Final Report

NRCS Conservation Innovation Grant Program
NRCS CIG 68-3A75-6-169

Promoting the Utilization of Prescribed Fire and Patch-burn Grazing as Acceptable Management Practices for Private Rangelands in the Prairie Coteau Region of South Dakota and Minnesota

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Project Funding:

Funding for this project was provided by the Natural Resources Conservation Service's Conservation Innovation Grants Program and The Nature Conservancy.

NRCS CIG funds:	$30,000
Nature Conservancy funds/match:	$30,000
Grant total:	**$60,000**

See Appendix A (final sf-425 report for details)

Project Duration: September 29, 2006 – September 29, 2010 (original grant end date was September 29, 2009, A one- year grant extension was requested and received due to The Conservancy's ability to minimize budgeted expenses within the original timeframe, which also extended our sampling by one year.

Acknowledgments:

The following individuals were instrumental to the completion of this project. *Initial project design* – Kyle Kelsey and Laura Hubers (USFWS), Dennis Skadsen (Day County Conservation District), Meredith Cornett (TNC) and the entire Prairie Coteau Habitat Partnership Team; *Project set-up and mapping* – Eric Salo (USFWS), Joe Blastick (TNC), Matt Morlock (PF*). Field research and monitoring* -Brian Simon, Cody Grewing, Joe Blastick, Kelli Bartholomew, Matt Nelson. *Data analysis* – Marissa Ahlering (TNC); *Grant Administration and financial management* – Amy Short, Shawn Canady, Cliff Huff, (TNC), Gregorio Cruz, Janet Oertley, Stan Boltz, Dana Vaillancourt, Kim Brannen, Reggie Blackwell, Sheila Leonard (NRCS). Special thanks to all private landowners who participated in the program, allowed access, and extended hospitality to our monitoring technicians and burn crews.

Summary

We sampled approximately 200 transects located on privately owned land across nine counties of the Prairie Coteau landscape in eastern South Dakota. Of these, 159 transects were analyzed representing six primary habitat or land use types. Land use types were grouped into three primary categories: Native Grazed and Ungrazed Sod, Grazed and Ungrazed Native

Plantings, Mismanaged and 'Go Back' Pasture. Data analysis has proven more complicated than expected due to difficulties in implementing planned treatments on privately owned properties where we lacked control of annual management decisions. Overall, the data reported here suggests that inclusion of fire into a variety of grassland management schemes can enhance and/or maintain structural factors such as litter depth, visual obstruction, and leaf height for native pasture and native grass plantings. Additionally, our preliminary analysis of the effects of fire inclusion into systems with grazing and rest regarding impacts to total number of native and exotic species was inconclusive (further analysis is being performed on specific species guilds). Finally, overall impacts of patch-burn grazing, although appearing very positive for the pasture and the producer, are still being analyzed.

Annual interest in prescribed fire by producers was encouraging, with an average annual request rate of approximately 50 burn units. We performed 48 prescribed fires on properties/ranches during the four years of this monitoring project (2007-2010), treating 3,999.5 acres with fire. During the course of this work we determined that although a culture of common fire use for grassland and pasture management, most producers: 1) are open to the use of fire for management for grazing lands and habitat, 2) are not 'afraid' of fire but harbor a healthy respect for fire, 3) understand their own limitations for incorporating fire independently of professional help, and 4) require more scientific information on both the economics and ecological benefits for fire and patch burn grazing before they are able to make a long-term commitment to the incorporation of fire in their operation.

Introduction

During the period of this grant project, The Nature Conservancy, in cooperation with the Prairie Coteau Habitat Partnership (Attachments A and B) worked with 24 individual landowner/producers in a 10 county region of northeast South Dakota. We planned and prepared 59 individual prescribed fire units totaling 5,348.5 acres. Of those units planned, we implemented 48 prescribed fires on 3,999.5 acres (Appendix B). The burn implementation program was funded under various grants and internal funds independent of the CIG grant being reported here. Also during this period we established 159 permanent monitoring plots on 22 separate privately owned properties ranging in acreage from 30 acres to over 2,000 acres.

The intent of the monitoring under this Conservation Innovation Grant project was to attempt to develop a fairly simple, easily replicable protocol that would allow us to determine whether significant vegetation response to various management strategies (burning, patch-burn grazing, grazing only, idle) could be determined within a relatively short timeframe. Specifically, we had hoped to focus on compositional and structural change over time on properties where patch-burn grazing rotations were likely to occur. In addition, our goals included overall promotion of the acceptance of prescribed fire as a viable tool that could be utilized to meet specific management objectives for both grazing lands and habitat projects. For complete background on this project, please see the full original project proposal.

Although our monitoring and data collection design proved to be reasonable and manageable, lack of overall control of annual implementation of planned specific treatments on larger ranches over time proved to be an unforeseen hurdle. Specifically, many producers expressed a keen interest in prescribed fire at the outset of the project and believed that fire

could produce beneficial results for their ranch or habitat projects. During the course of project, although interest and *desire* to implement fire remained very high for most producers involved, the actual willingness and/or ability of those same producers to modify existing management to accommodate the fire tool was limited and often unsuccessful, resulting in only two trial areas where we were able to implement burns under any type of true set rotation in order to evaluate burn and burn/graze effects over several years. Prescribed fire on pastureland in this region requires a full year of rest to build enough residual fuel loads to carry a fire. Although a few producers were able to participate by manipulating rotations for a initial single year in order to experiment with fire, most involved were unable/unwilling to modify their grazing systems on a consistent enough basis over time to mimic a true patch burn or other type of burn/graze rotation.

Overall, our project fell into an economic 'catch-22'. With the exception of a few ranchers we worked with, much of the range in this part of South Dakota could be categorized as overstocked. Although this is a somewhat subjective determination, it is fair to say that most of the range is heavily utilized and is likely stocked beyond a sustainable or healthy ecological carrying capacity. Although theoretical patch-burn grazing can be incorporated within the parameters of an appropriately stocked system, we found that most of our producers were trying to maintain stocking rates that were at or near maximum leaving little annual residual fuel and that short term destocking would be required in order to jump-start a patch-burn system. Understandably, this was a difficult decision for most, as the benefits of fire and patch-burn grazing had not yet been substantiated in economic terms in this region. Ironically, substantiating the value of the burning was, of course, an objective of the project. It should be noted that several producers felt uncomfortable with the paperwork that was associated with the actual implementation of the burns as well. Because the funding source for the burn implementation required a host of permissions, plans, and long-term conservation agreements, several producers opted out return treatments after receiving the first treatment, even though none of our producers expressed any dissatisfaction with the actual burn results. In fact, individual producer reaction was unanimously positive to the perceived benefits of the fire, regardless of whether those positive perceptions could be scientifically quantified.

Project Location:

Although the initial geographical extent of the project was to include properties on the Prairie Coteau Minnesota and South Dakota, fire implementation logistics and overall funding constraints limited our sampling area to private properties in the eastern South Dakota portion of the project area including Brookings, Clark, Codington, Day, Deuel, Hamlin, Kingsbury, Marshall, Moody, and Roberts counties.

Materials and methods

Mapping and transect distribution. Transects were randomly located within properties or management units based on management unit size. Randomization was accomplished using on screen GIS software (Arcview) and the Minnesota Department of Natural Resource's Sampling Tool (MN DNR Sampling Tool V2.8 November 09, 2005) for random point sampling. Transects were adjusted to exclude wetlands and non-use habitats while requiring a 100-yard buffer between any two random points. Because most management units are managed

uniformly, we stratified sampling effort based on unit size (acres). Generally larger properties with multiple pastures where vegetation and overall management was consistent between pastures were treated as a single management unit and random points were generated accordingly. In those instances, transect location and distribution was based on the entire ranch (unit) acreage instead of individual pastures. For example, random distribution of transects across a 2,000 acre ranch with 10 separate pastures was based on 2,000 acres instead of multiple 100 to 300 acre pastures. If those pastures were inconsistent in management and/or species composition, random plots were then generated for each individual pasture based on size. Transects were designed utilizing a G-transect methodology with 20 subplots located within each area (G) transect.

Data collection. 159 permanent transects were used as the unit of analysis for this summary and were sampled for all four years. Each transect consists of 20 sample points where the following measurements were taken: Robel pole (visual obstruction), plant community composition, litter depth, effective leave height, effective clump height, and clump length. Data were recorded annually (mid-growing season) for each sub-plot within each transect in each year (2007 – 2010). Species composition and diversity was recorded based on Floristic Quality Index criteria for easily identifiable species common to the Prairie Coteau. See Appendices C - E for complete sampling protocol, data sheets samples, vegetation categorization.

Data Analysis. (Credit: the majority of the following data analysis text was provided by Marissa Ahlering of The Nature Conservancy). Multiple different habitat types were included in the study: native pasture/range, native ungrazed sod managed for habitat, ungrazed native grass plantings managed for habitat, grazed native grass plantings managed for pasture, native grass planting managed for hay and seed production, severely mismanaged native sod, sod likely cropped and left to revegetate (go back pasture), and cropland intended to be replanted to grass. Two types were dropped from analysis because of low sample size (native grass planting managed for hay and seed production and crop intended to be replanted). Leaving six habitat types that were then grouped based on similarity for sample size and simplicity reasons. Categories analyzed together were: the two native sod categories (grazed and ungrazed), the two grass planting categories, and the mismanaged and naturally revegatated categories.

Each transect was manipulated with one of the following treatments annually: 1) burn, 2) grazed, 3) idle, 4) burn and grazed, 5) mowed or clipped, and 6) sprayed. Because of the numerous combinations that resulted from four years and six treatments, each transect was assigned to one of five categories of treatment sequences: 1) grazed all four years, 2) grazed with at least one burn in four years, 3) grazing, at least one burn, and at least one year of idle/rest, 4) only burning and idle, and 5) idle all four years. Transects with spraying treatments were too few and were dropped from the analysis. It is important to note that not all treatments were performed on all habitat types.

For each transect, the 20 plots were averaged to obtain an estimate of VOR (Robel pole reading), litter depth, effective leaf height, and effective clump height. Finally, the species checklists were summarized by number of native and exotic species per transect.

All data were summarized by year and treatment sequence category to look for trends over time or between treatments. Data are presented here in graphical format, and error bars represent 1 standard error (SE). For statistical significance, data should not overlap confidence

intervals, which are approximately the average plus or minus 2 standard errors (or double the length of the current error bars).

More formal linear analysis was attempted for the structural variables, but with unbalanced sample sizes among treatments and inconsistent sampling of transects across years, the analysis and interpretation has proven difficult and are still in process. However, results generally confirmed the trends seen in the graphs below.

Results

Note: We are performing further analysis on vegetation community composition, clumping, impacts to Floristic Quality, and overall trends resulting from patch-burn grazing treatments.

Sample Size Summary

Sample sizes between habitat types and treatment sequences were unbalanced. Native habitat managed for pasture that was grazed all four years had the highest representation in this data set.

