

NDSU NORTH DAKOTA STATE UNIVERSITY

December 2, 2013

Industrial Commission of North Dakota
Outdoor Heritage Fund
600 E. Boulevard Ave Dept 405
Bismarck, ND 58505-0840

Board members,

I am pleased to submit this application titled Management strategies to improve Conservation Reserve Program habitat quality and livestock grazing value to the Outdoor Heritage Fund board for consideration. Permanent vegetation cover is vital to maintain quality wildlife habitat and a successful livestock industry. We believe that by increasing the plant diversity in existing CRP fields, we can not only provide better habitat for ring-necked pheasants and other grassland birds, but also increase the livestock forage value and grazing potential, thus keeping CRP fields in permanent vegetation. This project evaluates several management strategies at three locations over a 4-year period. Our research team was strategically organized to allow us to investigate these management options with an ecosystem and economic perspective with the expectation that we will provide "best management options" for land owners and land managers across the state.

We believe that this project is of great importance to North Dakota conservation efforts and fits well with the outlined objectives of the Outdoor Heritage Fund. We look forward to your response.

Sincerely,

Dr. Ryan Limb
Assistant Professor
School of Natural Resource Sciences
North Dakota State University

MAJOR Directive:

Directive A. Provide access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;

Directive B. Improve, maintain, and restore water quality, soil conditions, plant diversity, animal systems and to support other practices of stewardship to enhance farming and ranching;

Directive C. Develop, enhance, conserve, and restore wildlife and fish habitat on private and public lands; and

Directive D. Conserve natural areas for recreation through the establishment and development of parks and other recreation areas.

Additional Directive:

Directive A. Provide access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;

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Directive D. Conserve natural areas for recreation through the establishment and development of parks and other recreation areas.

Type of organization:

State Agency

Political Subdivision

Tribal Entity

Tax-exempt, nonprofit corporation, as described in United States Internal Revenue Code (26 U.S.C. § 501 (c))

Project Name

Management strategies to improve Conservation Reserve Program habitat quality and livestock grazing value

Abstract/Executive Summary.

The overlaying objective of this project is to find cost effective management strategies that promote maintaining CRP fields in permanent vegetation through sustained livestock grazing while simultaneously improving wildlife habitat and ecosystem health. Through this grant, we can effectively accomplish both directives B and C (see details in the Purpose of Grant section).

CRP lands provide permanent cover for many wildlife including grassland birds. Pheasants and other bird species are rapidly declining throughout North Dakota, in part to many acres of CRP being converted back to agricultural production. Livestock grazing on CRP land is an economic alternative for agricultural production and in addition maintains grassland bird habitat. However, CRP fields produce exceptionally poor livestock forage and therefore grazing lease value is much reduced. Reintroducing disturbance into CRP fields during the mid-contract management period can increase plant diversity and livestock forage value while maintaining soil health and habitat quality. **We propose comparing the combination of haying, light discing with interseeding, and prescribed fire disturbances as methods to improve the livestock grazing value at the same time improving habitat quality of CRP fields for ring-necked pheasants and ducks across North Dakota. Focus will be placed on increasing plant community diversity, maintaining soil health, and decreasing excessive litter accumulation to promote sustained livestock grazing opportunities.**

This project evaluates management options available on CRP fields across North Dakota over a 4-year period. When completed, we will understand the benefits and drawbacks of each management practice from an economic, livestock forage, wildlife habitat, and ecosystem health standpoint across the state. Utilizing our existing North Dakota State University Extension Service framework, we can effectively deliver these management recommendations to interested land owners and managers and increase conservation efforts on CRP lands in North Dakota.

The total cost of the Outdoor Heritage Fund proposal over four years	\$1,668,982
Outdoor Heritage Fund request over four years	\$1,013,631
Match from NDSU for the Outdoor Heritage Fund over four years	\$ 655,351

Project participants:

- North Dakota State University
- CRP landowners

Finding effective management alternates for CRP lands that can benefit both wildlife and grazing are the types of goals that we feel are part of the directives that the Heritage Fund is designed to meet. The livestock industry in North Dakota is dependent upon the long-term sustainability of grasslands which are also extremely important to grassland nesting game birds including the economically important ring-necked pheasant. The continued long-term loss of grasslands including CRP will negatively affect both livestock production and wildlife populations. Therefore, steps must be taken to curtail some of the loss. The fostering of more

robust nutrient rich CRP grasslands may prove more attractive to livestock producers encouraging them to invest money into these areas following the expiration of the contract and prevent the loss of additional grasslands. Furthermore, findings generated from this study will be invaluable to the future management of the millions of acres of tamed grasslands that currently exist in ND. In future these management alternatives can be incorporated into effective management of lands no longer in CRP contract contributing to diverse and sustainable working lands for North Dakota.

Amount of Grant request

\$1,013,631.00 over a four year period

Total Project Costs

\$1,668,982 over a four year period

Amount of Matching Funds

\$655,351.00 (\$239,042 cash, \$416,309 in-kind) over a four year period

Source(s) of Matching Funds

North Dakota State University \$239,042 (cash) over a four year period

North Dakota State University \$416,309 (in-kind) over a four year period

Certifications

X I certify that this application has been made with the support of the governing body and chief executive of my organization.

X I certify that if awarded grant funding none of the funding will be used for any of the exemptions noted on Page 1 of this application.

Narrative

Organization Information –

North Dakota State University first opened as a public land grant institution in Fargo, North Dakota, in 1890, shortly after North Dakota officially became a state in November 1889. Initially known as the North Dakota Agricultural College, the college's name was changed to North Dakota State University in 1960. The North Dakota Agricultural Experiment Station and NDSU Extension Service are integral parts of the University. NDSU accepted its first graduate students in 1895.

