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HUNTER PERCEPTIONS AND ACCEPTANCE OF ALTERNATIVE DEER MANAGEMENT REGULATIONS[1]

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ABSTRACT

Wildlife managers are often confronted with a policy paradox where a majority of the public support's an outcome, but there is no agreement on specific management strategies to achieve this outcome. Previous research has also reported a link between regulatory acceptance, hunter satisfaction, and hunter participation rates. Thus, human dimensions research aimed at understanding hunter motivations and behavior is needed for effective management. In 2005, we surveyed Minnesota (USA) deer hunters (n = 6,000; 59% response) to evaluate attitudes regarding alternative deer (*Odocoileus virginianus*) harvest regulations. We also conducted a series of forced choice experiments in which respondents were asked to select an option from a list of representative regulations that might be adopted to achieve a particular deer management goal. Specifically, we modeled 5 deer population scenarios ranging from low populations with high buck-harvest rates to populations 50% over goal density. Our results indicate that hunters preferred different regulations depending on the population scenario, but generally preferred antler-point restrictions and disliked limiting buck licenses through a lottery. We also found consistency among scenarios, in that a small percentage of respondents indicated they would not hunt if regulations were changed. The results from this study should help wildlife managers design deer harvest regulations that are both acceptable to hunters and achieve management objectives.

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ESTABLISHMENT OF FORBS IN EXISTING GRASS STANDS

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SUMMARY OF FINDINGS

Interseeding native forbs into reconstructed grasslands could restore plant species diversity and improve wildlife habitat. Survival of forbs interseeded directly into existing vegetation may be enhanced by management treatments that reduce competition from established grasses. We evaluated the effects of two mowing and two herbicide treatments on diversity and abundance of forbs interseeded into established grasslands on 15 sites in southern Minnesota. Each site was burned and interseeded in fall 2009 or spring 2010, and two mowing treatments (once or twice per season) and two grass-selective herbicide treatments (high and low rate) were applied during the 2010 growing season. One year following treatments, 24 (83%) of the 29 native, seeded forbs were observed in the study plots, with no significant difference in seeded species abundance among treatments. Additional vegetation surveys will be conducted on all sites in the study in summers 2012-2013 to determine the extent of forb establishment and persistence.

INTRODUCTION

Minnesota Department of Natural Resources (MNDNR) wildlife managers indicated a need for more information on establishing and maintaining an abundance and diversity of forbs in grasslands (Tranel 2007). A diversity of forbs in grasslands provides the heterogeneous vegetation structure needed by some bird species for nesting and brood rearing (Volkert 1992, Sample and Mossman 1997). Forbs also provide habitat for invertebrates, an essential food for grassland birds and their broods (Buchanan et al. 2006).

The forb component on many restored grasslands has been lost or greatly reduced. Managers interested in increasing the diversity and quality of forb-deficient grasslands are faced with the costly option of completely eliminating the existing vegetation and planting into bare ground, or attempting to interseed forbs directly into existing vegetation. Management techniques that reduce competition from established grasses may provide an opportunity for forbs to become established in existing grasslands (Collins et al. 1998 and McCain et al. 2010). Temporarily suppressing dominant grasses may increase light, moisture, and nutrient availability to seedling forbs, ultimately increasing forb abundance and diversity (Schmitt-McCain 2008 and McCain et al. 2010). Williams et al. (2007) found that frequent mowing of grasslands in the first growing season after interseeding increased forb emergence and reduced forb mortality. Additionally, Hitchmough and Paraskevopoulou (2008) found that forb density, biomass, and richness were greater in meadows where a grass herbicide was used.

In this study, the effects of two mowing and two herbicide treatments on diversity and abundance of forbs interseeded into established grasslands in southern Minnesota were investigated.

METHODS

Study sites (n=15) were distributed throughout the southern portion of Minnesota's prairie/farmland region on state and federally owned wildlife areas. Each site was ≥4 ha and characterized by relatively uniform soils, hydrology, and vegetative composition. All sites were dominated by relatively uniform stands of native grasses with few forbs, most of which were non-native, such as sweet clover (*Melitotus alba, M. officinalis*).

