Native Grass Establishment Following Herbicide Applications

Photo courtesy of Mary Halstvedt

Herbicides are an important tool for removing noxious or invasive weeds from plant communities, allowing desirable vegetation to respond. However, severely degraded sites where desirable plants are either not present, or remnant populations of desirable grasses are insufficient to recover after invasive plant control may require re-vegetation.

It is important for land managers to have information on the length of time required between applying herbicide treatments and seeding desirable grasses to reduce the potential for seedling injury. The current label for aminopyralid-containing products (e.g., Milestone®) allows for use on established desirable grasses, or the herbicide can be applied in spring followed by fall grass seeding. The potential to seed grasses in late autumn as a dormant fall planting following an autumn herbicide application would allow more flexibility for land managers tasked with re-vegetating degraded sites.

Materials and Methods

Field research trials were established in 2009 to determine if warm and cool season grasses could be planted either in late autumn as a dormant fall planting or in the spring after a September application of herbicide. With a dormant seeding, grasses are planted in the fall just before the soil freezes. The seed remains dormant in the soil until the following spring when they will germinate and grow as soon as conditions are favorable.

Three sites were selected for the study at university research farms with Dr. Roger Becker, University of Minnesota, Dr. Rodney Lym, North Dakota State University, and Dr. Mike Moechnig, South Dakota State University. The study sites were tilled in August to prepare a seed bed and subsequently treated with glyphosate at 32 fluid ounces per acre (fl oz/A) to keep the sites weed free prior to seeding. Herbicide treatments included Milestone at 3, 7, and 14 fluid ounces per acre

Table 1: Herbicide application timing and seeding dates for cool and warm season grasses at three study locations.

Study location	Herbicide Application Date, 2009	Seeding Date	
		Dormant Fall 2009	Spring 2010
North Dakota	Sep. 15	-	Apr. 22
Minnesota	Sep. 16	Nov. 17	-
South Dakota	Sep. 22	Nov. 9	Apr. 4

Table 2: Grasses seeded at three university research farms located in Minnesota (MN), South Dakota (SD) and North Dakota (ND).

Grass	Bayer Code	Type	MN	SD	ND
Big bluestem	ANOGE	Warm	X	X	X
Little bluestem	ANSOC	Warm	X	X	
Sideoats grama	BOBCU	Warm	X	X	X
Switchgrass	PANVI	Warm	X	X	X
Yellow indiangrass	SOSNU	Warm	X	X	X
Canada wildrye	ELYCA	Cool	X	X	
Green needlegrass	STVDI	Cool	X	X	X
Intermediate wheatgrass	AGRIT	Cool		X	X

(fl oz/A), Transline® at 1.5 pints per acre (pt/A), and Tordon® 22K at 1 quart per acre (qt/A). Herbicides were applied in September (Table 1) with a CO_2 backpack or bicycle sprayer at 13 to 20 gallons per acre prior to seeding. Cool and warm season grasses commonly planted in restoration projects were selected for seeding. Grasses were seeded in late autumn or spring (**Table 1**) with a six-row cone seeder with 7 to 12 inch row spacing. Cool season species included intermediate wheatgrass (*Agropyron intermedium*), Canada wildrye (*Elymus canadensis*), and green needlegrass (*Stipa viridula*). Warm season species included big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), switchgrass (*Panicum virgatum*), and indiangrass (*Sorghastrum nutans*) (**Table 2**). Experiments were designed as randomized complete blocks with four replications per treatment combination.

Non-treated control plots were hand weeded for the early part of the growing season in 2010 to help ensure seedling success. Visual plant injury, plant count (number of plants per 0.5 meter row), and percent frequency of occurrence were measured in July 2010 at all sites.

Results and Discussion

Results showed grass establishment was greatest with the spring grass planting date compared to dormant fall planting when averaged across treatments (including the non-treated control) and sites (**Figure 1**). There was no significant difference in grass establishment in herbicide treated plots compared to the non-treated control when seeded at the dormant fall planting date (**Figure 2**). The low success in seedling establishment in the dormant fall planting may have been due to unfavorable conditions during winter and early spring.

Figure 1. The NUMBER OF GRASS SEEDLINGS established across all treatments (including non-treated control) and grass species was significantly less in the dormant fall planting (2.5 seedlings/0.5 meter row) compared to spring planting (5 seedlings/0.5 meter row). Data are for all locations combined (P=0.05).