NDSU has enjoyed steady growth, with enrollment now exceeding 14,500 students and over 700 faculty members. NDSU offers over 100 undergraduate and approximately 100 graduate programs in a wide variety of fields, with degrees awarded at the doctoral, master's, professional, and baccalaureate levels. In addition to their academic studies, students have opportunities to participate

in approximately 300 student organizations, leadership development, civic engagement activities, fine arts, athletics, and study abroad.

NDSU is part of the North Dakota University System (NDUS) which includes 11 campuses across the state. The State Board of Higher Education (SBHE) is the policy-setting and governing body for the NDUS. The SBHE is made up of seven citizen members appointed to four-year terms by the governor, one student appointed by the governor to serve a one-year term, a non-voting faculty advisor and a non-voting staff advisor. NDSU is headed by a President, with a Provost who provides administrative leadership for all academic activities, including eight academic colleges and the graduate school.

NDSU's mission statement: "With energy and momentum, North Dakota State University addresses the needs and aspirations of people in a changing world by building on our land-grant foundation." With its land-grant mission to provide quality education, leading-edge research and excellent service, NDSU is acknowledged as a national leader among its peers.

Purpose of Grant –

Perennial cover is a critical component of both migratory and non-migratory grassland bird habitat. North American grasslands are decreased as much as 99% from 100 years previous and are currently being converted to crop production agriculture. Numerous conservation efforts are in place to maintain existing grasslands and convert agricultural fields back to perennial vegetation. The Conservation Reserve Program (CRP) administered by the United States Department of Agriculture and the Farm Service Agency (FSA) aims to cooperate with farmers and, in exchange for annual rental payments, remove environmentally sensitive and less productive land from agricultural production and establish perennial vegetative cover. Initially established in 1956, the practice was not commonly used until 1985. Currently there is over 20 million acres of CRP nationally and almost 1.5 million acres in North Dakota alone (FSA 2013). These surrogate grasslands provide critical habitat for many grassland and waterfowl bird species with ring-necked pheasants being nearly 50% more abundant in areas with high CRP enrollment (King and Savidge 1995).

The future of CRP is unclear with large reductions in acreage occurring in recent years and contracts for almost 850,000 acres of CRP in North Dakota (nearly 57% of total CRP acres) scheduled to expire by 2017. In recent years, lands being removed from CRP have primarily been converted back to crop production, in part due to their low quality grazing potential. This conversion from perennial vegetation to annual crops greatly reduces their potential as suitable habitat for wildlife and limits the habitat potential of the overall landscape. Without alternative management strategies that maintain perennial vegetation cover, many acres will be converted back to cropland and much of the conservation efforts that were achieved lost. Therefore, management actions that can increase both the wildlife habitat and livestock forage (grazing, haying) potential of remaining CRP need to be evaluated and utilized (North Dakota Game and Fish).

Grassland managers recognize that long-standing benchmark of 50% permanent vegetation at the landscape level is critical to maintain habitat requirement for grassland obligate species (Sample and Mossman 1997). Expiring CRP lands have not attracted a lot of attention from livestock producers due in part to the inactivity of the plant community and reduced nutrient values of old, single-species grass stands. Furthermore, because CRP lands were previously cropped, water developments and fences are often not present. Management actions that result in a higher quality

and more productive stand of perennial grasses and forbs could improve the likelihood of livestock production occurring on expired CRP fields and maintaining relatively large blocks of perennial vegetation. From a wildlife standpoint, anything that can be done to help keep expiring CRP from being converted back to crop production would be considered a benefit. Therefore, actions that support sustained livestock production can be considered mutually beneficial to overall grassland conservation.

Grasslands, both native and surrogate, are disturbance dependent ecosystems and require periodic removal of aboveground biomass to maintain vegetation diversity and productivity (Sousa 1984). Historically, North American grasslands were burned as frequently as every two years as well as grazed by diverse wildlife species (Axelrod 1985). These frequent disturbances removed standing vegetation allowing sunlight to reach the soil surface and precipitation to infiltrate into the soil profile. Grassland plant species became so dependent on periodic disturbances that when disturbance is removed, species richness (Figure 1) and diversity declines rapidly (Collins et al 1998). CRP fields are removed from all methods of agriculture production to promote and maintain permanent vegetation cover, and remain in idle management for the duration of the contract. Unfortunately, much like native grasslands without disturbance, CRP fields display similar responses with increased thatch accumulation, decreased sunlight penetration and subsequent loss of forb abundance over time. The reduced plant diversity and thatch buildup greatly reduces the forage quality and has the potential to limit arthropod abundance and structural heterogeneity, and in return influence the habitat potential for nesting and brooding grassland birds (Siemann et al. 1999, Fuhlendorf et al. 2006).