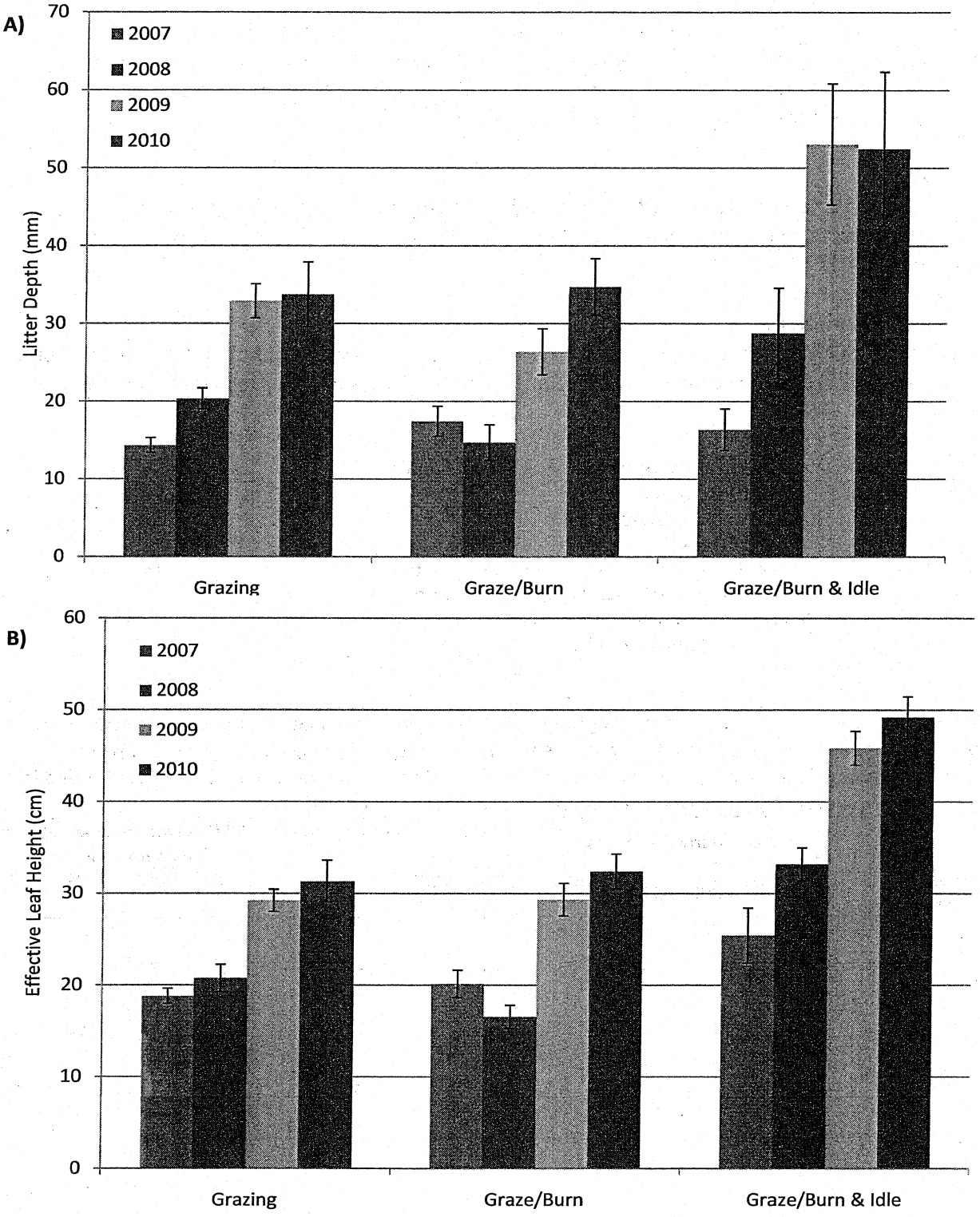
TABLE 1. Sample size of habitat categories included in the analyses.

Habitat Category	Habitat Description	Sample Size
A	Grazed native pasture/range	118
B	Ungrazed native sod, managed for habitat	5
C	Ungrazed native plantings, managed for habitat	16
D	Grazed native plantings, managed for pasture	4
F	Severely mismanaged native sod	2
G	Sod likely cropped and left as 'go back' pasture	14

TABLE 2. Sample size by habitat category groups and treatment sequences included in the structure and plant category analyses; these are the sample sizes that correspond to Figs. 1, 2, and 3 below. For habitat category FG, the grazing, burning and idle and burning and idle only plots were not included in these analyses because of only one transect representing these treatments.

	A&B (native pastures)				C&D (planted native grass)				F&G (severe mismanaged or go back pasture)			
Treatment Sequence	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
Grazing only	81	81	63	20	4	4	4	4	7	7	7	5
Grazing and ≥ 1 burn	28	28	28	23	-	-	-	-	7	7	7	5
Grazing, burning and ≥ 1 year of idle	14	14	10	10	-	-	-	-	1	1	1	1
Burning and idle only	-	-	-	-	12	12	12	5	1	1	1	1
All idle	-	-	-	-	4	4	4	3	-	-	-	-

FIGURE 1. Structural vegetation characteristics for Type A and B (native pastures) pastures during 2007 – 2010 A) litter depth, B) vegetation height, C) Visual obstruction reading; error bars represent 1 SE.



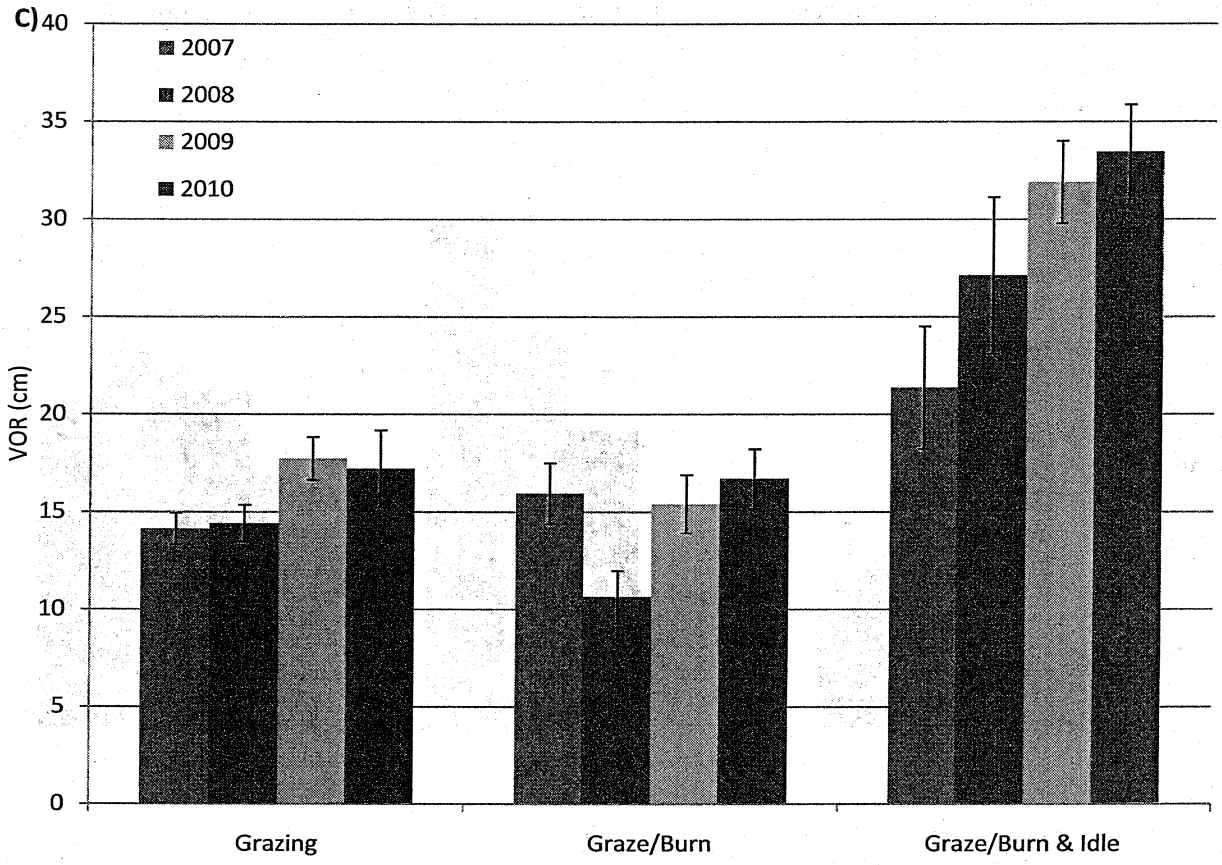
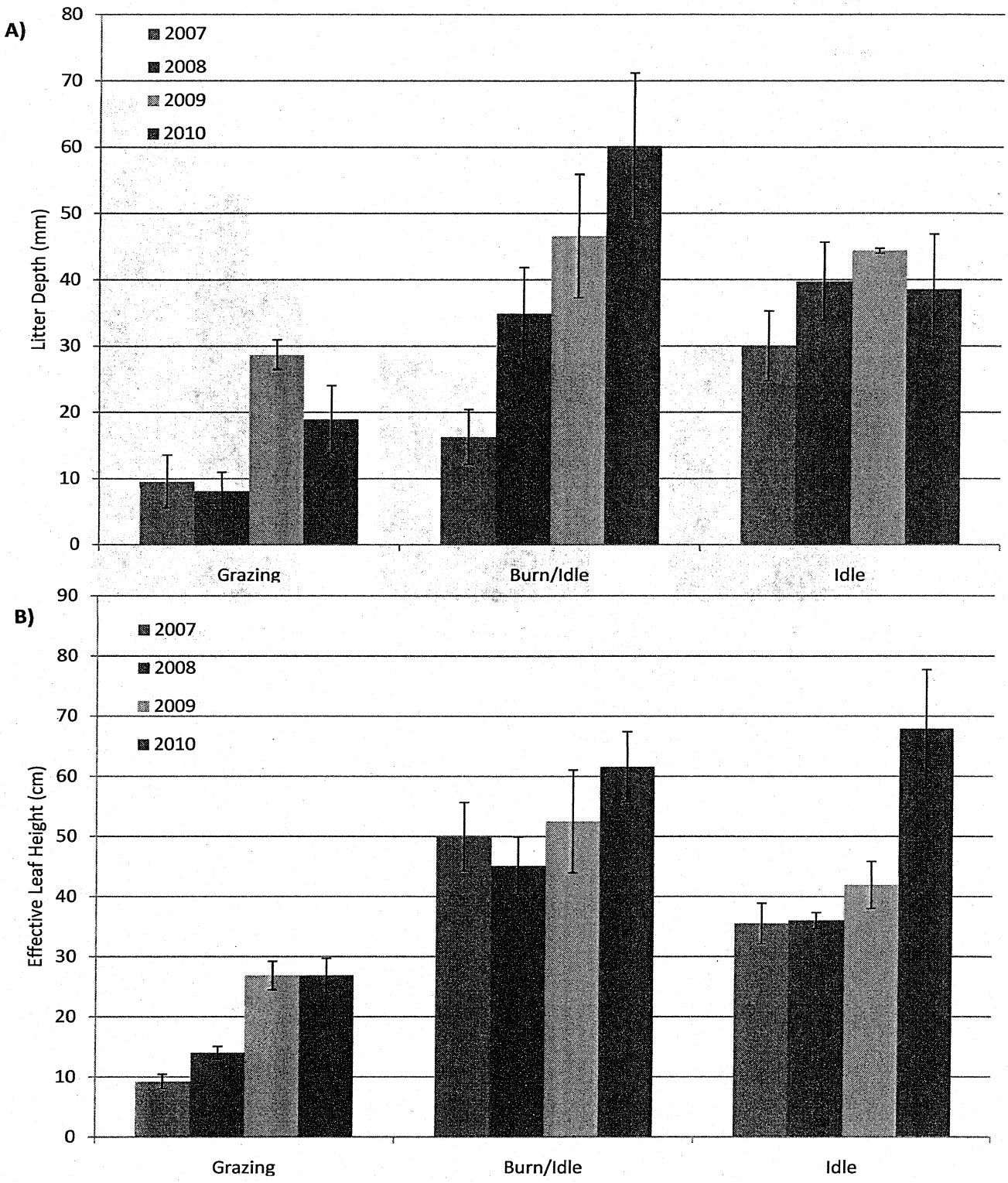

C)
40
35
30
25
20
15
10
5
0
VOR (cm)
2007
2008
2009
2010
Grazing
Graze/Burn
Graze/Burn & Idle

FIGURE 2. Structural vegetation characteristics for Type C and D (grass plantings) pastures during 2007 – 2010 A) litter depth, B) vegetation height, C) Visual obstruction reading; error bars represent 1 SE.