Eight sites were burned in October-November 2009 and frost interseeded during December 2009 and March 2010, whereas seven sites were burned and interseeded during

April and May 2010. The same 30-species mix of seed was broadcast seeded at all sites at a rate of 239 pure live seeds/m^2. Seed used on spring-burned sites was cold-moist stratified for 3-5 weeks in wet sand to stimulate germination during spring 2010 and seed used on fall-burned sites was not.

Treatments

Sites were divided into 10 plots of approximately equal size and randomly assigned each of four treatments and the control. Each site received all treatments to account for variability among sites, and each treatment was replicated twice at each site. The following treatments, designed to suppress grass competition, were applied during the first growing season after interseeding (2010) while the forbs were becoming established:

- Mow 1: mowed once to a height of 10-15 cm when vegetation reached 25-35 cm in height.
- Mow 2: mowed twice to a height of 10-15 cm when vegetation reached 25-35 cm in height.
- Herbicide Low: applied grass herbicide Clethodim (Select Max®) at 108 mL/ha (9 oz/A) when vegetation reached 10-15 cm.
- Herbicide High: applied grass herbicide Clethodim (Select Max®) at 215 mL/ha (18 oz/A) when vegetation reached 10-15 cm.

Sampling Methods

Between 25 July 2011 and 27 September 2011, 20 sampling points randomly distributed within each study plot were located using a Global Positioning System receiver. Presence of seeded forbs was estimated in a 76 x 31 cm^2 quadrat at each sampling point. In addition, observers estimated litter depth and percent cover (Daubenmire 1959) of native grasses, exotic grasses, native forbs, exotic forbs, bare ground, and duff within each sampling quadrat. Percent cover was estimated within 6 classes: 0-5%, 5-25%, 25-50%, 50-75%, 75-95%, and 95-100%. Visual obstruction readings (VOR; Robel et al. 1970) were recorded in the 4 cardinal directions at the 5th and 20th quadrats in each plot.

RESULTS

One year following treatments, 24 (83%) of the 29 native, seeded forbs were observed in the study plots (Table 1). Black-eyed Susan (*Rudbeckia hirta*) was the most common seeded forb species (forming 40% of all seeded forb observations), followed by wild bergamot (*Monarda fistulosa*, 16%), golden Alexander (*Zizia aurea*, 10%), common milkweed (*Asclepias syriaca,* 8%), and yellow coneflower (*Ratibida pinnata*, 7%). Differences in seeded forb abundance were not significant among treatments and the control ($P > 0.05$; Table 1).

Native grasses formed the greatest component of canopy cover, averaging 48% cover across all treatments (Table 2). Big bluestem (*Andropogon gerardi*) tended to dominate the study plots, occurring in 82% of the quadrats regardless of treatment ($P > 0.05$). Cover of native grasses was slightly less in the Mow 2 treatment than the Mow 1 treatment. In contrast, cover of exotic grasses was slightly greater in the Mow 2 treatment than other treatments except Herbicide Low (Table 2). Treatments did not significantly affect cover of native forbs or exotic forbs (Table 2).

DISCUSSION

Although the mowing and herbicide treatments were effective in suppressing grasses during the first growing season after application (Tranel 2009), the grasses had recovered by 2011. Most of the seeded forb species became established in low numbers, but we detected no benefit of treatments in supporting greater forb establishment 1 year after interseeding. Williams et al. (2007) also observed similarly abundant seeded forbs in mowed and control treatments at the end of the second growing season, but seeded forbs were twice as abundant in mowed treatments by the beginning of year 5. Hitchmough and Paraskevopoulou (2008) found that, in treatments where grass was suppressed with a graminoid herbicide, sown forb density was higher in the second and third years after treatment and forb richness was greater three years after treatment. Additional vegetation surveys will be conducted on all sites in the study in summers 2012-2013 to determine the extent of forb establishment and persistence.

MANAGEMENT IMPLICATIONS

The use of the pre-emergent grass selective herbicide Clethodim (Select Max) at 108 mL/ha (9 oz/A) and 215 mL/ha (18 oz/A) was effective at suppressing well established native and exotic grasses at the pilot site (Tranel 2009). Growth of grass was stunted but grass mortality was not observed even at the high application rate at any of the study sites. Because this herbicide is fairly inexpensive and requires only one application in a growing season, it could prove to be a cost effective alternative to repeated mowing in areas where grass suppression is desired.