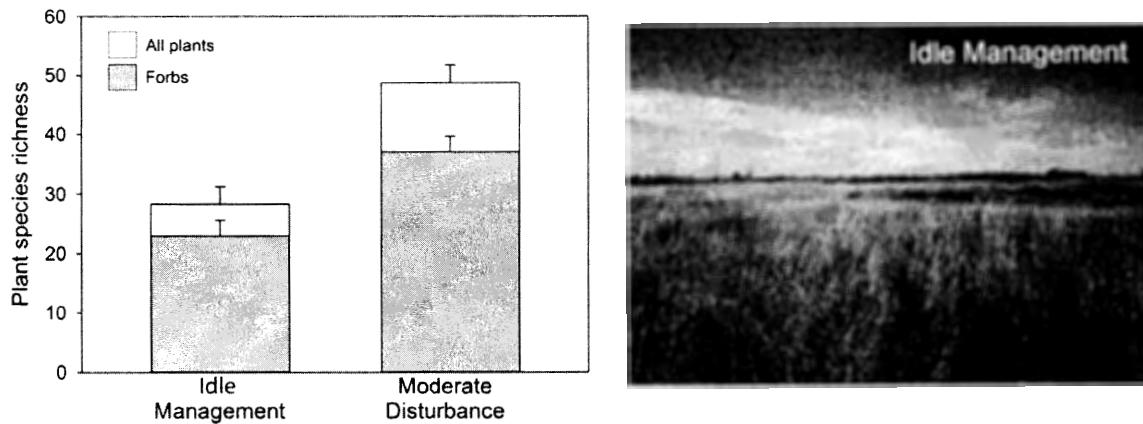


Figure 1. Plant species richness in pastures with either idle management or moderate disturbance near Streeter, ND. Forbs comprise of more than 75% of the plant community and decline with idle management.

Ring-necked pheasant typically select areas of permanent cover for nesting and brood rearing (Mathews et al. 2012). CRP fields are planted to perennial cover and can provide suitable nesting cover for pheasants (King and Savidge 1995). However, as CRP fields age their quality as nesting and brood rearing habitat may decline (McCoy et al. 2001; Ryan et al. 1998). Insects are a critical component of pheasant chick diets, with variation in arthropod densities explaining 75% of polt survival (Hill 1985). Diet demand and availability can greatly influence the home range size of many bird species. Pheasant broods with larger ranges generally consisted of low insect densities while broods with small home ranges tended to have larger insect densities (Hill 1985). Furthermore, higher

biomass consumption of invertebrates by pheasant chicks is positively correlated with chick survival and is most important during the first 24 days following hatch (Hill 1985; Woodward et al. 1977). The insect community is directly tied to the local plant community with areas of higher plant diversity often fostering higher levels of insect diversity (Siemann 1998). This relationship is partially the result of the co-evolution of flowering plants and their associated pollinators, but can further be explained by local insect herbivores and their interactions with insect parasites and predators (Kearns and Inouye 1997; Siemann et al. 1998).

Much of the CRP within the Northern Great Plains has been planted into a low diversity of grasses and legumes. Early plantings were primarily smooth brome grass or crested wheatgrass, with alfalfa or sweetclover included in a small percentage of the mix. CRP plantings over the past 15 years included a mixture of wheatgrasses with alfalfa and/or sweetclover included. These low diversity plantings have limited avenues for nutrient cycling, energy capture, vegetative production, livestock nutrition and wildlife habitat. The evidence suggests by increasing the diversity of grassland areas (particularly forb species) there are a number of beneficial outcomes such as increased rooting depth and more sustainable vegetative production compared to single or dual species plantings. Intuitively, more species with varying life histories and morphologies would mean a variation in vegetation structure, temporal nutrient availability for livestock, and the ability to attract varying wildlife.

As CRP fields age and become dominated by grasses, often a single species of grass, insect abundance and diversity declines, thus affecting its habitat potential (McIntyre and Thomson 2003). Mid-contract management of CRP fields (i.e. disturbance) is often required and may be used to improve the habitat potential of the land (Negus et al. 2010). Recent work in Nebraska suggests that hen pheasant preferentially selected nest sites in areas within idled CRP fields that were recently disced and interseeded and avoided areas with excessive litter accumulation (Mathews et al. 2012). To date, the harvest of CRP as hay is the primary mid-contract management option employed. Haying CRP reduces accumulated litter and helps maintain the legume component present within the initial stand (Allen et al. 2001). However, haying CRP fields alone may have limited ability to improve plant diversity in the relatively short timeframe of traditional CRP contracts, and as a result may not maximize the habitat potential of such lands (Rooney and Leach 2010). Disturbances that generate a rapid increase in forb abundance and diversity (2-3 years) provide the greatest opportunity to enhance CRP habitat potential at the mid-contract point.

Prescribed fire is a common practice in the central and southern Great Plains ecoregion to revitalize grasslands that also promotes a temporarily forb dominant pasture. Natural plant community succession following prescribed fire promotes both annual and perennial forb abundance, often during the second year after burning (Fuhlendorf and Engle 2004, Fynn et al. 2005). Because of this increase in forbs, fire is often used to increase livestock forage value and create wildlife food plots and brood rearing habitat for bobwhite quail and other grassland birds (Bidwell et al. 2004, Fuhlendorf et al. 2006, Cox and Jones 2009, Limb et al. 2010). Human induced soil disturbances, such as disking, while not natural to grasslands, trigger plant community succession similar to prescribed fire, and increase forb abundance and diversity (Sousa 1984, Limb et al. 2010, Negus et al. 2010). However, light disking does not remove accumulated thatch buildup common on many aging CRP fields. When disking is combined with haying, changes in both forb abundance and vertical structure are expected. Disturbances, such as haying with disking or fire, may not only improve CRP habitat for pheasants, but have been shown to improve nesting conditions for other grassland birds including dickcissels (Negus et al 2010, Adams et al. 2013). When sections of pastures are disturbed and

others remain undisturbed (i.e. patch-disturbance), nesting cover and over wintering and brood rearing habitat exist in close proximity, providing essential vertical structure requirements for diverse bird communities (Fuhlendorf et al. 2006). Patch disturbance in CRP fields not only can improve ring-necked pheasant habitat, but can improve habitat for a variety of grassland bird species.