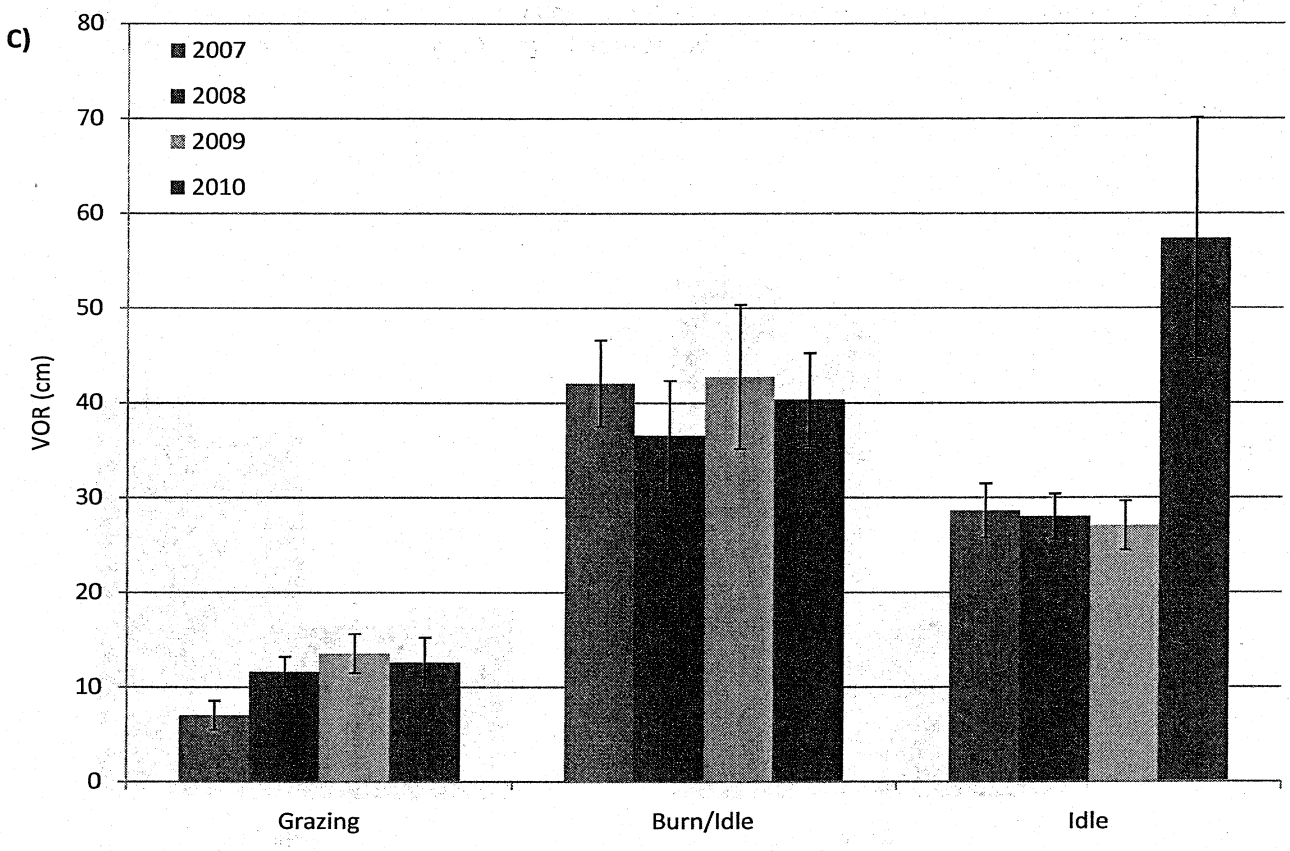
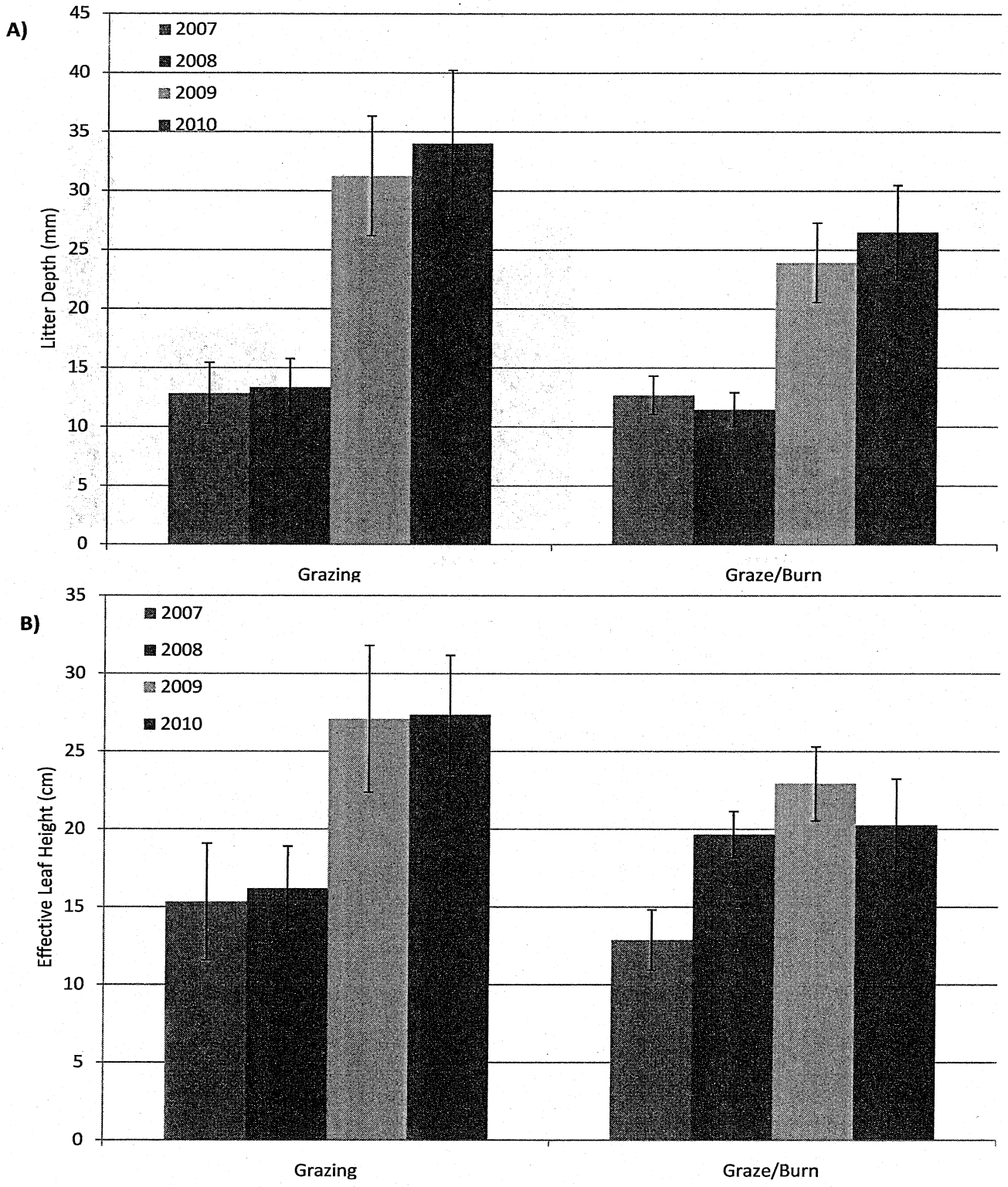

C)
2007
2008
2009
2010
VOR (cm)
80
70
60
50
40
30
20
10
0
Grazing
Burn/Idle
Idle

FIGURE 3. Structural vegetation characteristics for Type F and G (mismanaged sod or go-back pasture) pastures during 2007 – 2010 A) litter depth, B) vegetation height, C) Visual obstruction reading; error bars represent 1 SE.



C)

