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Evaluating Preferences of Hunters and Landowners for Managing White-tailed Deer in Southwest Minnesota – A Progress Report

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SUMMARY OF FINDINGS

We mailed questionnaires to 3,600 hunters and 4,400 landowners in southwest Minnesota to evaluate their experiences and attitudes regarding white-tailed deer (*Odocoileus virginianus*) densities, hunting opportunities, and potential regulations for deer hunting. This paper summarizes findings from 2 of 3 mailings that were completed. We expect final results will be available in summer 2013. Preliminary results suggested hunters were satisfied with deer densities, but would prefer to see a higher proportion of bucks in the population and more older-aged bucks. Most landowners believed deer populations were too high or about right, and 46% of landowners wished to see deer densities reduced. The results of these surveys will help evaluate the 2012 deer goal-setting process in southwest Minnesota, and will help inform decisions about future management of deer in southwest Minnesota.

INTRODUCTION

During 2012, Minnesota Department of Natural Resources (MNDNR) conducted a deer goal-setting process to gather public input to aid in setting deer population goals for 3 blocks of deer permit areas (DPAs) in the state, including southwest Minnesota, the Grand Rapids area, and the Hibbing area (Thorson 2012). The goal-setting process included development of recommendations for deer population goals by stakeholder teams and an online survey of voluntary participants. Stakeholder teams from the respective blocks represented hunters, landowners, local government officials, and other people with an interest in deer. Stakeholder teams were presented with information about deer biology and management in their region. After discussion among the stakeholders, the team developed recommendations for deer population goals.

Online surveys were available on the MNDNR public website and were announced through news releases. Online surveys were open for a period of 26 days. Participants in the online survey were voluntary, and they were asked to select 1 block of DPAs that was of interest to them. These participants were presented with a slide show of information specific to the block of DPAs, including the recommendations for deer population goals from the stakeholder teams. Participants then completed a survey about deer management in their area, and were asked at what level the deer population should be managed in the block of DPAs.

Online respondents indicated they would like deer populations to be increased in all 3 blocks of DPAs. In both the Grand Rapids area and the Hibbing area, >60% of respondents felt that deer numbers were too low. The results were less clear in the southwest block of DPAs with 46% of respondents indicating that deer numbers were about right and 50% of respondents indicating that deer numbers were too low. With no plurality of opinion about deer population levels in southwest Minnesota, the results of the goal-setting process were difficult to apply to management. In addition, only 36% of online respondents were satisfied with the goal-setting process. Thus, the purpose of our study was to obtain detailed public input data to aid in setting deer population goals for southwest Minnesota.

OBJECTIVES

1) To evaluate the satisfaction of deer hunters with regards to their hunting experiences in southwest Minnesota;
2) To identify the preferences of hunters for potential regulations to manage deer in southwest Minnesota;

3) To evaluate the experiences and attitudes of landowners in southwest Minnesota about deer relative to land use on their property and perceptions of deer damage to agriculture;
4) To evaluate the satisfaction of landowners that hunt with regards to their hunting experiences in southwest Minnesota; and
5) To identify the preferences of landowners for potential regulations to manage deer in southwest Minnesota.

METHODS

The surveys focused on southwest Minnesota, including the counties of Brown, Cottonwood, Jackson, Lac qui Parle, Lincoln, Lyon, Martin, Murray, Nobles, Pipestone, Redwood, Rock, Watonwan, and Yellow Medicine. To evaluate potential geographic differences in experiences and attitudes of respondents, the region was stratified into 2 sub-regions. Sub-region 1 was generally north of U.S. Route 14, including DPAs 252, 279, 286, 288, 289, and 296. Sub-region 2 was generally south of U.S. Route 14, including DPAs 234, 237, 238, 250, 294, and 295.