Overall, CRP mid-contract management has a strong likelihood to improve ring-necked pheasant habitat and livestock grazing value, but the lack of information in northern regions makes it unclear which methods are most feasible. The future success of habitat conservation in North Dakota is strongly tied to the presence and maintenance of CRP grasslands. Without realistic management information and strategies, much of the current habitat conservation efforts will be lost. Therefore, **the purpose of this grant is to compare the combination of haying, light discing with interseeding and prescribed fire as methods to improve the habitat quality of CRP fields for ring-necked pheasants and ducks, and livestock grazing value across North Dakota. Focus will be placed on increasing plant community diversity, increasing insects as a food resource, maintaining soil health, and decreasing excessive litter accumulation to promote sustained livestock grazing opportunities.**

The time-line provided in **Table 1**, as well as our plan of work, will be the core documents used to evaluate the progress of the team to meet the timely completion of the project. During the monthly conference call, the time-line and plan of work will be reviewed to determine if tasks outlined within the documents have been achieved. Furthermore, the preparation of annual reports as required as part of this funding opportunity will allow the team to make sure we are doing what we committed to in this application. Dr. Limb will evaluate the budgets on a monthly basis to ensure that tasks are being completed within the budgetary constraints of the proposal.

Table 1.

Tentative timeline for Treatment implementation, data collection/analysis, and reports

Date	Activity
Spring 2014	Select research sites; Gain FSA/NRCS waivers
Spring 2014	Capture and collar hen pheasants
Spring/Summer 2014	Monitor radio collared hens Quantify nest and random locations Sample breeding bird populations Collect soil data Collect vegetation/forage data Collect invertebrate data Collect waterfowl data Survey service providers
Late Summer/Early Fall 2014	Hay, disc and seed treatment areas
Fall 2014	Burn treatment areas
Winter 2015	Compile baseline data and submit annual report to ND Industrial Commission/Outdoor Heritage Fund Board
Spring/Summer 2015	Monitor radio collared hens Quantify nest and random locations Sample breeding bird populations Collect soil data Collect vegetation/forage data

	Collect invertebrate data Collect waterfowl data Educational tours
Late Summer/Early Fall 2015	Hay, disc and seed treatment areas
Fall 2015	Burn treatment areas
Winter 2016	Compile baseline data and submit annual report to ND Industrial Commission/Outdoor Heritage Fund Board
Spring/Summer 2016	Monitor radio collared hens Quantify nest and random locations Sample breeding bird populations Collect soil data Collect vegetation/forage data Collect invertebrate data Collect waterfowl data Educational tours In-service training to service providers Survey service providers
Late Summer/Early Fall 2016	Hay, disc and seed treatment areas
Fall 2016	Burn treatment areas
Winter 2017	Compile baseline data and submit annual report to ND Industrial Commission/Outdoor Heritage Fund Board
Spring/Summer 2017	Monitor radio collared hens Quantify nest and random locations Sample breeding bird populations Collect soil data Collect vegetation/forage data Collect invertebrate data Collect waterfowl data Educational tours In-service training to service providers
Fall 2017	Educational tours State-wide workshop In-service training to service providers Survey service providers
Winter 2018	Analyze data and submit findings to ND Industrial Commission/Outdoor Heritage Fund Board Produce and distribute informational brochures

Management of Project –

The general oversight of the project including the budget will be carried out by the project leader Dr. Ryan Limb, Assistant Professor at North Dakota State University. Dr. Limb has lead interdisciplinary research teams throughout the United States for the past 9 years and currently sits on regional and national leadership and research advisory panels. Our proposed project will involve

collaboration among a dynamic group of research and extension personnel from NDSU. At the onset of the project, all team members will meet to develop a comprehensive plan for the proposed project which will more thoroughly outline tasks and make sure all tasks have been properly delegated. Dr. Limb in collaboration with all primary investigators will set long term and annual milestones and make frequent checks to ensure milestones are met and if they are not achieved, evaluate why and make the proper adjustments to facilitate later achievement of future milestones. To ensure tasks are being completed on time and to provide an avenue for monthly discussions concerning the project, Dr. Limb will coordinate monthly conference calls with all those involved with the project expected to attend. Dr. Limb will be responsible for all reporting required to the granting agency as outlined in the request for applications. Along with his responsibilities as project manager, Dr. Limb will be responsible for all activities related to the collection of vegetation data. Furthermore, Dr. Limb will manage the prescribed fire aspects of the project and assist with graduate and undergraduate student advising and mentoring.

Along with Dr. Limb, all other PI's will be responsible for providing those materials requested by him which are necessary to make sure all project goals and responsibilities are being met. Each PI will have management responsibilities related to their areas of expertise.

Dr. Kevin Sedivec, Rangeland Extension Specialist with NDSU will be responsible for the oversight and management of all outreach activities. Dr. Sedivec has over 25 years of extension experience and is knowledgeable in numerous issues concerning livestock production, forages, range health and wildlife. He will also be responsible for the management of the forage quality data set.

Dr. Benjamin Geaumont, Assistant Research Professor at the Hettinger Research Extension Center, will be responsible for managing all tasks related to the collection of data concerning wildlife. Dr. Geaumont will be in charge of the oversight and on the ground management of all research site(s). He will be responsible for the management and coordination of all field personnel at all sites. He will be in charge of scheduling personnel at all sites to avoid the completion of one task interfering with the completion of another. Dr. Geaumont will be responsible for advising and mentoring both graduate and undergraduate students involved with the wildlife portion of the study. Dr. Geaumont has worked full time at NDSU in one capacity or another since 2009 and has considerable experience with research involving upland gamebirds.