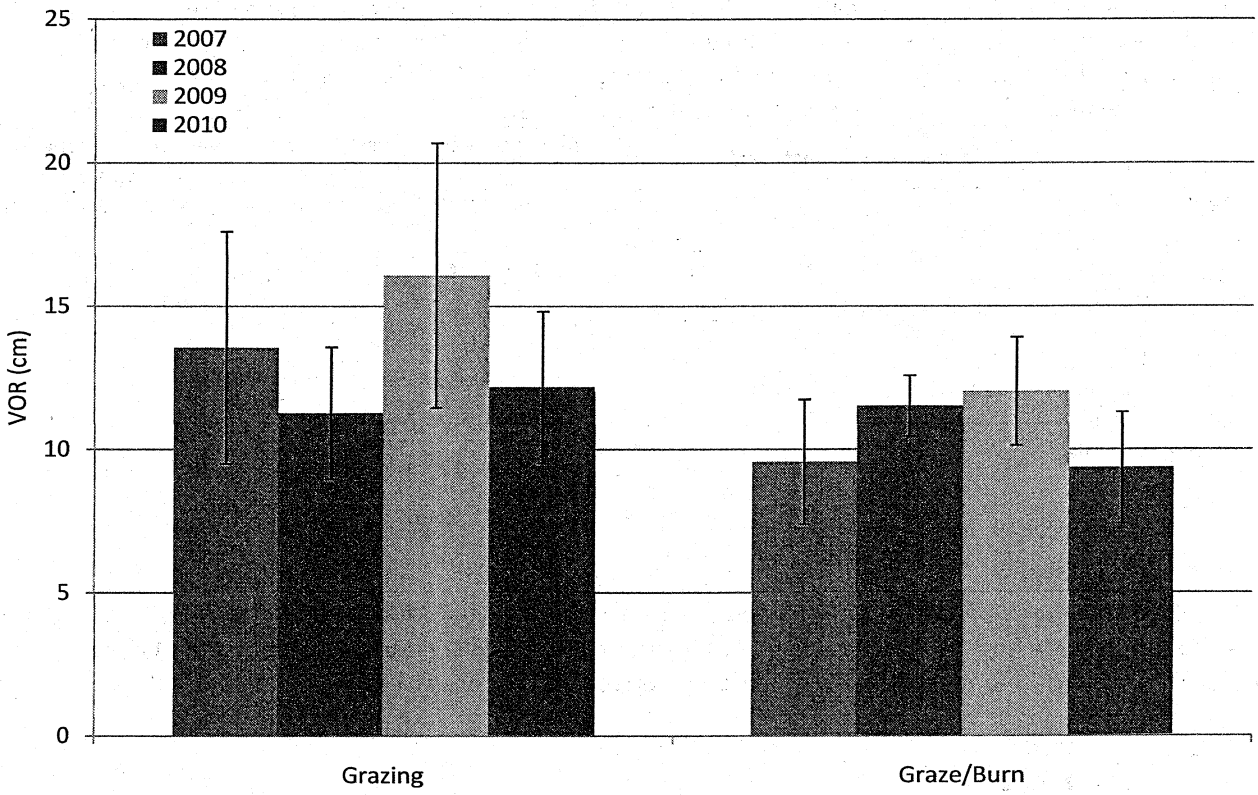
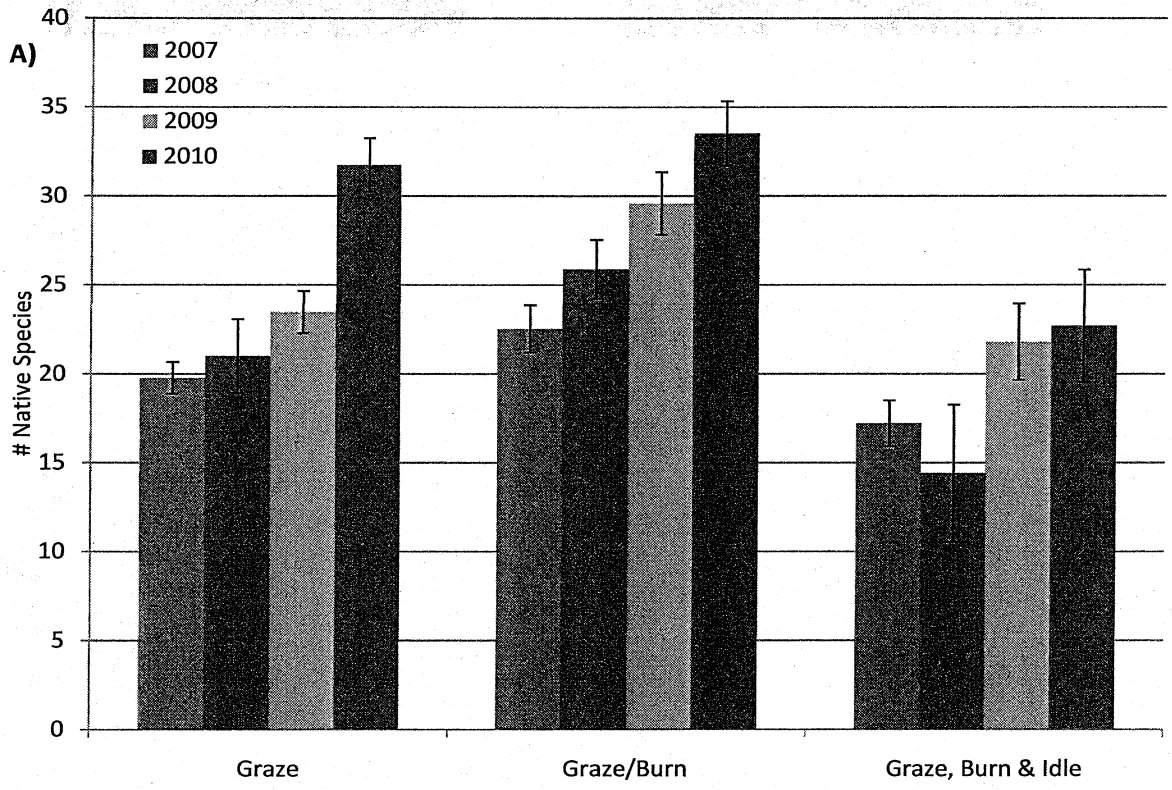
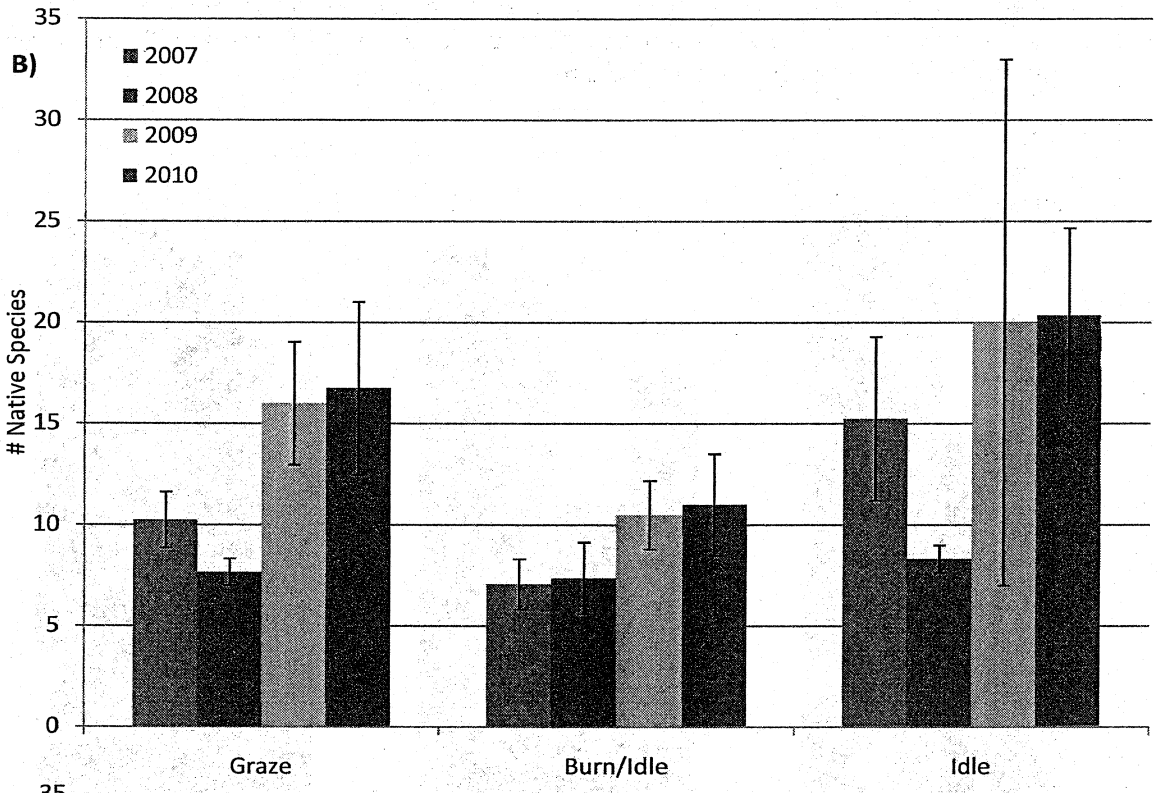


TABLE 3. Sample size by habitat category groups and treatment sequences included in the native and exotic species analyses; these are the sample sizes that correspond to Figs. 5 and 6 below. For habitat category FG, the grazing, burning and idle and burning and idle only plots were not included in these analyses because of only one transect representing these treatments.

	A&B (native pastures)				C&D (planted native grass)				F&G (severe mismanaged or go back pasture)			
Treatment Sequence	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
Grazing only	81	24	63	20	4	3	4	4	7	5	7	5
Grazing and ≥ 1 burn	28	18	28	23	-	-	-	-	7	7	7	5
Grazing, burning and ≥ 1 year of idle	14	5	10	10	-	-	-	-	1	0	1	1
Burning and idle only	-	-	-	-	12	8	12	5	1	0	1	1
All idle	-	-	-	-	4	3	2	3	-	-	-	-

FIGURE 5. Average number of native species by treatment and year (2007 – 2010) for each habitat group A) habitat types A and B (native pastures), B) habitat types C and D (grass plantings), and C) habitat types F and G (mismanaged or go-back pasture); error bars represent 1 SE.