We selected a random sample of 3,600 hunters from the MNDNR Electronic Licensing System. All Minnesota hunters were asked to indicate which DPA they intended to hunt when they purchased a license for hunting deer in 2012. Our survey population included adult, resident firearms deer hunters who indicated they intended to hunt in 1 of the DPAs within the study area. We randomly selected 1,800 hunters in each sub-region for this survey. We created a database of landowners from tax records of the counties in our study area and selected landowners who owned at least 1 property $\geq$160 acres. We then randomly selected 2,200 landowners for each sub-region for a total of 4,400 landowners.

We mailed individuals a self-administered questionnaire with a postage-paid return envelope. Accompanying the survey was a cover letter, which requested participation in the survey, outlined the goals of the survey, and assured individuals that their participation, contact information, and answers would remain confidential. We conducted 3 mailings beginning on 21 February 2013 with 4 weeks between the first and second mailing, and 6 weeks between the second and third mailings.

The survey of hunters was 8 pages and included questions about their hunting participation and behaviors, satisfaction with their hunting experiences, opinions about deer population levels, and preferences for potential regulations. The survey of landowners was 12 pages and included questions about land ownership, perceptions of wildlife damage, strategies used to reduce wildlife damage, opinions about deer population levels, and preferences for potential regulatory changes. Landowners who indicated they hunted were directed to the same questions asked in the survey of hunters, including their hunting participation and behaviors, and satisfaction with their hunting experiences. Potential regulations for deer hunting presented in the survey were: 1) an early youth-only season, 2) buck-only hunting when deer densities were considered below goal in a DPA, 3) buck permit lottery with youth exemption, 4) antler point restriction with youth exemption, 5) prohibit cross-tagging of bucks, 6) prohibit cross-tagging of antlerless deer, 7) earlier start of the firearm season, and 8) delayed start of the firearm season.

RESULTS and DISCUSSION

Two of 3 mailings were completed at the time of this report and we expect final results will be available in summer 2013. The preliminary results we present in Tables 1-5 include data from the first 2 mailings for the survey of hunters and landowners. Estimated response rates from these 2 mailings were $\geq$50% and $\geq$44% for hunters and landowners, respectively.

Preliminary results suggested about 60% of hunters in southwest Minnesota were satisfied with the number of antlerless deer and the total number of deer seen while hunting, but hunters were less satisfied with the quantity and quality of bucks in the population (Table 1). Although only 6% of hunters believed too many either-sex licenses were being offered by the

MNDNR (Table 2) and most hunters believed deer densities were about right (Table 3), approximately 52% of hunters responded that they would still like to have deer densities increased (Table 4). In contrast, 31% of landowners were satisfied with current deer numbers (Table 4) but 42% of landowners believed deer numbers were too high (Table 3) and 46% of landowners would prefer to see deer densities decreased (Table 4). Thus, our preliminary results indicated the majority of hunters and landowners were satisfied with current deer numbers and believed the number of either-sex permits issued by the MNDNR has been appropriate, but hunters want more deer and landowners want fewer deer in the future.

About half of the hunters we surveyed were not satisfied with the number or quality of bucks in the southwest Minnesota deer population (Table 1). As demonstrated in southeast Minnesota and in other states, an antler-point restriction regulation reduces harvest mortality rates of young bucks thereby allowing bucks to reach older-age classes and grow larger racks. Previous hunter surveys conducted in Minnesota suggest buck harvest mortality would slightly decrease if hunters were not able to cross-tag bucks with their hunting licenses. There is a perception that bucks would be less vulnerable to being harvested if the deer hunting season were held after the rut. Our preliminary results suggest a majority of hunters support an antler-point restriction regulation but there was strong opposition from hunters about prohibiting the cross-tagging of deer or holding the deer hunting season after the rut (Table 5). Based on these preliminary findings, we believe wildlife managers should consider implementing an antler-point restriction to address satisfaction levels associated with the quantity and quality of bucks in southwest Minnesota deer populations.

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Table 1. Satisfaction of hunters and landowners in southwest Minnesota with deer population demographics, 2012 (*Note: Answers of "Don't know" were removed from these analyses, and if landowners indicated they did not hunt, they were not asked these questions*).