Dr. Norland, Assistant Professor of Natural Resources at NDSU will be responsible for the management and analysis of data. After annual completion of data collection, Dr. Norland will inspect the data and work with other PI's and students to ensure that the data being collected is correct, thorough, consistent with objectives, and ready for analysis. Dr. Norland will help develop seed mixtures to be used as part of the interseeded treatment and oversee all interseeding activities. Dr. Norland has 25 years of experience with data analysis and is extremely interested in native prairie restoration.

Dr. Tom DeSutter, Assistant Professor of Soil Sciences at NDSU will be responsible for the oversight and management of all aspects of the project as they relate to soils. He will be responsible for the management and mentoring of students involved with soils data collection. Dr. DeSutter has been with NDSU since 2007, has numerous publications related to soils and is the current Soil Science program leader.

Dr. Edward DeKeyser, Program Leader of Natural Resources Management at NDSU will be responsible for the management and implementation of the interseeding treatments along with Dr. Norland. Dr. DeKeyser will also be involved with the mentoring of both graduate and undergraduate

students. Dr. DeKeyser has been at NDSU since 2000 and has strong research interests in invasive species ecology and management and native prairie restoration.

Dr. Marion Harris, Professor at NDSU will manage all data as it pertains to the insect portion of the study. Dr. Harris has been at NDSU for 13 years and has extensive research experience studying insect-plant interactions. She will manage all students involved with insects as part of this study.

Evaluation –

We propose comparing the combination of haying, light discing with interseeding, and prescribed fire as methods to improve the habitat quality of CRP fields for ring-necked pheasants and ducks, and livestock grazing value across North Dakota. Focus will be placed on increasing plant community diversity, decreasing excessive litter accumulation to promote sustained livestock grazing opportunities.

The project will be evaluated based on:

- The treatments ability to economically:
 - o improve habitat quality for pheasants and ducks
 - o Improve the forage value and livestock grazing potential of CRP grasslands
- Progress being made towards project completion
- Our ability to educate stakeholders on CRP and post-CRP management options

To determine if our proposed treatments are indeed improving the habitat and forage quality of CRP, we will evaluate all aspects of the project using common field research techniques and methods. To compare the disturbance methods, twelve CRP fields will be selected in the southwest, south-central and southeast portions of North Dakota and grouped based on physical and vegetation characteristics. Each of the fields will be divided into three relatively equal patches where haying followed by light discing, haying followed by light discing and interseeding, or prescribed fire will be applied to one third of the field in late summer or early Fall the first year (Figure 2). This leaves two thirds of each field undisturbed with relatively tall vegetation structure. The second year, disturbance treatments will be applied to the second third of the field leaving one third undisturbed, one third recently disturbed and one third one-year post disturbance. The third year, the last third will be disturbed resulting in one third recently disturbed, one third one-year post disturbance and one third two-years post disturbance. Each of these patches, with varying time since disturbance, will likely have slightly different plant species and fulfill different habitat requirements for ring-neck pheasants and grassland obligate birds in general. In addition to our treatment fields, three fields in each location will remain unaltered and serve as controls.

Permanent transects will be established in each of the fields to assess changes in soil properties, plant community composition and structure, and livestock forage value. Soil bulk density, water infiltration rate, and shallow and deep root biomass will be measured annually. Plant community composition, visual obstruction and ground cover will be recorded along each transect in mid-summer annually using modified Daubenmire cover classes (Daubenmire 1959) (See Table 1. for a complete timeline). Vegetation structure will be estimated using a combination of the Robel technique (Robel 1979) and digital imagery (Limb et al. 2007). Vegetation samples will be collected at the mid-point and end of the growing season annually and analyzed for livestock forage quality. To estimate pheasant food resources and abundance, invertebrate abundance will be estimated mid-and late-summer annually within each field using sweep nets. Invertebrate samples will be sorted to Order and weighed.

To quantify the use of disturbed CRP fields by upland birds, each of the fields will be surveyed by dragging a 25-m chain between two ATV's across vegetation and all birds will be identified when possible. Nests will be marked for pheasants, ducks, sandpipers, doves, harriers, and short-eared owls by intensively searching areas from which adult birds are flushed (modified from Higgins et al. 1969). Microhabitat vegetation characteristics will be measured at each nest location and also at exponentially greater distances from the nest to assess the nest site selection within the broader landscape. Nests will be monitored for fledgling survival. Along with nest dragging, radio telemetry will be used to assess habitat selection by hen ring-necked pheasant. During the spring of each year, female pheasant will be captured using a night-lighting technique (Labisky 1959). Captured hens will be fitted with necklace style radio transmitters and monitored 5-10 times per week using triangulation and or homing techniques. Universal Transverse Mercator coordinates of each known location will be recorded. Nests will be monitored until completion at which time the local plant community composition and structure will be recorded around each nest site. Hens with and without broods will continue to be monitored past the nesting season to allow for quantification of brood rearing habitat as well as to allow for comparisons of habitat selection between hens with broods versus those without. Telemetry data concerning both hens and broods will be used to estimate survival using program MARK. Additionally, to estimate bird community composition, we will conduct 5-minute fixed radius point counts (Ralph et al. 1995) using distance-sampling along each of the permanent vegetation transects (Buckland et al. 2000).