B)
2007
2008
2009
2010
Native Species
35
30
25
20
15
10
5
0
Graze
Burn/Idle
Idle

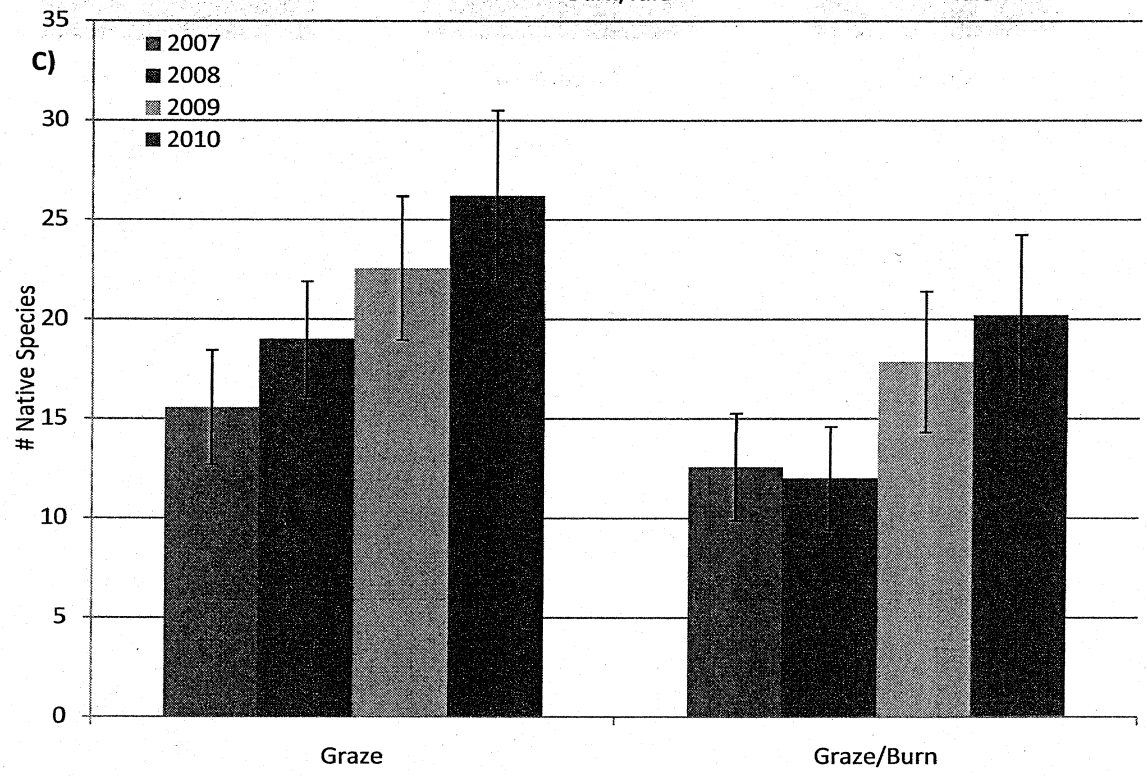
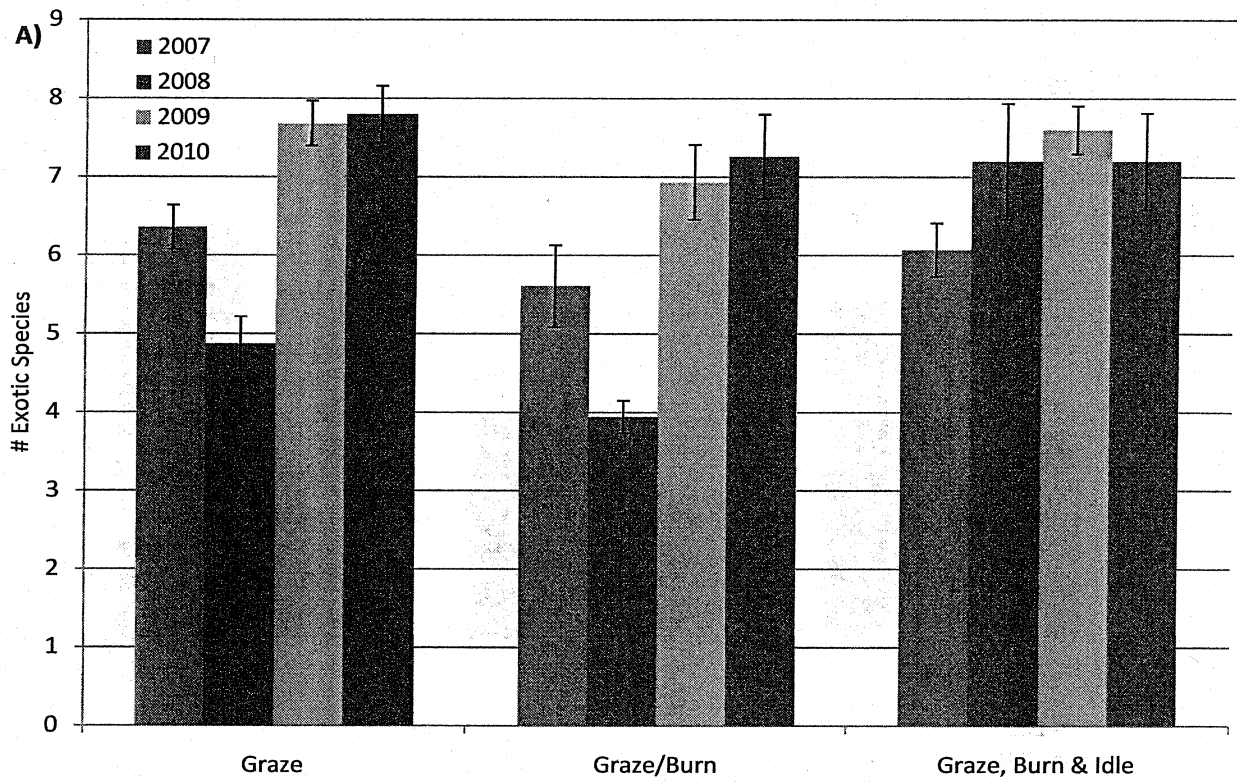
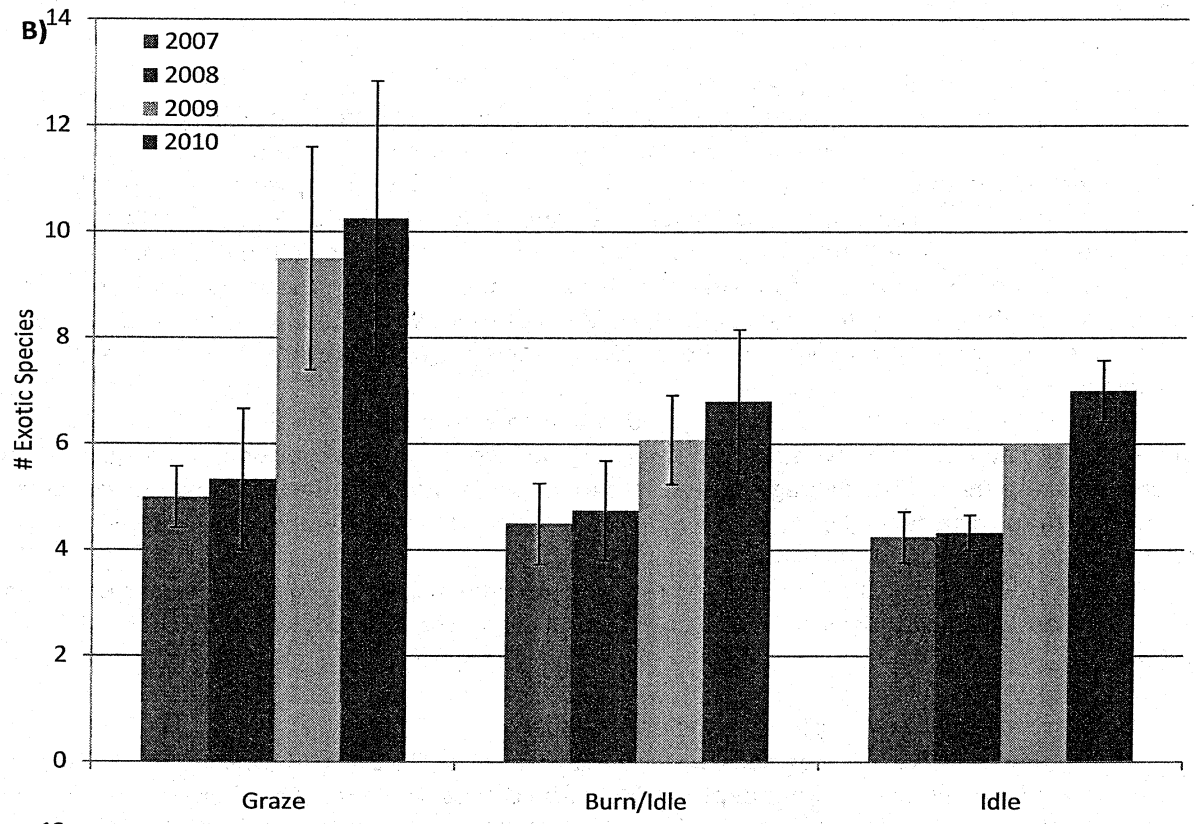
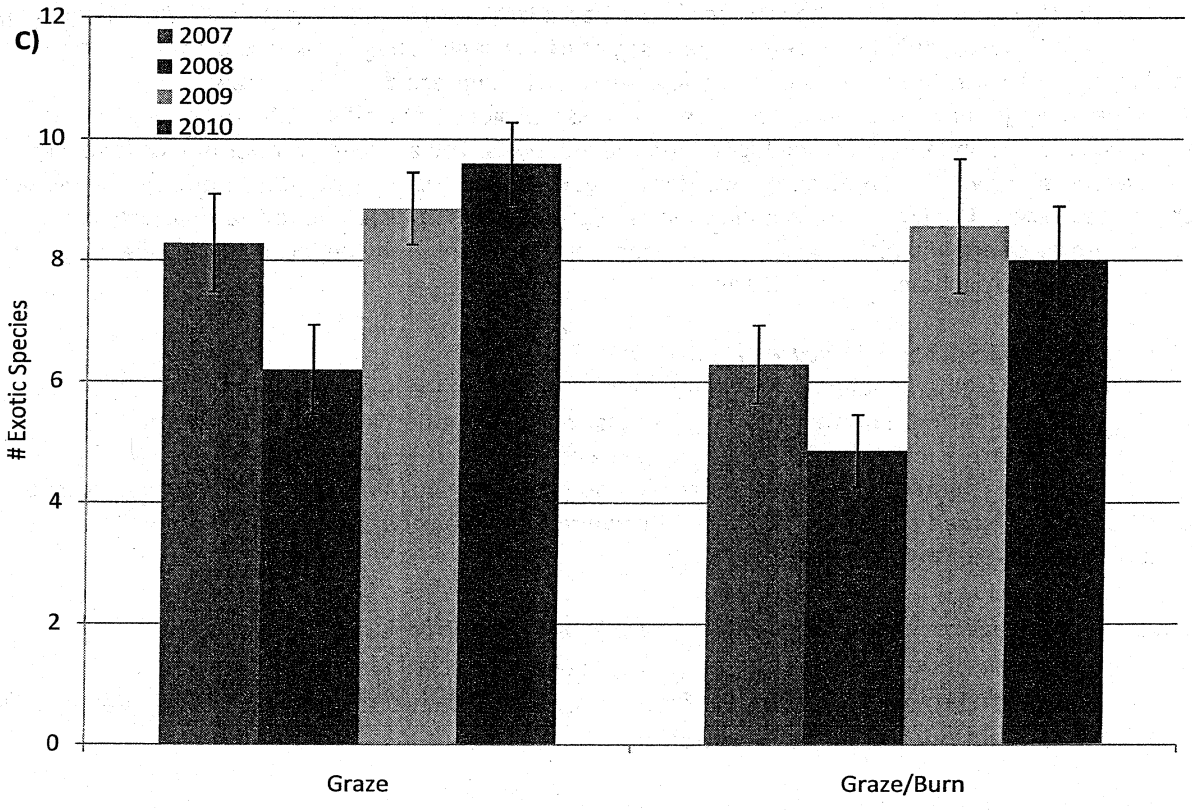

C)
2007
2008
2009
2010
Native Species
35
30
25
20
15
10
5
0
Graze
Graze/Burn

FIGURE 6. Average number of exotic species by treatment and year (2007 – 2010) for each habitat group A) habitat types A and B (native pasture), B) habitat types C and D (grass plantings), and C) habitat types F and G (mismanaged or go-back pasture); error bars represent 1 SE.




B)
2007
2008
2009
2010
Exotic Species
0
2
4
6
8
10
12
14
Graze
Burn/Idle
Idle


C)
2007
2008
2009
2010
Exotic Species
0
2
4
6
8
10
12
Graze
Graze/Burn

Summary

Native Grazed and Ungrazed sod (Types A and B)

There was a tendency for 3 of the structural variables analyzed (litter depth, height, and VOR) to increase through time for all 3 treatments represented on this habitat type. In general, the amount of biomass on the ground seemed to increase over the course of the study. This was true for plots that were grazed all 4 years as well as plots that experienced some idle years within that time frame. However, the increase in litter depth, height and VOR was more pronounced on the plots that experienced some idle/rest over the four years. By the last year of the study, the graze, burn, and idle treatment had significantly greater height and VOR than the other two treatments in that year. These results may be attributed to both local weather patterns and management rotations. Further analysis will be performed.

The average number of native species tended to increase over time for all 3 treatments (Fig. 5, A), but overall the number of native species was higher and increased more over time on the grazed and graze and burn treatments. The average number of exotic species started out a little lower on the graze and graze and burn treatments (Fig. 6, A), but all treatments had a similar number of exotic species present by the end of the study in 2010.

Further in-depth analysis with focus on change over time of specific plots is being performed to determine if measureable changes in species or structural composition occurs within patch- burn transects.

Grazed and Ungrazed Native Plantings (Types C and D)

Trends over time were not as clear for these habitat types (Fig. 2). The burning and idle only treatment tended to have greater litter depth, height and VOR readings than the other two treatments in most years. However, in 2010, the idle treatment had a large increase in height and VOR. The grazing only treatment showed fairly low levels of these structural variables suggesting less biomass on the plots. Samples sizes for these treatments are low and conclusions are difficult to draw.

The average number of native species recorded per plot increased slightly for all treatments over time (Fig. 5, B), and tended to be highest on the idle plots. The average number of exotic species also increased slightly for all treatments over time (Fig. 6, B), and the total number tended to be highest on the grazed plots. The increase in exotic species in grazed plots may be due to the relatively low species diversity of original plantings. When grazed, these plantings may be more susceptible to short-term or annual encroachment of exotic species.

Mismanaged and 'Go Back' Pasture (Types F and G)

The litter depth and height were higher in 2009 and 2010 for both treatments (Fig. 3), but in general, trends and absolute numbers are very similar between both the graze and graze and burn treatments for all structural variables. No treatment differences are suggested by the data.

The average number of native species recorded generally increased for both treatments, but was higher on the grazed transects (Fig. 5, C). The average number of exotic species did not differ between treatments or through time (Fig. 6, C).

Discussion, Management implications, and transferability of results

Since much of our data is still being processed, final conclusions are somewhat premature in regard to on-the-ground effects of fire and patch-burn grazing. These data will be immediately shared once analysis is complete.

One of our primary objectives of the study was to introduce prescribed fire back into the region as a legitimate private lands management tool. In the simplest of terms, our data shows that fire created no irreparable harm to native or planted grasslands and was often associated with 'improvements' and positive perceptions by producers when compared to grazing treatments alone. These results will allow for a more informed conversation when discussing the potential value of the use of fire for native and planted grassland management alike.

We outlined four primary objectives to this work on the outset of the project:

A. Promote the social acceptance, implementation, and long-term use of alternative rangeland management tools such as prescribed fire and patch-burn grazing through on-site habitat and forage evaluations of private lands, fire and grazing planning, and coordination of fire and grazing implementation. Specifically, representatives from the Partnership will perform on-site floristic quality indexing of pre- and post- treatment vegetation. We will work with landowners to identify potential burn areas and to draft legal fire plans. Depending on specific site goals, additional assessment tools such as grazing exclosures, forage production analysis, wildlife occurrence, and seed harvest guidance may be utilized. Our intent is to lead by example by providing landowners with the knowledge base necessary to assess their operations and plan for advanced techniques.

Assessment: We feel we achieved a remarkable degree of success in regard to the social acceptance and interest in fire during the course of this project. We are inundated with requests from producers to perform fire services, and our data from this monitoring will serve agencies and producers well when weighing their options for burning and burn-grazing management. Logistically, fire implementation remains fairly difficult for most producers, and implementing a true fire-grazing or patch-burn grazing system is likely unrealistic in the very near future for most producers given that it requires an adoption of a fundamental shift in range management philosophy. In short, producers are very curious about fire, but not yet ready or able to adopt fire as a realistic tool that they can implement annually with their current resources.