	Survey population	n	Strongly disagree	Slightly disagree	Neutral	Agree	Strongly agree
Satisfaction with number of legal bucks	Hunters	1,705	24%	25%	10%	27%	14%
	Landowners	456	24%	22%	11%	24%	18%
Satisfaction with quality of bucks	Hunters	1,711	28%	24%	12%	24%	12%
	Landowners	462	33%	19%	11%	22%	14%
Satisfaction with number of antlerless deer	Hunters	1,731	11%	14%	12%	23%	40%
	Landowners	465	14%	16%	13%	16%	41%
Satisfaction with total number of deer	Hunters	1,745	12%	18%	10%	30%	30%
	Landowners	474	11%	19%	12%	22%	37%

Table 2. Opinions of hunters and landowners in southwest Minnesota about the number of either-sex permits provided for their area for the 2012 deer season (*Note: If landowners indicated they did not hunt, they were not asked this question*).

Survey population	n	Too low	About right	Too high	Don't know
Hunters	1,774	27%	49%	6%	18%
Landowners	504	27%	50%	8%	15%

Table 3. Opinions of hunters and landowners in southwest Minnesota about the level of the deer population in their area, 2012.

Survey population	n	Too low	About right	Too high	Don't know
Hunters	1,781	36%	42%	15%	7%
Landowners	1,742	11%	31%	42%	16%

Table 4. Opinions of hunters and landowners in southwest Minnesota during 2012 about future management of the deer population in their area.

Survey population	n	Decrease 50%	Decrease 25%	Decrease 10%	No change	Increase 10%	Increase 25%	Increase 50%
Hunters	1,755	3%	7%	10%	28%	26%	20%	6%
Landowners	1,560	18%	16%	12%	29%	11%	9%	5%

Table 5. Support or opposition of hunters and landowners in southwest Minnesota for potential deer regulations or season structures, 2012 (*Note: Answers of "Don't know" were removed from these analyses*).

	Survey population	n	Strongly oppose	Slightly oppose	Neither	Slightly support	Strongly support
Antler-point restriction	Hunters	1,697	22%	12%	13%	24%	28%
	Landowners	1,350	27%	14%	24%	16%	19%
Prohibition of buck cross-tagging	Hunters	1,740	48%	14%	9%	12%	18%
	Landowners	1,416	43%	14%	18%	8%	17%
Prohibition of antlerless deer cross-tagging	Hunters	1,734	41%	15%	10%	12%	23%
	Landowners	1,409	44%	14%	17%	9%	16%
Early youth-only season	Hunters	1,670	22%	11%	13%	25%	28%
	Landowners	1,359	17%	8%	23%	24%	29%
Delay firearm season until early December	Hunters	1,752	45%	17%	10%	14%	13%
	Landowners	1,479	36%	16%	23%	12%	13%

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, yet many managers report having limited experience with interseeding and poor success with a few early attempts. Survival of forbs interseeded directly into existing vegetation may be enhanced by management treatments that reduce competition from established grasses. In 2009, we initiated a study to investigate the effects of two mowing and two herbicide treatments on diversity and abundance of forbs interseeded into established grasslands on 15 sites across southern Minnesota. Each site was burned and interseeded in fall 2009 (n=8) or spring 2010 (n=7), and two mowing treatments (Mow 1, Mow 2) and two grass-selective herbicide treatments (Herbicide Low, Herbicide High) were applied during the 2010 growing season. By summer 2011, we observed 24 (83%) of the 29 native, seeded forbs in study plots, but there was no significant difference in seeded species abundance among treatments. Differences in percent cover of native and exotic grasses varied slightly among treatments, but percent cover of native forbs and exotic forbs did not vary among treatments. We will survey sites during summer 2013 to determine the extent of forb establishment and persistence. We will also determine if it is more effective to restore forbs through interseeding compared to completely eliminating all vegetation then re-establishing grasses and forbs into wildlife management areas. These findings will then be used to determine if additional research is warranted.

