

Business Plan

Conserving and Restoring Tallgrass Prairie

Prairie Coteau, South Dakota and Minnesota

Draft

April 30, 2010

What is a business plan?

Each of the Foundation's keystone business plans has its own unique structure that reflects the conservation problem and the needs of the community working to solve that problem. However, each plan has four elements at its core:

Impact: A concrete description of the outcomes to which the Foundation and grantees will hold ourselves accountable.

Strategic priorities: The specific activities that must take place and have a cause-and-effect connection with the impact we are trying to achieve.

Resource implications: An analysis of the financial, human and organizational resources needed to carry out these activities.

Performance measures: Quantitative outputs and outcomes and a timeline for achieving them that make it possible to measure success and make it possible to adaptively revise strategies in the face of underperformance.

The strategies and activities discussed in this plan do not represent the Foundation's view of the actions necessary to achieve the identified conservation goals. Rather, this document reflects the consensus or majority view of the many federal, state, academic or organization experts that we consulted with during plan development.

The plan is also meant to be inclusive of others' conservation strategies by recognizing and discussing many of the ongoing investments that any party is making and that have a strong connection to achieving identified conservation goals. Some of these actions are already completed, are ongoing and being implemented by others, or are still to be implemented but unlikely to be supported by the Foundation. Nevertheless, this plan tries to at least briefly describe them because experts have indicated that they are critical to achieving the goals of this plan.

EXECUTIVE SUMMARY

Tallgrass prairie grasslands once covered more than 140 million acres of the American Great Plains, stretching as an almost unbroken sea of grass from Texas to Canada. More than 96 percent of this prairie has been converted to cropland or other less diverse vegetation.

Centered in South Dakota, stretching into Minnesota, and just touching North Dakota and Iowa, the Prairie Coteau is one of last great tallgrass prairies remaining in the United States. This eight million acre landscape contains more than 1.4 million acres of prairie that has never been plowed and planted with crops and contains thousands of small glaciated wetlands at a density and abundance that is unparalleled throughout the tallgrass prairie region. The Coteau stands apart from all other tallgrass prairies in the northern Great Plains in having roughly 17 percent of original cover intact – more than an order of magnitude above the rest of the Northern Tallgrass Prairie Region.

The Prairie Coteau is a conservation priority because it is a last large remnant of tallgrass prairie and supports the diverse species unique to this habitat including waterbirds, Topeka shiner, western prairie fringed orchid, Dakota skipper and Poweshiek skipper butterflies, and a host of other species. These species and the prairies themselves are declining and imperiled by a host of threats, but most especially by the conversion of remaining prairie to row crops, by inappropriate grazing regimes that diminish native diversity, by numerous and aggressive invasive species, and by an absence of disturbances like fire which helped maintain the grassland and a heterogeneous set of habitats in which wildlife could thrive.

This business plan maps out a 10 year plan to restore, manage and conserve tallgrass prairie in the Prairie Coteau. This business plan will also guide every aspect of the Foundation's anticipated \$9 million in grant-making associated with this habitat over 10 years. Ultimately we hope that the strategy and activities described herein are adopted by the broader community of agencies and organizations working on the same goals and responsible for the additional \$120-130 million or more of investments identified as necessary to protect and restore tallgrass prairie systems. The Foundation's resources will be focused on the following overarching strategies:

Protecting native prairies. High-value prairies are still being plowed and converted to crop fields at a rapid rate. Activity - Expand support for permanent easement and acquisition activities that secure 100,000 acres of additional grassland and wetland in areas with the highest biological values and connectivity to other protected grasslands within 10 years.

Restoring prairie landscapes. Even if all of the native prairie is protected, prairie systems will not be viable in many areas of the Coteau. Large areas of contiguous grassland are needed to maintain viable populations of many prairie animals and to provide ecosystem services such as water purification, flood retention, soil building, and carbon sequestration. Activity – Buffer and connect native prairie remnants with restored grasslands that establish prairie landscapes of at least 20,000 acres.

Promoting prairie-based agriculture. The recreation of prairie landscapes would be prohibitively expensive if funded solely through conservation sources both public and private. Furthermore, restoration will lack political support unless local communities and rural families benefit economically. The solution to these obstacles is to change local economics in a way that prairie-based agriculture generates a greater economic return than the alternative of marginal row-crop agriculture. Activity – Test and promote innovate prairie-based economic ventures such as grass banks, prairie landscape grazing cooperatives, prairie beef, and a native seed market derived from harvesting seed from native prairies.