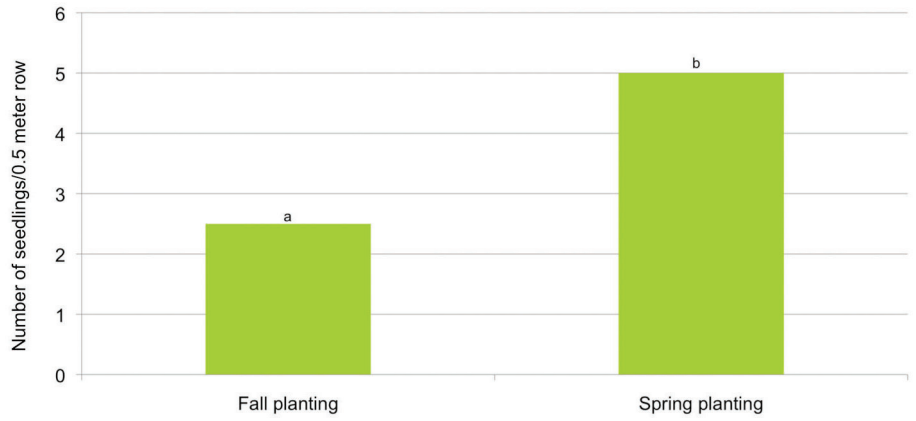


Figure 2. There was no significant difference in the NUMBER OF COOL AND WARM SEASON GRASS SEEDLINGS established per 0.5 meter row with a September application of Milestone at 7 fl oz/A followed by a dormant fall (November) planting. Data were collected the growing season following planting and are averaged across locations. See Table 2 for key to Bayer Codes.

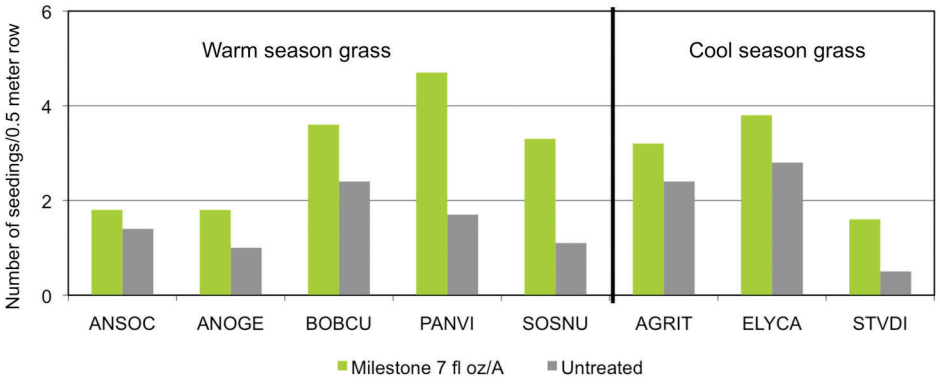
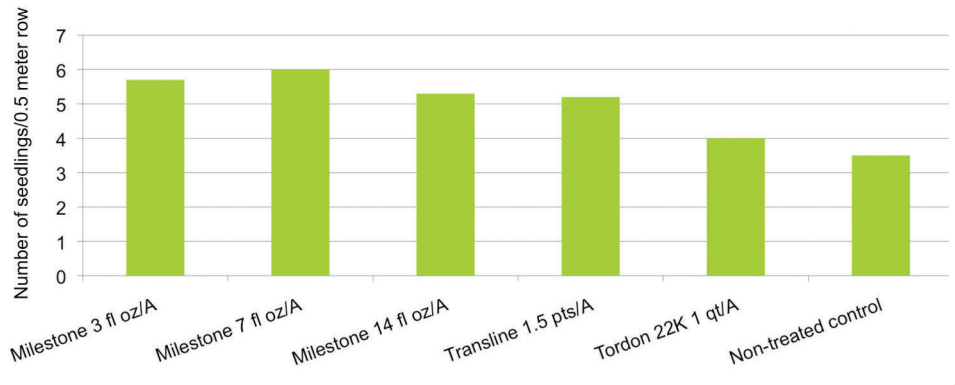


Figure 3. There was no significant difference in the NUMBER OF GRASS SEEDLINGS established per 0.5 meter row between various herbicide treatments compared to the non-treated control for the spring planting. Data shown are for COOL AND WARM SEASON GRASSES COMBINED (excluding big bluestem) and averaged across locations.



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Results of the spring planting date showed there was no significant difference in either cool or warm season grass establishment (except for big bluestem) in herbicide-treated plots compared to non-treated controls. There was a trend for greater seedling establishment in plots treated with Milestone at 3 and 7 fl oz/A compared to non-treated controls (**Figure 3**). The number of cool season grasses established in spring plantings ranged from 7.2 to 7.6 plants per 0.5 meter row (plants/0.5m row) in Milestone-treated plots, 6.6 plants/0.5m row in Transline-treated plots, and 5.2 or 5.4 plants/0.5m row for Tordon 22K-treated or non-treated controls, respectively. There was also a trend for the number of established warm season grass seedlings to be less in plots treated with Milestone at 14 fl oz/A, Transline, or Tordon 22K compared to Milestone at 3 or 7 fl oz/A; however, this difference was not significant. Milestone at 14 fl oz/A is twice the maximum broadcast rate of 7 fl oz/A. The percent frequency of warm season grass was greater in plots treated with Milestone at 3 or 7 fl oz/A or Transline at 1.5 pts/A compared to non-treated controls (**Figure 4**).

