Impact of Herbicide Applications for Exotic Annual Grass Control on Fuel Load Production

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Abstract

Exotic annual grasses such as downy brome, medusahead, and Ventenata can produce fine fuel loads that create favorable conditions for wild fire. This study assesses the effectiveness of imazapic (Plateau®) and propoxicarbazone sodium (Canter R+P®) in various application timings in reducing annual grass fuel load production. The study was conducted near South Junction, Oregon, in two sites with a reported invasive annual grass infestation – one site was burned, and one site unburned. *Preliminary results suggest that herbicides have the potential to reduce fuel loads from annual weedy grasses, particularly in recently burned fields.* The total biomass at the burned site (929 pounds per acre) in the beginning of the study was 40 percent less than the unburned site (1527 pounds per acre). The fire had a major impact in reducing the amount of litter available with 191 pounds per acre in the burned site against 1243 pounds per acre in the unburned. Treatment effects differed between locations. At the burned site, total biomass was reduced 53 percent with Plateau® at 6 oz/acre and 44 percent with Canter R+P® at 1.2 ounces per acre with spring application. In the unburned site, the herbicide application helped control annual weedy grasses; although, the effect on the produced biomass was not significant enough to reduce the production of litter or total biomass. These preliminary results suggest that herbicides can be used as tools to reduce the production of fine fuels, although the magnitude in the reduction is going to be determined by the history of previous wildfires.

Introduction

Exotic annual grasses such as cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput-medusae*), and Ventenata (*Ventenata dubia*) can produce large amounts of fine fuel loads creating favorable conditions for wild fires. These fuel loads change the fire regime and help perpetuate invasive grasses dominance in plant communities. One way to alter this cycle is by reducing the amount of fine fuel which can be achieved by mowing or grazing, however these practices have their limitations. For instance, mowing is restricted by terrain conditions and grazing is limited by the rapid loss of the palatability of the grasses. Herbicides imazapic and propoxicarbazone sodium have been particularly effective in controlling or suppressing exotic annual grasses, depending on rates and time of application. The main limitation for extensive use of these herbicides, particularly in rangelands, is the cost. However, if the fuel load from exotic annual grasses is reduced, the risk of wild fires will also decrease as the result of herbicide applications. This could help create lower fire risk sections or corridors in order to protect more sensitive areas such as installations, roadsides, buildings, animal shelters, etc. The cost of herbicide application for these areas would be compensated by the value of the saved resources and reduction in the cost of controlling frequent wild fires. The use of herbicides would only be justified if a significant reduction of the fuel load is achieved. The objective of this study was to quantify the impact of herbicides and application timings on invasive annual grass fuel load production.

Materials and Methods

The study was conducted near South Junction, Oregon, in two sites with a reported invasive annual grass infestation. In the first site, from now on referred to as the "unburned site," no fires had been recorded during the last four years. In the second site, fire was recorded in the summer of 2011, from this point forward this second site will be referred as "burned site." The study design was a randomized complete block design replicated four times with a plot size of 10 feet by 60 feet. Herbicides were applied with a backpack sprayer calibrated to deliver 20 gallons of spray solution per acre at 40 psi pressure using XR 8002 Teejet® nozzles. Application dates and environmental conditions are detailed in Table 1. Herbicide treatments consisted of imazapic (Plateau®) and propoxicarbazone sodium (Canter R+P®) (Table 3). An electrical fence was built around the perimeter of the studied area to avoid grazing. The impact of the treatments on fuel load production were determined by sampling the vegetation of a 5.4 square foot area in each plot, during the spring and fall of 2012. The harvested vegetation was separated into two categories: actively growing grasses (annual and perennial), and fuel load (laying dead plant matter). Samples were then oven dried and weighed.

Results and Discussion

The effect of the fire on the plant community was evident by the differences in biomass for all plant categories recorded at the beginning of the study (Table 2). The total biomass at the burned site (929 pounds per acre) was 40 percent less than the unburned site (1527 pounds per acre). The fire had a major impact in reducing the amount of litter available with 191 pounds per acre at the burned site against 1243 pounds per acre at the unburned. The effects of the fire were also evident on both annual and perennial grasses, where biomass at the burned site was 2.5 times higher than the unburned.

Six months after the spring application, the impact of the herbicide treatments differed between sites. A significant reduction in total biomass when compared to the untreated, was observed with the use of Plateau® at 6 ounces per acre, or Canter R+P® at 1.2 ounces per acre in the burned site (Table 3). Although every treatment had an impact on the produced litter, the most significant biomass reduction, 53 percent, was observed with the application of Plateau®. The control of annual weedy grasses was also more effective with Plateau®, as suggested by the lowest recorded biomass among treatments. All tested treatments reduced the biomass of the perennial grasses. A possible explanation for this is that a significant portion of the perennial grass biomass came from Bulbous bluegrass (*Poa bulbosa*), a species that has shown to be affected by the tested herbicides.

At the unburned site, treatments affected both perennial and annual weedy grasses but impacts were not significant enough to affect litter and total biomass production (Table 4). At this site, annual weedy grass control was more effective with Plateau® at 6 ounces per acre, and Canter R+P® at 0.6 ounces per acre, as indicated by the harvested biomass. The main perennial grass species at the unburned site was intermediate wheatgrass (*Thinopyrum intermedium)* and was only affected by Canter R+P® at 1.2 ounces per acre.

These preliminary results suggest that herbicides have the potential be used to reduce fuel loads from annual weedy grasses, particularly in recently burned fields. This project will be continued in 2013, with additional herbicide applications and vegetation sampling which will allow more definitive conclusions.

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Table 1. Application date and environmental conditions

	Unburned	Burned
Application Date	4/7/12	4/7/12
Time of Day	10 AM	12 PM
Air temperature (F)	49	51
Relative Humidity (%)	63	48
Wind Speed (MPH)	2	5
Wind Direction	NNW	N

Table 2. Average biomass (lb/acre) by category for both sites at the beginning of the study in the spring of 2012.

	Biomass lb/acre[1]							
Site	Weedy Grass		Perennial Grass		Litter		Total	
Burned	352	a	330	A	191	a	929	a
Unburned	137	b	132	B	1243	b	1527	b

[1]Means among columns followed by the same letter are not different at P=0.05.

Table 3. Average biomass (lb/acre) by category for the burned site in the fall of 2012.

		Biomass lb/acre[1]							
Treatment	Product Rate	Weedy Grass		Perennial Grass		Litter		Total	
Plateau®	6 oz/acre	21	b	6	b	607	b	679	b
Canter R+P®	1.2 oz/acre	60	a	17	b	743	ab	854	b
Canter R+P®	0.6 oz/acre	72	a	27	b	964	ab	1064	ab
Untreated		97	a	150	a	1292	a	1565	a

[1]Means among columns followed by the same letter are not different at P=0.05

Table 4. Average biomass (lb/acre) by category for the unburned site in the fall of 2012.

		Biomass lb/a[1]					
Treatment	Product Rate	Weedy Grass		Perennial Grass		Litter		Total	
Plateau®	6 oz/acre	12	b	518	ab	843	a	1386	a
Canter R+P®	1.2 oz/acre	26	ab	389	b	707	a	1140	a
Canter R+P®	0.6 oz/acre	9	b	577	a	882	a	1476	a
Untreated		39	a	476	ab	840	a	1372	a

[1]Means among columns followed by the same letter are not different at P=0.05