B. Enhance previous public investment in habitat programs on private lands currently administered through federal, state, and private conservation organizations by assisting landowners in assessing rangeland condition

Assessment: We feel we achieved some successes in this regard simply due to the administrative requirements of the burn program. All burn recipients were required to agree to a 10 year contract to keep their property in pasture or grassland, as required by other funding sources. Participation in the burning and monitoring programs allowed for improved communication and outreach on the value of grasslands overall.

C. Promote private lands demonstration sites that model appropriate disturbance regimes for the benefit of endemic northern tallgrass prairie species while exploring viable economic alternatives for participating landowners, such as grass seed production, grass-finished beef, hunting, and recreation.

Assessment: Throughout the study, we were able to utilize several of the treatment sites for various outreach and education events primarily focused on the potential benefits of fire incorporation into management. Topical outreach opportunities regarding seed production, grass-finished beef, and habitat/hunting were limited.

D. Support a 'culture' that recognizes ecologically based burning and grazing methods on private grasslands by annually increasing the number of private landowners utilizing ecologically sound prescribed fire and grazing.

Assessment: It is difficult to determine the overall impact of our project. We feel that this project allowed for a more open discussion of fire as a tool in the landscape. It was assumed that producers in the region might be anti-fire due to previous negative experiences or misunderstanding of the value of fire. We discovered these assumptions were largely unfounded. Producers, although having a healthy respect for fire, did not fear fire. The prevalent culture, therefore, is one of lost knowledge for what fire can provide to grasslands. When coupled with the lack of knowledge, skills, or resources to implement fire effectively, producers generally do not view fire as a viable option for their ranch. Simply put, grazing and other mechanical manipulations appear more practical because they are part of the current culture and require no additional skills, tools, or risk. Our project was able to show producers who were fortunate enough to receive our services that fire can provide a management option rarely available. Unfortunately, the ability or desire for producers to replicate the use of fire on a consistent basis is limited, and will likely require years or decades of continued agency support unless or until the economics of fire and patch/burn grazing use warrants a true shift in range management in the region.

Appendix A: Final sf-425 report

FEDERAL FINANCIAL REPORT

(Follow form instructions)

1. Federal Agency and Organizational Element to Which Report is Submitted	2. Federal Grant or Other Identifying Number Assigned by Federal Agency (To report multiple grants, use FFR Attachment)	Page	of
NRCS	68-3A75-6-169	1	1 pages

3. Recipient Organization (Name and complete address including Zip code)
The Nature Conservancy
P.O. Box 816, 410 - 3rd Avenue South, #2
Clear Lake, SD 57226

4a. DUNS Number	4b. EIN	5. Recipient Account Number or Identifying Number (To report multiple grants, use FFR Attachment)	6. Report Type	7. Basis of Accounting
072656630	53-0242652	1230153830	○ Quarterly ○ Semi-Annual ○ Annual ✓ Final	✓ Cash ☐ Accrual

8. Project/Grant Period From: (Month, Day, Year)	To: (Month, Day, Year)	9. Reporting Period End Date (Month, Day, Year)
September 29, 2006	September 30, 2010	September 30, 2010

10. Transactions	Cumulative
(Use lines a-c for single or multiple grant reporting)	
Federal Cash (To report multiple grants, also use FFR Attachment):	
a. Cash Receipts	$ 25,275.72
b. Cash Disbursements	30,000.00
c. Cash on Hand (line a minus b)	$ (4,724.28)
(Use lines d-o for single grant reporting)	
Federal Expenditures and Unobligated Balance:	
d. Total Federal funds authorized	$ 30,000.00
e. Federal share of expenditures	30,000.00
f. Federal share of unliquidated obligations	-
g. Total Federal share (sum of lines e and f)	$ 30,000.00
h. Unobligated balance of Federal funds (line d minus g)	-
Recipient Share:	
i. Total recipient share required	$ 30,000.00
j. Recipient share of expenditures	30,390.19
k. Remaining recipient share to be provided (line i minus j)	$ (390.19)
Program Income:	
l. Total Federal program income earned	$ -
m. Program income expended in accordance with the deduction alternative	-
n. Program income expended in accordance with the addition alternative	-
o. Unexpended program income (line l minus line m or line n)	$ -

11. Indirect Expense	a. Type	b. Rate	c. Period From	Period To	d. Base	e. Amount Charged	f. Federal Share
	Fixed	15.00%	09/29/06	09/30/10	$ 52,513.25	$ 7,876.99	$ 3,913.00
				g. Totals:	$ 52,513.25	$ 7,876.99	$ 3,913.00

12. *Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation:*

13. Certification: By signing this report, I certify that it is true, complete, and accurate to the best of my knowledge. I am aware that any false, fictitious, or fraudulent information may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)

a. Typed or Printed Name and Title of Authorized Certifying Official	c. Telephone (Area code, number and extension)
Pete Bauman, Director of Community-Based Programs	**(605) 874-8517**
	d. Email address: pbauman@tnc.org
b. Signature of Authorized Certifying Official: Pete Bauman/als	e. Date Report Submitted (Month, Day, Year): 12/17/2010
	14. Agency use only:

Standard Form 425
OMB Approval Number: 0348-0061
Expiration Date: 10/31/2011

Paperwork Burden Statement
According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB Control Number. The valid OMB control number for this information collection is 0348-0061. Public reporting burden for this collection of information is estimated to average 1.5 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0061), Washington, DC 20503.

Appendix B: Scheduled and implemented burn units 2007-2010

Prairie Coteau Habitat Partnership 2007 - 2010 burn units					
landowner name	**burn unit name**	**County**	**planned acres**	**actual date burned**	**Burned Acres**
2007					
Lane Tekroney	B TNC/TEKRONY N	Deuel	601	05/09/07	601
Darwin Peckham	Darwin Peckham (BDP12)	day	109	05/22/07	109
John Lentz	John Lentz (BJL1)	Deuel	76	05/25/07	76
Jim Madsen	Jim Madsen (BJM4)	brookings	32	05/24/07	32
Jim Gruber	Jim Gruber (BJG2)	brookings	47	05/24/07	47
Jim Gruber	Jim Gruber (BJG3)	brookings	27	05/15/07	27
Jim Gruber	Jim Gruber (BJG4)	brookings	70	NO BURN	0
Cory Kirby	Cory Kirby (BCK3)	Kingsbury	107	05/15/07	107
Jay Hotchkiss	Jay Hotchkiss (BJH1)	Deuel	31	05/15/07	31
Roger Headrick	Roger Headrick (BRH2W)	Moody	27	05/10/07	27
Roger Headrick	Roger Headrick (BRH5S)	Moody	33	05/10/07	33
Steve Maag	Steve Maag (BSM3)	codingtion	22	NO BURN	0
Jim Dailey	Jim Dailey (BJD5/6)	Deuel	305	04/28/07	305
Jim Dailey	Jim Dailey (BJD1W)	Deuel	128	04/30/07	128
Jim Dailey	Jim Dailey (BJD3E)	Deuel	61	04/30/07	61
Bruce Prins	Bruce Prins (BRP2)	Roberts	157	05/01/07	157
11 producers	**16 planned units**		**1833**	**14 burns**	**1741**
2008					
Dale Anderson	Anderson, Dale	Clark	22	04/17/08	22
Nathan Atyeo	Atyeo, Nathan (BNAE1)	Deuel	6	04/19/08	6
Pete Bauman	Bauman, Pete (units 2, 5 training burn)	Codington	371	05/14/08	371
Jim Dailey	Dailey, Jim, Crystal Springs central unit	Deuel	242	05/14/08	242
Jim Dailey	Dailey, Jim, Crystal Springs SW unit	Deuel	15	05/21/08	15
Ecosun Prairie Farms	Ecosun Prairie Farms (unit 1)	Moody	25	05/21/08	25
Ecosun Prairie Farms	Ecosun Prairie Farms (unit 3)	Moody	4	05/19/08	4
Jim Gruber	Gruber, Jim. (BJG2)	Brookings	70	05/21/08	70
Jim Gruber	Gruber, Jim. (BJG4)	Brookings	35	05/15/08	35
Roger Headrick	Headrick, Roger, (BRH2E)	Moody	30	05/19/08	30
Ralph Hurlbert	Hurlbert, Ralph (BRH1W)	Clark	242	NO BURN	
Cory Kirby	Kirby, Cory (BCK1)	Kingsbury	47	05/04/08	47
Dan Krause	Krause, Dan (BDKNE)	Roberts	31	05/04/08	31
Steve Maag	Maag, Steve (BSM1)	Codington	32	NO BURN	
Jim Madsen	Madsen, Jim (pasture unit)	Brookings	32	05/05/08	32
Darwin Peckham	Peckham, Darwin (BDP12A)	Day	100	05/05/08	100
Darwin Peckham	Peckham, Darwin (BDP4W - East 1/2)	Day	166	NO BURN	
Bruce Prins	Prins, Bruce (BRP1)	Roberts	120	05/06/08	120
Bruce Prins	Prins, Bruce (BPS1	Marshall	10	05/21/08	10
Jim Rood	Rood, Jim (BJRS)	Day	95	NO BURN	
Lane Tekroney	Tekroney, Lane (BLT1)	Deuel	35	05/21/08	35
Jim Thyen	Thyen, Jim (BJT16SE3 &SE4)	Codington	48	05/22/08	48
Jim Thyen	Thyen, Jim (BJT4E1)	Codington	17	05/04/08	17
Ron Thyen	Thyen, Ron (BRT4)	Hamlin	24	NO BURN	24
Dwayne Wulf	Dwayne Wulf (BDW1)	Brookings			
19 producers	**25 planned units**		**1819**	**20 burns**	**1284**
	2009				
Nathan Atyeo	Atyeo, Nathan (BNAE3)	Deuel	28	05/04/09	28
Nathan Atyeo	Atyeo, Nathan (BNAE4)	Deuel	29	05/04/09	29
Pete Bauman	Bauman, Pete (all units)	Codington	15	04/15/09	15
Jim Dailey	Dailey, Jim, Crystal Springs 9 N 1/2	Deuel	345	04/05/09	345
Jim Gruber	Gruber, Jim. (BJG3)	Brookings	27	04/21/09	27
Dan Krause	Krause, Dan (BDKNW)	Roberts	39	05/19/09	39
Dan Krause	Krause, Dan (BDKNE)	Roberts	114	05/19/09	114
Bruce Prins	Prins, Bruce (BRP1,)	Roberts	166	05/19/09	5
Lane Tekroney	Tekroney, Lane (BLT1)	Deuel	95	05/14/09	95
Ron Thyen	Thyen, Ron (BRT2)	Hamlin	19	04/21/09	19
8 producers	**10 planned units**		**877**	**10 burns**	**716**
	2010				
Bruce Prins	Prins, Bruce (BRP1,)	Roberts	166	04/22/10	166
Pete Bauman	Bauman, Pete (all units)	Codington	8	5/15-5/16/10	8
Ron Thyen	Thyen, Ron (BRT1)	Hamlin	17	05/03/10	17
Ed Spies	Spies, ED(BESE)	Hamlin	67.5	04/27/10	67.5
Nathan Atyeo	Nathan Atyeo (BNAE4)	Deuel	29	NO BURN	NO BURN
Steve Horning	Steve Horning (north)	codington	30	NO BURN	NO BURN
Jim Dailey	Dailey, Jim (S1/2, Sect 3)	Deuel	348	NO BURN	NO BURN
Bureau of Indian Affairs	Prins, Bruce (BRP-Tribal)	Roberts	154	NO BURN	NO BURN
8 producers	**8 planned units**		**819.5**	**4 burns**	**258.5**
24 individuals over time participated in the program from 2007 - 2010	**59 prescribed burn units were planned and prepared**	**10 counties**	**5348.5**	**48 burns**	**3999.5**

Appendix C. Transect distribution and sampling protocols

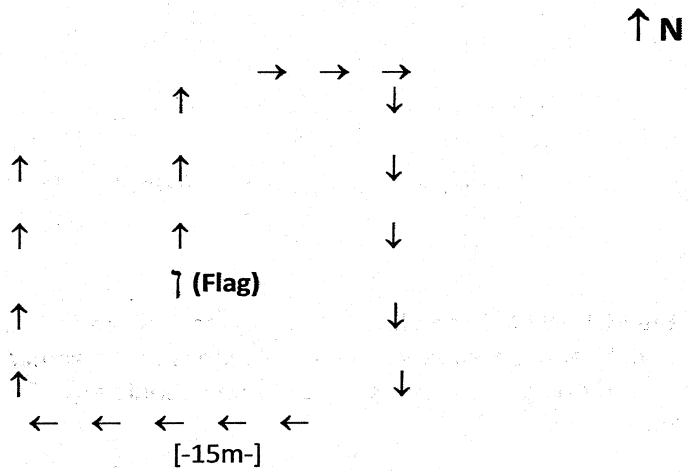
Protocol for G-Transect Vegetation Monitoring

1. Using the MN DNR GIS Sampling Tool generate random sampling plots excluding wetlands and non-use habitat at a frequency that corresponds to the acreage found in the chart below. Also add one or more extra sampling plots per unit should any of the plots fall in an undesirable location.