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 reconstructed grasslands (Tranel 2007). A diversity of forbs in grasslands provides the heterogeneous vegetation structure needed by many bird species for nesting and brood rearing (Volkert 1992, Sample and Mossman 1997). Forbs also provide habitat for invertebrates, an essential food for breeding grassland birds and their broods (Buchanan et al. 2006).

The forb component in 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, 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, 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, we examine the effects of two mowing and two herbicide treatments on diversity and abundance of forbs interseeded into established grasslands in southern

Minnesota. Results will be used to help guide future management decisions made by wildlife managers.

METHODS

We selected study sites (n=15) 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 species [e.g., sweet clover (*Melitotus alba, M. officinalis*)].

Eight sites were burned in October-November 2009 and frost interseeded during December 2009 and March 2010, whereas 7 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; seed used on fall-burned sites was not cold-moist stratified prior to interseeding.

Treatments

We divided sites into 10 study plots of approximately equal size and randomly assigned each of 4 treatments and the control. Each site received all treatments to account for variability among sites, and the control 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

2011 – We visited all sites once between 25 July – 27 September. Twenty randomly-distributed sampling points within each study plot were chosen *a priori* using ArcGIS 10.1 (ESRI, Redlands, California) and loaded onto a Global Positioning System (GPS) receiver to locate them in the field. We estimated presence of seeded forbs in a 76 x 31 cm^2 quadrat at each sampling point. In addition, we 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. We estimated percent cover within 6 classes: 0-5%, 5-25%, 25-50%, 50-75%, 75-95%, and 95-100%. Finally, we recorded visual obstruction readings (VOR; Robel et al. 1970) in the 4 cardinal directions at the 5^{th}, 10^{th}, 15^{th}, and 20^{th} quadrats in each plot to determine vegetation vertical density.

2012 – Field protocols used in 2012 differed from those used in 2011 in the following ways:

- Only 10 of the 15 sites were visited.

- Several flags and markers disappeared or fell down between seasons, and plot corners were not remarked or reflagged prior to the start of data collection. As a result, plot boundaries were difficult to determine in the field.
- The start of data collection was >30 days later in 2012. Data were collected between 28 August – 23 September 2012.
- Sampling points were not relocated with a GPS receiver. Instead, 20-30 new points were randomly chosen in the field at the time of data collection.
- Robel pole readings were only taken at 7 of the 10 sites.

Due to these deviations from the 2011 protocol, we have not included the 2012 data in our analyses.

Post-Treatment Management

To aid forb establishment and persistence, managers conducted prescribed burns at 14 sites during April and May 2013. One site was not burned due to time constraints and adverse weather conditions.

RESULTS

One year following treatments, we observed 24 (83%) of the 29 native, seeded forbs 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 year after treatment and forb richness was greater 3 years after treatment.

We will remark all plot boundaries before the summer 2013 field season and follow the vegetation protocols that were used in 2011 so that direct comparisons can be made to

measure changes in forb establishment and persistence. In addition, we will determine if it is more effective to completely eliminate all vegetation and plant forbs and grasses into bare ground compared to interseeding forbs into existing grasslands.

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. Clethodim is an inexpensive herbicide that requires only 1 application per growing season. Therefore, Clethodim may be an alternative for managers to consider when repeated mowing is needed to keep grasses suppressed. Additional management may still be needed in subsequent years, however, to further suppress dominant grasses and allow forbs to establish and compete for resources.

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Table 1. Frequency of seeded forb species by treatment type on 15 study sites across southern Minnesota 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 across southern Minnesota 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	29.4	43.27-47.97	39.35	35.07	36.54-42.16	21.26	32.3	18.68-23.84	20.78	28.77	18.48-23.08
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	18.4	28.58	16.11-20.69
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
All	48.12			34.04			22.34			19.58		