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Table 1. Frequency of seeded forb species by treatment type on 15 study sites during 2011 (1 year post treatment). Maximum possible frequency was 3,000 (15 sites x 5 treatments x 2 replicates x 20 quadrats).

Seeded Forb	Control		Mow 1		Mow 2		Herbicide Low		Herbicide High		Sum	% of Total
Alumroot	0	0	0	0	0	0	0	0	0	2	2	0.12
Aster, Heath	2	1	0	8	13	1	0	7	9	0	41	2.39
Aster, New England	1	1	0	1	0	1	0	1	1	0	6	0.35
Aster, Sky Blue	0	1	0	0	0	0	0	0	0	0	1	0.06
Bergamot, Wild	28	29	25	22	29	30	22	35	37	26	283	16.47
Black Eyed Susan	68	59	54	74	81	59	61	92	68	75	691	40.22
Blazingstar, Prairie	0	0	1	0	0	0	1	0	0	0	2	0.12
Blazingstar, Rough	0	0	0	0	0	0	0	0	0	0	0	0.00
Canada Milk Vetch	6	3	5	2	4	6	7	5	5	7	50	2.91
Closed Bottle Gentain	0	0	0	0	0	1	0	0	0	0	1	0.06
Coneflower, N. L. Purple	0	1	0	2	1	7	1	0	2	1	15	0.87
Coneflower, Yellow	11	10	13	8	17	19	7	7	14	18	124	7.22
Culver's Root	0	0	0	0	0	0	0	0	0	0	0	0.00
False Sunflower	0	1	1	3	1	2	0	0	1	3	12	0.70
G. Alexander, Heart Leaf	0	1	0	0	0	0	0	0	1	1	3	0.17
Golden Alexander	16	15	21	27	22	14	2	20	23	13	173	10.07
Goldenrod, Stiff	1	3	0	3	1	0	0	3	0	3	14	0.81
Leadplant	0	0	0	0	0	0	0	0	0	0	0	0.00
Maximilian Sunflower	0	0	0	0	0	0	0	0	0	2	2	0.12
Milkweed, Common	18	17	11	8	11	19	17	9	14	13	137	7.97
Partridge Pea	0	0	0	0	1	0	1	2	0	3	7	0.41
Prairie Cinquefoil	10	3	7	7	5	6	4	4	10	9	65	3.78
Prairie Clover, Purple	1	0	2	2	1	0	2	1	1	1	11	0.64
Prairie Clover, White	0	0	1	1	0	0	0	1	1	2	6	0.35
Prairie Coreopsis	0	0	0	0	0	0	0	0	0	0	0	0.00
Prairie Onion	0	0	0	0	0	0	0	0	0	0	0	0.00
Showy Tick Trefoil	0	0	1	0	1	0	0	0	1	0	3	0.17
Vervain, Blue	9	2	2	9	3	8	2	2	3	5	45	2.62
Vervain, Hoary	2	0	3	3	3	1	2	2	6	2	24	1.40
Sum	173	147	147	180	194	174	129	191	197	186	1718	100.00

Table 2. Comparison of estimated percent cover of native grasses, exotic grasses, native forbs, and exotic forbs on 15 study sites during 2011 (1 year post treatment).

	Native Grasses			Exotic Grasses			Native Forbs			Exotic Forbs		
Treatment	Mean	SD	95% CI	Mean	SD	95% CI	Mean	SD	95% CI	Mean	SD	95% CI
Control	49.08	27.81	46.85-51.31	31.19	33.08	28.54-33.84	21.62	31.97	19.06-24.18	21.25	30.89	18.78-23.72
Mow 1	50.49	27.43	48.30-52.68	33.21	33.45	30.53-35.89	21.48	31.45	18.96-24.00	19.27	26.75	17.13-21.41
Mow 2	45.62	29.40	43.27-47.97	39.35	35.07	36.54-42.16	21.26	32.30	18.68-23.84	20.78	28.77	18.48-23.08
Herbicide high	48.11	27.32	45.92-50.30	31.11	33.26	28.45-33.77	24.98	31.98	22.42-27.54	18.19	24.41	16.24-20.14
Herbicide low	47.63	27.72	45.41-49.85	36.42	35.07	33.61-39.23	22.37	32.23	19.79-24.95	18.40	28.58	16.11-20.69
All	48.12			34.04			22.34			19.58		