Land Area (acres)	No. of 'G' Transects
0 – 50	1
50 – 100	2
100 – 300	3
300 – 500	4
500 – 700	5
700 – 900	6
900 – 1100	7
1100 – 1400	8
1400 – 1700	9
1700 – 2000	10
2000 – 2500	11
2500 – 3000	12

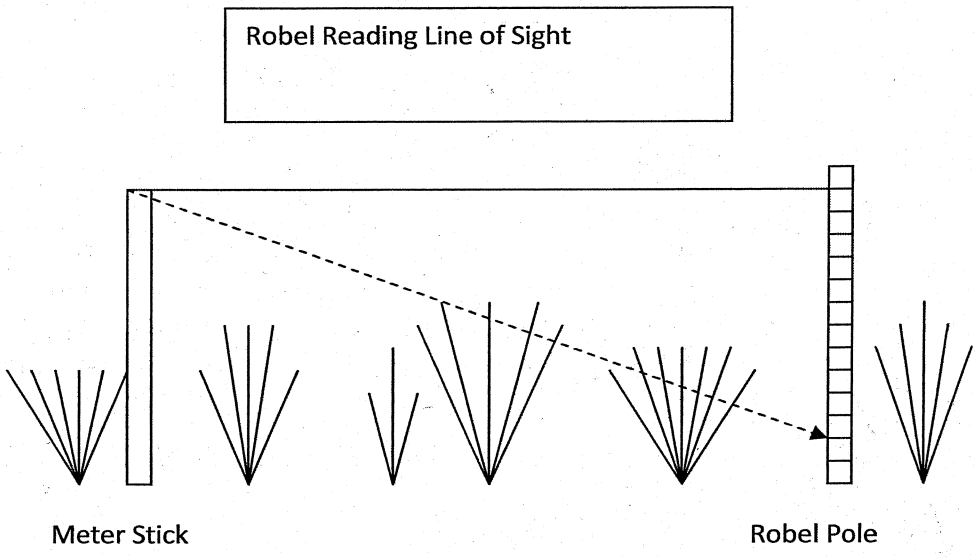
Increase 1 sampling plot for every 500 acre beyond 2000 acres

2. Use a GPS to navigate to the random sampling plots. Because one or more extra plots have been generated, choose to sample the plots that best represent the landscape within the unit, and throw out the extra plots.
3. Place a numbered flag in the ground to mark the center of the plot. The number of the flag should then be recorded on the data sheet. Flag numbers within a given unit should be consecutive to aid in the data management process.
4. From the flag take 2 steps heading north to avoid measurements in vegetation which has been trampled from installing the plot flag. Each transect will be started by heading due north.
5. Twenty observation points fall along the transect. Three points heading north, 3 heading east, 5 heading south, 5 heading west, and 4 heading north. Each observation point is stepped off so that 15m separate each point.

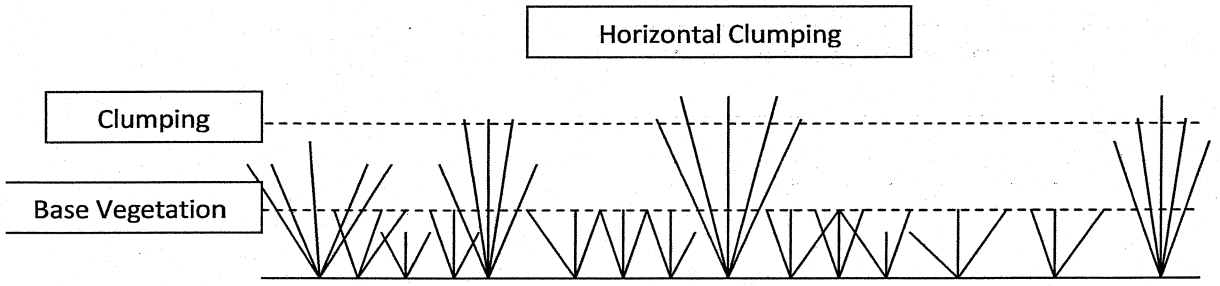


The following protocols are performed at each of the 20 points. Record each of the following values for each point on the data sheet. Also see protocol power point for a slide show description of the following measurements.

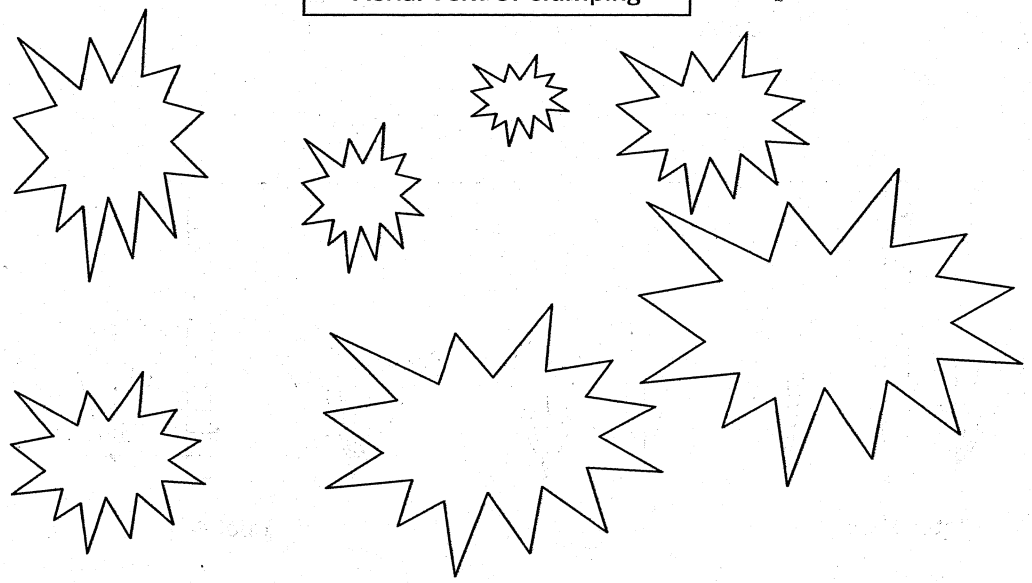
6. Place the Robel pole in the ground approximately one foot in front of the observer at each point after stepping off 15m.
7. Determine the Plant Community Composition value by looking at the vegetation within a 1 meter diameter around the Robel pole and using the Vegetation Category List. See the breakdown of the Vegetation Category List for a better description of determining this value **(Slide A).**
8. Take the Litter Depth measuring the depth in millimeters. Place the bottom of the meter stick on the ground and make sure that it is flush with the soil surface. The litter measurement is the height of the litter layer, that is, the layer lying horizontal (not leaning, not standing, etc.). Slide your finger down the meter stick until it is resting on the top of the litter. Remove the stick and record the reading. **(Slides B, C)**
9. Record the Effective Leaf Height by holding the meter stick parallel to the ground at a height which shows the height of the majority of the vegetative plant growth, with less of an emphasis on seed heads, etc. The distance will be measured to the nearest 2.5 cm on the Robel pole **(Slide D).**
10. Take the Robel reading at a height of 1 m and a distance of 4 m from the pole (always extend outside of or away from the center of the G). Record vegetation height to the nearest 2.5cm that is completely obstructed by the vegetation **(Slide E).**



Clumping:
Clumping is considered as a taller or more dense patch of one or multiple plant species which create a structural mosaic over the vegetative area. Generally clumping is characterized as a 'significant' structural difference in vegetation beyond what is 'normal' for the area. For instance, individual scattered bunchgrass plants growing tall in an otherwise grazed pasture would constitute clumping. Clumps can comprise very little of the total biomass or vegetative canopy of an area, but still may serve to provide ample horizontal cover across the plane. The diagrams below depict clumping from a horizontal and aerial viewpoint.



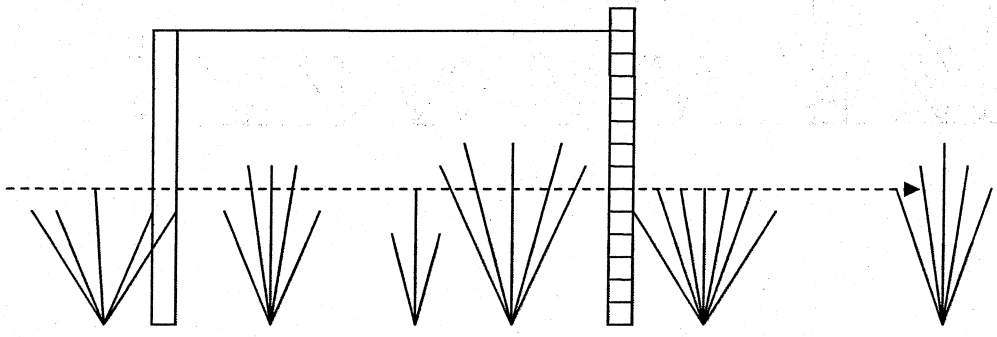
Aerial Veiw of Clumping



Slide F shows an example of clumping in grazed pasture.