Developing prairie grass bioenergy markets. Conversion of prairies to cropland occurs because markets and subsidies provide a higher economic return to landowners from crop farming than grass farming.

Expansion of gasifiers and other biomass-to-energy facilities may result in a market for wildlife-friendly native prairie grass production which improves economic returns associated with grasslands. Activity – Support planning, Best Management Practice development, outreach and market development that result in sustainable grass-to-biomass contracts on at least 20,000 acres of private prairie and planted grasslands (e.g., CRP) that buffer and connect important native prairies within 10 years.

Returning ecological fire to native grasslands. Prairie Coteau grasslands evolved and thrived under a regular regime of natural wildfire that eliminated woody vegetation and released nutrients in native sod. Since the early 1900s, fire has been suppressed leaving more homogeneous grasslands that provide habitat for lower densities and fewer species of at-risk wildlife. Activity – Implement at least 12,000 acres/year of burning, on both private and public lands within 10 years.

Grazing land management. Nearly all remaining private grasslands are grazed season-long with moderate-to-heavy intensity stocking densities leaving more homogeneous grasslands that are less diverse, more susceptible to weed invasion, and more prone to erosion. Activity – Work directly with landowners to expand and/or incentivize similarly profitable grazing management practices that improve wildlife habitat on an additional 30,000 acres within 10 years.

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Conservation Need

Dominated by big bluestem, little bluestem, Indian grass, and switchgrass, the tallgrass prairie once comprised an estimated 142 million acres of land cover in the central United States. Less than 4 percent of original native prairie remains today. In South Dakota and adjacent areas in Minnesota, however, approximately 1.4 million acres of this most-endangered habitat survives in the Prairie Coteau – a rolling plateau that rises 200 feet above the prairie plains. Along with the Flint Hills tallgrass prairie of Kansas, this is one of the last two vast expanses of tallgrass prairie left in North America.

On the South Dakota side of the Prairie Coteau large areas of prairie remain. There are five areas that contain more than 20,000 contiguous acres of prairie each. The situation is very different in Minnesota. The conversion of prairie to cropland is much more complete and only about 29,000 acres of native prairie remain of the approximately 2,827,772 that were once found in the Minnesota portion of the Prairie Coteau. The culture of prairie management also differs in the two states. Ranching is a major component of the economy in South Dakota and grazing management of even public prairie is the accepted norm. In Minnesota where farming is dominant, grazing as a conservation management tool is not widely accepted.

Even in the South Dakota portion of the Coteau where relatively large amounts of prairie remain, most of the tallgrass prairie has been converted to cropland in the past 150 years. The remaining grasslands of the Prairie Coteau are intact largely because of topographic relief, wet conditions, and rocky soils, all which reduce the desirability for plowing. However, the technology of conversion is continuing to improve. Large-scale rock pickers, improved drainage tile techniques, and drought resistant crop varieties allow farming in places where it would not have been practical in the past. Recent research shows that remaining grasslands in the Dakotas are being lost at a rate of approximately 2 percent per year. This figure is even higher when the plowing of restored low-diversity grasslands formerly enrolled in the Conservation Reserve Program (CRP) is included.

Because of the differences in the extent and distribution of prairie in South Dakota and Minnesota, different conservation approaches are needed in the two states. The prairie in South Dakota needs additional protection and better management practices. In Minnesota, the restoration of large contiguous prairie landscapes is needed to maintain and create viable native prairie communities and animal populations. In both states, the needed conservation actions must take place in harmony with the development of sustainable “grass-based” local economies.

The Coteau, with its close proximity to major urban centers including Sioux Falls, Watertown, and Brookings in South Dakota, and Marshall and Minneapolis in Minnesota, is heavily used by hunters in the fall. The grasslands and wetlands provide habitat and hunting land that produces an abundance of the ducks, geese, and pheasant favored by area hunters. The autumnal influx of hunters provides a diversifier to a local economy that is otherwise almost completely dependent upon the vagaries of agriculture.

Topography within the Prairie Coteau adds diversity including extensive areas of both mesic tallgrass in the valleys and dry upland prairies. This landform, with its relatively large blocks of intact grassland in South Dakota and the possibility for large-scale restoration in Minnesota, provides the potential for long-term sustainability of populations of unique prairie species and grassland communities. The Prairie Coteau contains a diversity and density of temporary, seasonal, semi-permanent and permanent wetlands that greatly exceeds that of any other remaining tallgrass region. The density of semi-permanent and permanent wetlands provide a reliable refuge for wildlife during drought years and may give this landscape enhanced resilience in the face of higher temperatures and lower precipitation that could occur through climate change in the next 50 years.

