064	83	64	86	70
0.094	92	73	96	82
0.125	96	75	97	86
0.157	96	84	98	89
0.188	99	88	98	92
LSD (0.05)	13		7	

*All Plateau treatments were applied with a non-ionic surfactant at 0.25% v/v.
†The April 24 and July 2 evaluation dates were 188 and 257 DAT, respectively.

Table 2. Interaction between burning, herbicide rate, and application timing for downy brome control, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

	Downy brome control			
	July 10, 2003†			
	Burned		Unburned	
Plateau rate*	Preplant	Postplant	Preplant	Postplant
lb ai/acre	%		%	
Untreated	0		0	
0.031	8	43	27	5
0.064	52	64	25	7
0.094	74	61	13	41
0.125	73	78	28	38
0.157	87	87	25	62
0.188	91	92	62	53
LSD (0.05)	22			

*All Plateau treatments were applied with a non-ionic surfactant at 0.25% v/v.
†The July 10 evaluation was 630 DAT.

Table 3. Interaction between burning and Plateau application rate for desirable species establishment, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

	Valvalov Siberian wheatgrass		Goldar Bluebunch wheatgrass		Magnar Great Basin wildrye		Western yarrow	
	July 2, 2002†							
Plateau rate*	Burned	Unburned	Burned	Unburned	Burned	Unburned	Burned	Unburned
lb ai/acre	Plants/50 ft²							
0.031	26	6	8.5	0.2	5.3	0.0	24	3
0.064	21	12	6.3	1.3	8.7	0.0	13	3
0.094	35	13	4.2	1.0	4.7	0.7	3	4
0.125	24	9	2.3	1.3	2.5	0.0	3	4
0.157	22	7	2.2	0.8	3.2	0.5	2	4
0.188	11	7	1.0	0.2	0.8	0.3	3	6
LSD (0.05)	NS		3.1		3.1		8	
LSD (0.10)	8		--		--		--	

*All Plateau treatments were applied with a non-ionic surfactant at 0.25% v/v.
†The July 2 evaluation was 257 days after Plateau treatment.

Table 4. Interaction between burning and herbicide application timing with Valvalov Siberian wheatgrass and Magnar Great Basin wildrye establishment, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

	Valvalov establishment		Magnar establishment	
	July 2, 2002			
Timing	Burned	Unburned	Burned	Unburned
	Plants/50 ft²		Plants/50 ft²	
Preplant	27	9	5.6	0.3
Postplant	20	9	2.8	0.2
LSD (0.05)	NS		1.6	
LSD (0.10)	5		--	

Table 5. Interaction between burning, herbicide rate, and application timing for Valvalov Siberian wheatgrass establishment, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

	Valvalov Siberian wheatgrass establishment†			
	July 10, 2003			
	Burned		Unburned	
Plateau rate*	Preplant	Postplant	Preplant	Postplant
lb ai/acre	Shoots/50 ft²		Shoots/50 ft²	
Untreated control	26		0	
0.031	1,608	2,273	154	329
0.064	1,551	988	372	348
0.094	3,408	1,409	405	350
0.125	2,242	1,743	322	512
0.157	1,530	528	158	198
0.188	1,466	638	220	134
LSD (0.05)	711			

*All Plateau treatments were applied with a non-ionic surfactant at 0.25% v/v.
†The April 24 and July 2 evaluation dates were 188 and 257 DAT, respectively.