Big bluestem was the only grass that had a significant response to herbicide treatment (**Figure 5**). Seedling establishment was greatest in plots treated with Milestone at 3 and 7 fl oz/A compared to the non-treated control (**Figure 5**). Big bluestem seedling establishment was significantly greater with Milestone at 3 fl oz/A compared to Milestone at 14 fl ozA, Transline at 1.5 pts/A, or the non-treated control when averaged across locations.

Figure 4. The FREQUENCY OF WARM SEASON GRASSES was significantly greater in plots treated with Milestone at 3 or 7 fl oz/A or Transline at 1.5 pts/A compared to non-treated controls. Data averaged across locations. (P=0.05)

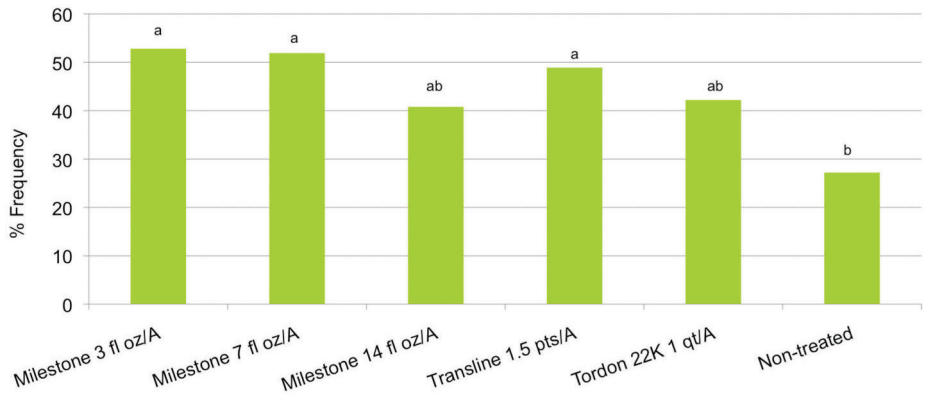
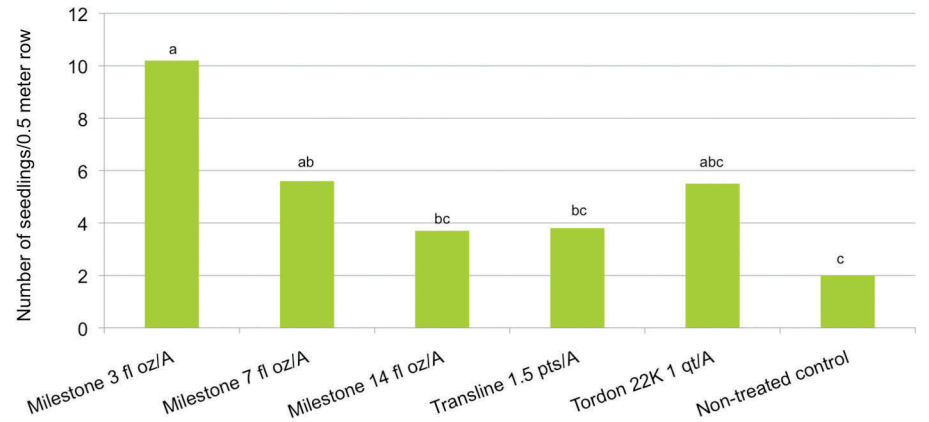


Figure 5. There was a significant difference in the NUMBER OF BIG BLUESTEM SEEDLINGS per 0.5 meter row between various treatments applied in September with an early spring planting. Data were collected the growing season following planting and averaged across locations (P< 0.05).



Conclusions

Based on these results a land manager could apply Milestone at 7 fl oz/A or less in early fall followed by a dormant fall planting or early spring planting of these grass species and have successful seedling establishment if environmental conditions are favorable. These data are corroborated by a similar study in Colorado (http://tinyurl.com/3ml52w4) in addition to other field experiments conducted in the western United States. Results confirm the utility of Milestone herbicide in rangeland grass reseeding programs following invasive broadleaf weed control.

EDITOR'S NOTE

Information in this article was presented at the Western Society of Weed Science meeting in Spokane, WA in 2011 by Mary B. Halstvedt[1], Vanelle F. Peterson[2], Roger L. Becker[3], Rodney G. Lym[4], and Michael J. Moechnig[5]

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