Evaluation of the data collected annually will occur following the completion of each field season. An annual evaluation of data will allow investigators to ensure the data being collected is correct and sufficient to meet the project goal. The annual evaluation of data will provide the project team and stakeholders with an opportunity to look at basic output including all descriptive statistics. Furthermore, a thorough evaluation of the data will help the project team recognize any problems that may be occurring as well as to recognize any shortcomings regarding data collection.

Educational workshop and tours will be conducted to provide outreach opportunities for land owners and managers who participate, or plan to participate, in CRP; as well as any interested people. We will also offer training activities for service providers; such as the NDSU Extension Agent, NRCS, and Soil Conservation Service, to create experienced educators at the county level.

Educational tours will begin in year three of the project and held annually through the remaining duration of the studies. In the last year of the project, an educational workshop will be conducted to present study findings and recommendations for managing CRP lands with the hope of demonstration alternative uses of CRP that maintain a perennial plant cover. These findings will show impacts on wildlife habitat and livestock forage values in terms of quality and production. Economic analysis of treatments and value will be provided to substantiate the ecological values. Electronic media and web-based information will be developed to create educational opportunities throughout the study. The web-based information will be linked to the School of Natural Resource Sciences web site.

Our ability to educate stakeholders on management options for CRP and post-CRP will be evaluated via surveys. A pre-study survey will be conducted to attain the present knowledge base of CRP management options and perspective of uses of CRP lands when they expire. This survey will be targeted toward the service provider community as they should have the best feel for what CRP landowners are planning for future use. Since we will be providing training opportunities specifically for the service provider community annually starting in year three, they should be able to provide knowledge base levels of CRP management options during the end of year three and at the end of the project. So, follow-up surveys will be conducted at the end of year three and when the study ends in year five. Educational material will be developed including electronic and printed material. Two extension publications will be developed to provide management strategies, tools, and recommendations to address wildlife habitat and livestock forage.

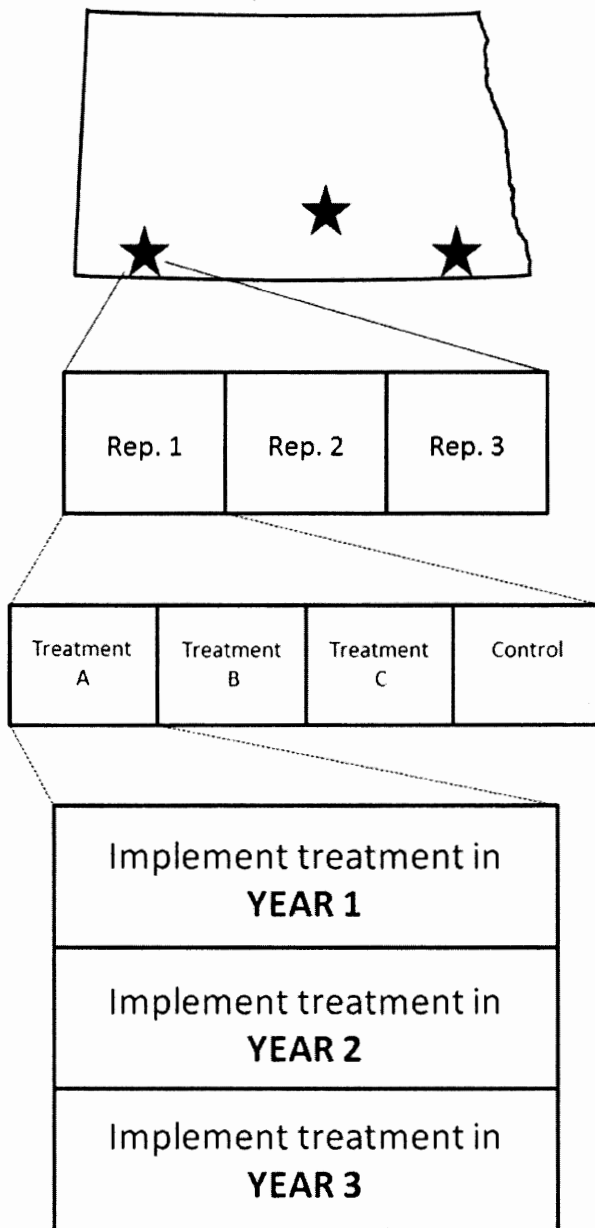


Figure 2. Sample field arrangement for disturbance treatments to increase species diversity and remove decadent vegetation. Each field is divided into 3 sections where the respective treatments are applied to one of the patches annually. CRP fields need not be adjacent to one another, but need to have similar landscape characteristics (size, proximity to water, roads, agriculture etc.). The specific size of field is not critical. However, fields of at least 160 acres are better to ensure adequate sample size of birds and to eliminate treatment edge effects.

Financial Information

X I certify that a project budget will be sent to the Commission

Sustainability –

This project aims to gain vital information on management options to improve wildlife habitat and promote livestock grazing on post-CRP land. Knowledge gained will be distributed and permanently available to interested citizens through the North Dakota State University Extension Service and is not contingent on continuation or supplementation of current funds. Funding for landowners to implement each management option evaluated in this project is currently available through reoccurring NRCS-EQIP or NRCS-CIG grants and is not contingent on future Outdoor Heritage Funds. Additionally, economic analysis of each management option will showcase the implementation costs and anticipated returns with emphasis on minimizing initial costs.