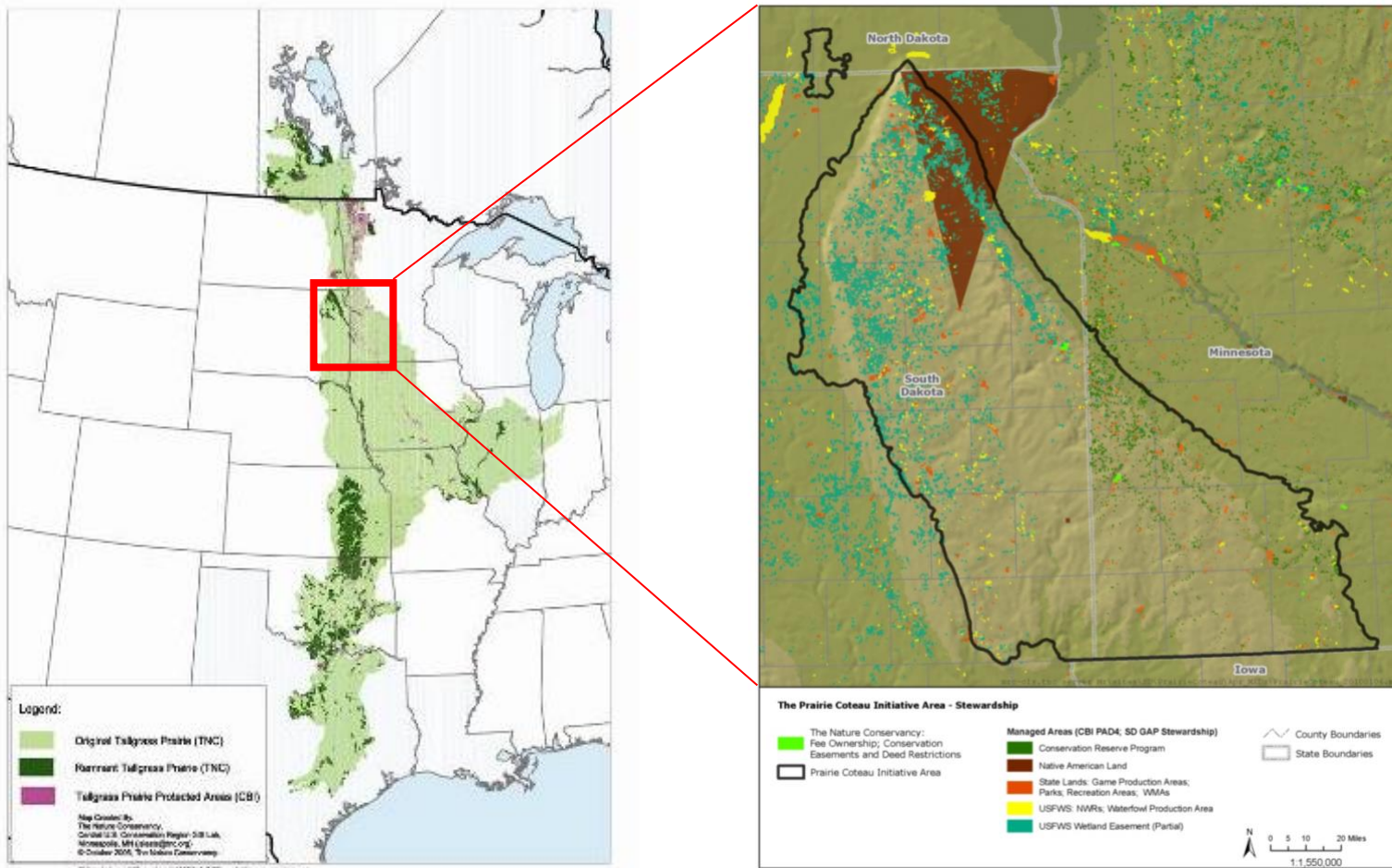
Because the Prairie Coteau is a relatively vast region of close to 2.3 million acres of native prairie and planted grassland, it is a stronghold for several species that depend upon northern tallgrass prairie for their survival. Two examples are the near endangered Dakota skipper and Poweshiek skipperling butterflies that are a target of this plan. Some of the most viable remaining populations of the threatened Topeka shiner are found in streams originating on the slopes of the Coteau and are significantly affected by the loss of prairie. For many other species, the grassland habitat found in the Coteau is one of the key geographic priorities for conservation action to secure their future population viability. These species include the western prairie fringed orchid and a suite of declining grassland and wetland birds like the grasshopper sparrow, western meadowlark, marbled godwit and Wilson's phalarope and waterfowl such as mallard, blue-winged teal, northern shoveller, and gadwall which have significant populations in the Coteau. Another important conservation goal in the Prairie Coteau would be the restoration of two species of prairie grouse that are now largely gone from the Coteau. The numbers of Greater Prairie Chicken and Sharp-tailed Grouse could be increased in South Dakota and re-established in Minnesota if prairie landscapes were restored.