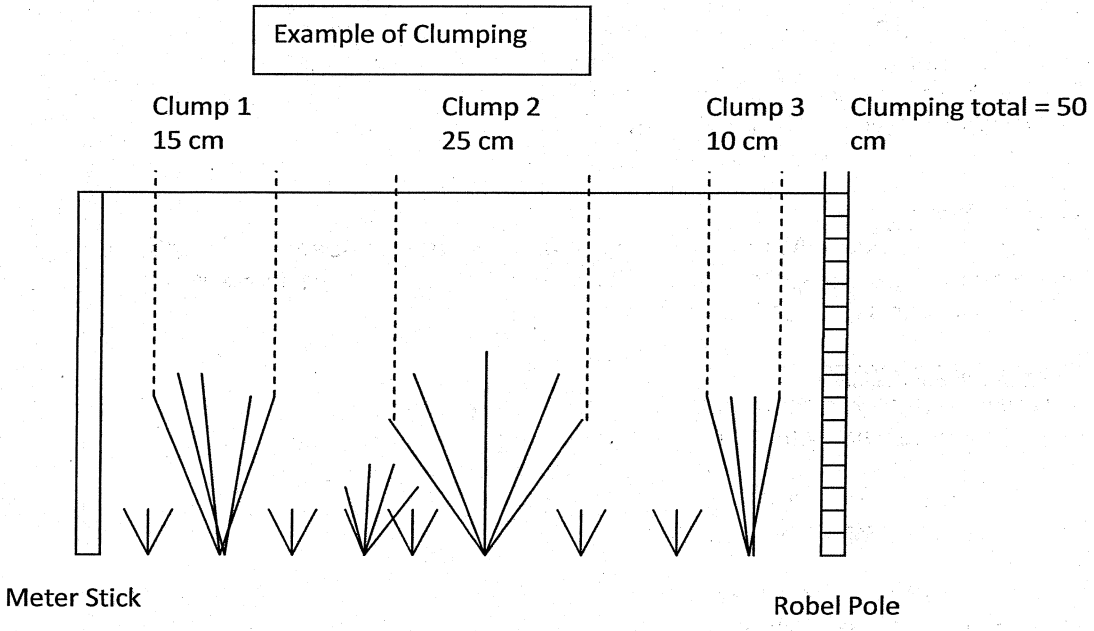
11. The Effective Clump Leaf Height measurement is taken by the observer looking from the top of the vegetation across the plane of the vegetation, parallel to the ground, both in front and behind the Robel pole. The observer is looking for the height where a majority of the leaves block the view behind them. (Another way to look at it is if the observer is a predator; what is the height of the vegetation at which your prey is obscured from view.) Slopes in the terrain should be taken into consideration when taking this reading **(Slide G).**

Clump Leaf Height Line of Sight



Meter Stick Robel Pole

12. If clumping is present write the species that make up the clump in the Clump Composition column. Substituting the plant community is fine only if the species are unknown.
13. When clumps are present measure the total length of the clumps that fall along the four meters of rope stretched between the Robel pole and meter stick Use the rope to add the lengths of each individual clump together and then compare the measured length of rope with the Robel pole to get a reading to the nearest 2.5cm. **(Slide H, I)**



14. While taking measurements or afterwards, check off the species present on the checklist (this consists of key species quality indicators and exotics).

Appendix D: Plant association categories.

Upland Plant Associations

- Record 1 of below types
- Based on Daubenmire canopy cover (>50% unless otherwise indicated)
- Revised from Grant/Madden-JCS, Madden 1996, Hegstad 1973

SHRUB TYPES

Low shrub (generally 0.5 to 1+ m tall except in 1-few yrs post-mow, etc.)

11 dense low shrub, other plants few or none
12 low shrub, remainder native grass and forb
13 low shrub, remainder KY bluegrass
14 low shrub, remainder brome or quackgrass

NATIVE GRASS TYPES

21 cool season grasses A)green needlegrass, B)western wheatgrass, C)porcupine grass
22 warm season grasses A)big blue, B)switch, C)Indian, D) little bluestem
23 mixed warm and cool season grasses

NON-NATIVE GRASS TYPES

31 Kentucky bluegrass dominant
32 Kentucky bluegrass with native grasses

41 Smooth brome dominant
42 Smooth brome with native grasses

51 Crested wheatgrass dominant
52 Crested wheatgrass with native grasses

61 Tall, intermediate, or pubescent wheatgrass
62 Other non-native grass (quackgrass, downy/Japanese brome, etc.)
63 DNC (planted wheatgrass/legume mix)

NOXIOUS WEED TYPES

71 Leafy spurge
72 Canada thistle
73 Sow thistle
74 Wormwood
75 Other weeds (user-defined)

OTHER

81 Forbs – most/all native
82 Tall introduced legume (sweet clover or alfalfa)
83 Wet meadow (sedges, rushes, dock, smartweed, cordgrass, reed canarygrass, etc.)

91 Barren, unvegetated (bare soil, gopher mound)
92 Other (rock, manure, hole, ant hill)

Appendix E. Species checklist and Floristic Quality Index values for individual G-Transects

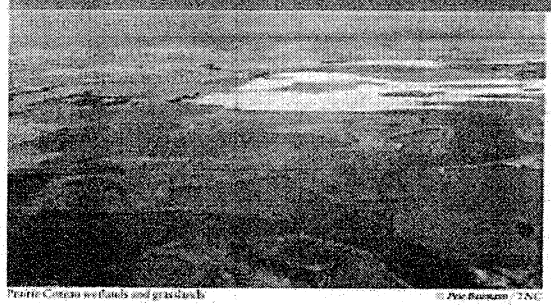
Native Forbs	scientific name	FQI		**Native Grasses**	scientific name	FQI	
ragweed	*Ambrosia sp.*	0,2		reed canary	*Phalaris arundinacea*	0	
common milkweed	*Asclepias syriaca*	0		canada wildrye	*Elymus canadensis*	3	
curly cup gumweed	*Grindelia squarrosa*	1		big bluestem	*Andropogon gerardii*	5	
canada goldenrod	*Solidago candensis*	1		side oats grama	*Bouteloua curtipendula*	5	
wild licorice	*Glycyrrhiza lepidota*	2		switchgrass	*Panicum virgatum*	5	
hoary vervain	*Verbena stricta*	2		cordgrass	*Spartina pectinata*	5	
common yarrow	*Achillia millifollium*	3		green needlegrass	*Stipa viridula*	5	
white sage	*Artemisia ludoviciana*	3		little bluestem	*Schizachrium scoparium*	6	
prairie coneflower	*Ratibida columnifera*	3		indian grass	*Sorghastrum nutans*	6	
prairie rose	*Rosa arkansana*	3		grama grass	*Bouteloua sp.*	7	
western snowberry	*Symphoricarpos occidentalis*	3		june grass	*Koeleria pyramidata*	7	
canada anemone	*Anemone canadensis*	4		porcupine grass	*Stipa spartea*	8	
wild strawberry	*Fragaria virginiana*	4		prairie dropseed	*Sporobolus heterolepis*	10	
silver leaf scurfpea	*Psoralea argophylla*	4		sedge	*Carex sp.*	2-10	
rigid goldenrod	*Solidago rigida*	4					
flodmans thistle	*Cirsium flodmanii*	5					
maximilian sunflower	*Helianthus maximilianii*	5					
wild bergamot	*Monarda fistulosa*	5		**Exotic Grasses**			
missouri goldenrod	*Solidago missouriensis*	5		smooth brome	*Bromus inermis*	*	
blue vervain	*Verbena hastata*	5		kentucky blue grass	*Poa pratensis*	*	
wild onion	*Allium sp.*	7,8		green foxtail	*Setaria viridis*	*	
thimbleweed	*Anemone cylidrica*	7		timothy	*Phleum pratense*	*	
ground plum	*Astragalus crassicarpus*	7		cheatgrass/japanese brome	*Bromus sp.*	*	
toothed evening primrose	*Calyophus serrulatus*	7					
purple coneflower	*Echinacea angustifolia*	7					
blazing star	*Liatris sp.*	7,8					
puccoon	*Lithospermum sp.*	7		**Exotic Forbs**			
false gromwell	*Onosmodium molle*	7		wormwood sage	*Artemisia absinthium*	*	
violet wood sorel	*Oxalis violacea*	7		musk thistle	*Carduus nutans*	*	
white beard tongue	*Penstemon albidus*	7		canada thistle	*Cirsium arvense*	*	
purple meadow rue	*Thalictrum dasycarpum*	7		bull thistle	*Cirsium vulgare*	*	
new england aster	*Aster novae-angliae*	8		field bindweed	*Convolvulus arvensis*	*	
prairie clover	*Dalea sp.*	8		leafy spurge	*Euphorbia esula*	*	
prairie larkspur	*Delphinium virescens*	8		butter n eggs	*Linaria vulgare*	*	
prairie smoke	*Geum triflorum*	8		alfalfa	*Medicago sativa*	*	
stiff sunflower	*Helianthus rigidus*	8		white sweet clover	*Melilotus alba*	*	
alumroot	*Heuchera richardsonii*	8		yellow sweet clover	*Melilotus officinalis*	*	
wood lily	*Lilum philadelphicum*	8		buckthorn	*Rhamnus cathartica*	*	
prairie cinquefoil	*Potentilla arguta*	8		common sow thistle	*Sonchus oleraceus*	*	
prairie violet	*Viola pedatafida*	8		goatsbeard	*Tragopogon dubius*	*	
white camass	*Zigadenus elegans*	8		plumeless thistle	*Carduus acanthoides*	*	
golden alexanders	*Zizia sp.*	8					
lead plant	*Amorpha canescens*	9					
pasque flower	*Anemone patens*	9					
silky aster	*Aster sericeus*	10					
gentian	*Gentiana sp.*	10					
prairie phlox	*Phlox pilosa*	10					
rattlesnake root	*Prenanthes racemosa*	10					
prairie turnip	*Psoralea esculenta*	10					

Attachment A. Prairie Coteau Habitat Partnership Flyer

Prairie Coteau Habitat Partnership

South Dakota

Great Plains Fire Learning Network — 5 counties/tribes



Prairie Coteau wetlands and grasslands © Pete Baumann / TNC

The Prairie Coteau region of South Dakota and Minnesota is an excellent example of the once vast northern tallgrass prairie. The area is characterized by native big and little bluestem, switchgrass, indiangrass and blue grama, with bur oak woodland surrounding wetlands to the northeast. These grasslands are interspersed with thousands of wetland basins and small forested valleys known as coulees. As fire is gradually reintroduced, native grasses and forbs burst forth abundantly. Today, this mosaic of wetland and prairie attracts a diverse array of waterfowl and grassland birds. The landscape also provides excellent habitat for rare prairie-dependent insects, including numerous species of butterflies.

The Partnership's goals are to conserve biodiversity, including rare and endangered species, improve management practices on lands that are currently being managed to improve native species habitat, increase the number of private landowners using ecologically sound prescribed fire and grazing and model appropriate disturbance regimes while exploring new niche markets for participating landowners. Under the U.S. Fish & Wildlife Service Private Stewardship Grant Program, the partnership has worked with Region 6 fire personnel to ensure the fire program meets all national and regional FWS and National Wildfire Coordinating Group (NWCG) standards for fire planning and implementation.

The Partnership was formed in 2004 as part of the Great Plains FLN, and has seen an impressive increase in landowner participation and interest over the years. To date, 20 landowners across nine counties have participated, implementing 5,000 acres of fire and monitoring for ecological effects. Outreach and education—at farm and home shows, through landowner tours and SDSU Extension 'Pasture Walks' and at a 2009 landowner tour and forum—along with partnering to secure long-term funding, have set the stage for continuing growth in the effectiveness of the Partnership's activities.

Landscape Partners

- Bureau of Indian Affairs
- Day County Conservation District
- Ducks Unlimited
- Erosion Prairie Farms
- National Fish and Wildlife Foundation
- National Park Service – Pipestone National Monument (MN)
- Northern Prairies Land Trust
- Pheasants Forever
- Private Landowners
- South Dakota Dept. of Agriculture – Wildland Fire Suppression
- South Dakota Department of Game, Fish, and Parks
- South Dakota Fire Marshall's Office
- South Dakota Grasslands Coalition
- South Dakota Natural Resources – Conservation Service
- South Dakota State University – Animal and Ranch Sciences
- South Dakota State University – Wildlife and Fisheries
- South Dakota State University – Extension Service
- The Nature Conservancy
- Upper Big Sioux Watershed Project
- USDA Forest Service
- U.S. FWS – Big Stone NWR (MN)
- U.S. FWS – Madison WMD
- U.S. FWS – Partners for Fish and Wildlife
- U.S. FWS – Waubay NWR

Landscape Vision

The Partnership will promote a greater appreciation of the value of native tallgrass prairie by working with agencies, landowners and the public to return to a more natural fire and grazing regime.

Contact: Pete Baumann — pbaumann@tnc.org — (605) 874-8517

Attachment B: Prairie Coteau Habitat Partnership Focus Area