Partial Funding –

This project evaluates management options to improve wildlife habitat and livestock grazing potential on post-CRP land at three locations across North Dakota to maximize the project applicability to local land managers. At each location, treatments are replicated three times to provide reasonable assurance of quality results. To maintain data quality, replications at each location cannot be reduced. However, if less funding is available, we can reduce the number of locations across North Dakota where we conduct the study. This project covers a wide range of soil and weather conditions across the state, each with their own set of opportunities and challenges. Conducting the study in a wide variety of conditions, improves our ability to provide effective management recommendations to a wide audience.

Citations

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Outdoor Heritage Fund Limb and others 2013
Budget Standard Form

Project Expense	OHF Request	Applicant's Match Share (Cash)	Applicant's Match Share (In-Kind)	Applicant's Match Share (Indirect)	Other Project Sponsor's Share
Salaries	\$329,004	\$183,880	\$	\$	\$
Fringe Benefits	\$21,189	\$55,162	\$	\$	\$
Equipment = >\$5,000	\$88,500	\$	\$	\$	\$
Travel	\$212,533	\$	\$	\$	\$
Supplies	\$249,749	\$	\$	\$	\$
Publications	\$7,500	\$	\$	\$	\$
Other Direct Costs	\$105,156	\$	\$	\$	\$
Unrecovered Indirect Costs	\$	\$	\$	\$	\$416,309
Total Project Costs	\$1,013,631	\$239,042	\$0.00	\$	\$416,309

Outdoor Heritage Fund Limb and others 2013 Budget Narrative

Project Title: Management strategies to improve Conservation Reserve Program habitat quality and livestock grazing value

BUDGET NARRATIVE

The project budget begins May 1, 2014 and continues for 4 years (ends May 31, 2018). We used 2013-2014 prices to estimate budgets for 2014 and increased all costs 3% per year to account for inflation. All figures are rounded up to the nearest whole dollar.

Salaries – \$329,004.00

Personnel supported by this project include 2 Graduate Research Associates (GRA) and 6 temporary student workers annually. The GRAs will be hired for the duration of the project and under faculty supervision will implement all field efforts, and assist with data analysis and preparation of deliverables. The GRAs will be paid \$20,000/yr in years 1, 2, 3, and 4 (\$40,000, \$41,200, \$42,436, and \$43,710 respectively). We have also have requested support for 6 temporary student workers annually to assist the GRAs with data collection and data entry. They will be paid \$11.50/hr. Collectively we budgeted \$38,640, \$39,800, \$40,994, and \$42,224 for years 1, 2, 3, and 4.

Fringe Benefits – \$21,189.00

GRA fringe benefits are 3% of the annual salary (\$1,200, \$1,236, \$1,274 and \$1,312 for years 1, 2, 3, and 4). Temporary student workers have a 10% fringe benefit rate (\$3,864 \$3,980, \$4,100, and \$4,223).

Equipment - \$88,500.00

In year 1, 3 ATVs will be purchased (\$8,000/ATV) for transport of equipment and nest dragging at each location. Additionally, 3 Trimble GPS units (1-m accuracy) will be purchased for each location (\$6,500/GPS). To properly implement the prescribed burn treatments, a 4-wheel drive water pump unit will be purchased in year 1 (\$30,000). Additionally, 3 telemetry antennas and receivers will be purchased in year 1 (\$5,000/unit, \$15,000 total)

Travel - \$212,533.00

The travel costs include: 1) Travel (vehicle mileage) to 3 field sites, near Hettinger, Streeter and Oaks North Dakota, for the GRAs, student workers and project PIs for years 1, 2, 3, and 4 are estimated at \$36,200, \$37,286, \$38,405 and \$39,558 respectively; 2) Hotels are not consistently available near each of the respective field sites. Therefore, housing for the field season will be secured in communities near the respective field sites at \$800.00/house/mo. Three months lodging for GRAs and student workers in years 1, 2, 3, and 4 are estimated at \$9,600, \$9,888, \$10,185, and \$10,491 respectively; and 3) Travel for GRAs and PIs to local and regional meetings to present

preliminary and final results in years 1, 2, 3, and 4 are estimated at \$5000, \$5150, \$5,305 and \$5,465 respectively.

Materials and Supplies - \$249,749.00

To implement interseeding treatments, seed will be purchased from local suppliers. There will be 15 acres seeded (10 lbs/acre @ \$18.50/lb) in each replication annually. Seed costs are estimated at \$25,000, \$25,750 and \$26,523 for years 1, 2 and 3 respectively. To identify and follow birds within the study area, telemetry collars (\$200/collar) will be attached to 20 birds in each of our 12 treatment areas in year 1 (\$48,000). We expect to recover 40% of our collars from year 1 and purchase an additional 12 collars/site in year 2 (\$28,800).

Soil and vegetation sampling equipment (flagging, penetrometer, meter sticks, tape measurers, data sheets, field markers, etc.) will be purchased in years 1, 2, 3, and 4 and estimated at \$7,500, \$7,725, \$7,957, and \$8,196. Insect field and lab supplies (alcohol, sweep nets, sample jars, vials, vial boxes etc.) are required in years 1, 2, 3 and 4 and estimated at \$7,500, \$7,725, \$7,957 and \$8,196 respectively. Avian sampling equipment (drag ropes, thermal probes, flagging, binoculars, etc.) will be purchased in years 1, 2, 3, and 4 and budgeted at \$5,000, \$5,150, \$5305, and \$5,465 respectively.

Data entry and analysis equipment (3 laptop computers @ \$2,500 ea and printers @ \$450 ea, hard drives, etc.) will be purchased in year 1 to enter and process data at the remote field locations (\$12,000 total).

Publications - \$7,500.00

Educational brochures about the study and results and management recommendations will be produced and distributed through the North Dakota State University Extension Service in year 4 (\$7,500).

Other Direct Costs - \$105,156.00

Computer software licenses are required for each of the 3 computers to analyze the field and laboratory data and will be purchased in years 1, 2, 3 and 4 @ \$600, \$618, \$637 and \$657/yr respectively. To implement the haying, discing and interseeding treatments, a tractor and equipment will be rented at \$200/hr for 25 hrs in years 1, 2, and 3 (\$5,000, \$5,150 and \$5,305 respectively). We budgeted for maintenance and repair on the off-road pump unit at \$500 and \$515/yr in years 2 and 3 respectively. Miscellaneous maintenance parts and repairs to the telemetry collars will be purchased in year 3 (\$2,000).

Forage quality samples (18/replication/year = 648 samples) in years 1, 2, 3 and 4 will require lab analysis (\$25/sample). We budgeted \$16,200, \$16,686, \$17,187 and \$17,703 for analysis respectively. To better understand the needs of CRP landowners, mail surveys will be conducted in years 1, 2, 3, and 4 (500 surveys @ \$3.00/survey \$1,500, \$1,545, \$1,592 and \$1,649). Workshops throughout the state will be conducted in years 2, 3, and 4 to educate landowners and interested citizens about the study findings. Meeting room rental and food service are budgeted at \$1000, \$1030, and \$2,500 respectively. To keep North Dakota citizens informed during and after the study,

an educational website will be developed and maintained through the NDSU School of Natural Resource Sciences (\$5,591).

Matching Funds – \$655,351.00

PI Limb will serve as the overall project coordinator and the lead on vegetation sampling. PI Geaumont will serve as the field operations coordinator and lead on bird sampling. Both Limb and Geaumont will contribute 10% FTE (salary + 30% fringe benefits) annually for years 1, 2, 3 and 4. coPIs DeKeyser and Norland will serve as leads on interseeding operations, coPI DeSutter will serve as lead on the soil sampling, coPI Harris will oversee the insect sampling, coPI Sedevic and cooperator Dennis Whitted will coordinate efforts to relay the results and recommendations to land managers throughout the state. All coPIs and cooperator will contribute 5% FTE (salary + 30% fringe benefits) annually for years 1, 2, 3, and 4. The collective contribution for each year is \$57,136, \$58,854, \$60,616, and \$62,436 respectively.

North Dakota State University will be providing indirect costs to support this project. NDSU's federally approved indirect cost rate is 45% of modified total direct costs in years 1, 2, 3, and 4 are \$119,387, \$108,085, \$98,882, and \$89,955 respectively.

NDSU NORTH DAKOTA
STATE UNIVERSITY

GRANT APPLICATION TRANSMITTAL

This page indicates university endorsement of the referenced proposal and is intended to be submitted to the sponsor organization.

Sponsor Organization: ND Industrial Commission

Project Title: Management strategies to improve Conservation Reserve Program habitat quality and livestock grazing value

Principal Investigator/ **Ryan Limb**

Department: School of Natural Resource Sciences – Range Program

Project Budget:

Direct Costs	\$1,013,631
F&A	N/A
Total Project	\$1,013,631

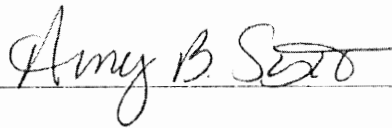
Authorized University Representative: Amy B. Scott

Title: Assistant Director, Sponsored Programs Administration

Address: North Dakota State University
1735 Research Park Drive
Fargo, ND 58105-5756

Phone: (701) 231-8045

Signature:



Date:



Any future notifications regarding this proposal, including award notices, should be directed to the authorized university representative at the address listed above.

Thank you.

SPONSORED PROGRAMS ADMINISTRATION

NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.8045 | Fax 701.231.8098 | ndsuh.research@ndsuh.edu

Shipping address: Research 1, 1735 NDSU Research Park Drive, Fargo, ND 58102



Keith Trego
Executive Director

1605 East Capitol Avenue, Ste. 101

Bismarck, ND 58501-2102

(701) 223-8501

FAX: (701) 223-6937

November 25, 2013

North Dakota Industrial Commission
ATTN: Outdoor Heritage Fund Program
State Capitol - Fourteenth Floor
600 East Boulevard Ave, Dept 405
Bismarck, ND 58505

Dear Grant Review Committee:

The North Dakota Natural Resources Trust (Trust) is providing our support for the research project "Management strategies to improve Conservation Reserve Program habitat quality and livestock grazing value" by Limb and others from the School of Natural Resources at NDSU. The Trust supports research of effective management practices that both improve grassland diversity and assist private landowners in improving CRP fields for livestock grazing. This research is very complimentary of our efforts to maintain areas of grasslands and wetlands in the Working Lands Partnership.

CRP fields can provide critical habitat for numerous wildlife species. However, each year more and more acres are converted back to row-crop agriculture. Finding realistic opportunities to transition post-CRP fields to livestock use by maintaining grassland cover is imperative. Several obstacles persist in maintaining cover on CRP fields after contracts expire. Livestock grazing could provide an economic base and are highly compatible with bird habitat. However, producers are concerned about grazing CRP fields due to the low quality forage.

The research proposed would aid in maintaining CRP as grassland cover after contracts expire in two ways. First, it addresses key questions about economical ways to improve the livestock grazing potential of these fields. Second, it seeks ways to improve the bird habitat quality of post-CRP fields.

Sincerely,

A handwritten signature in black ink, appearing to read "Keith Trego". The signature is fluid and cursive, written over a light grey background.

Keith Trego