The Prairie Coteau is also important for another reason, the high productivity of its grasslands resulting from fertile soils and abundant precipitation. In conjunction with their relative proximity to population centers and other energy-demanding services to the east, this creates an opportunity to help preserve prairie through a new tool – native grass biofuels – that also conserves soil carbon and reduces greenhouse gas emissions. New technologies already in use within a couple hundred miles of the Coteau offer great promise for this strategy that can use market forces to foster grassland conservation.

The future of native grasslands in the Prairie Coteau is at risk, especially given the devastating losses to date. Several major threats to the tallgrass prairies of the Coteau today are:

1. Conversion of grasslands to annual row crops is eliminating approximately 15,000 acres of prairie/year (2% loss annually).
2. Fragmentation of prairie landscapes is significant. Not only is there less prairie, what is left in many parts of the Prairie Coteau occur as scattered remnants.
3. Degradation and homogenization of prairie is occurring because of several factors:
 - a. The absence of fire. Once a vital natural disturbance, fire prevented woody plants from taking over grasslands and maintained a diversity of grassland microhabitats essential for many wildlife species and grassland plants. Today it is largely suppressed. The absence of fire is perpetuated by fear, roads, fragmented land ownership, and lack of knowledge of how to manage grassland with fire.
 - b. Uniformity of grazing practices and incompatible grazing practices. The majority of Coteau grasslands are managed under season-long, moderate- to heavy-stocking density that maintains a relatively uniform, low grass height and leaves relatively little 'tallgrass' habitat that is important for many wildlife species and prairie plants. Overstocking of cattle also results in loss of native plant diversity, increased potential for erosion, and increased susceptibility to invasive species.
 - c. Invasive weeds are becoming increasingly common in many native prairies and their increase in abundance is being partially driven by lack of fire and uniformity of grazing. Sometimes, landowners implement control via broadcast application of herbicides - itself is a threat because it reduces native forb diversity which is an essential habitat component for many prairie invertebrates.

Figure 1. a) Of 140 million acres of tallgrass prairie that once existed in the United States and Canada, less than 4 percent remains. The Prairie Coteau of South Dakota and Minnesota – containing over 1.4 million acres of native tallgrass prairie – is one of only three areas of extensive tallgrass prairie that remains in the United States. **b)** Most land in the Prairie Coteau is private land or tribal land (SD); approximately 529,000 acres of prairie, grassland, and wetlands in South Dakota and 131,000 in Minnesota have been protected through easements or are owned or managed by state agencies or the U.S. Fish and Wildlife Service. Extensive acres of CRP also occur.



Conservation Outcomes

The Prairie Coteau is approximately 8.3 million acres in size. Of approximately 2.3 million acres of grassland (native prairie plus planted grassland) that remain in the Prairie Coteau (27.7% of the overall landform), 1.4 million acres of untilled tallgrass prairie (17.4% of landscape) were present in 2001. Another 703,000 acres (8.5%) of the landscape is covered by wetlands including 197,000 acres of temporary and seasonal wetland (many of which are cropped), 282,000 acres of semi-permanent wetland and 210,000 acres of permanent wetlands associated with lakes and ponds.

At least 262,000 acres of the untilled prairie (18%) are protected with federal or state grassland easements and if we assume a 50:50 mix of prairie:wetland on conservation lands owned in fee title (265,000 acres), an estimated 27 percent of the untilled grassland in the Prairie Coteau are protected. An additional 136,169 acres of wetlands and grassland buffer (19% of the wetlands) are protected with easements. With the same 50:50 mix of prairie:wetland on fee title conservation lands, an estimated 38 percent of the wetland is protected.

We expect that full implementation of the strategies of land protection, grassland management and restoration, grass-to-fuel energy expansion and grazing practice implementation described in this plan will have the following outputs by year 10:

- Implementing at least 12,000 acres/year of prescribing burning and invasive species control.
- Expanding the use of beneficial grazing management practices on 30,000 acres.
- Redirecting grass production from at least 20,000 acres of low value and planted grasslands to biomass feedstock production per year.
- Securing easement or fee title protection for at least 69,000 acres of the highest value prairies.
- Securing easement or fee title acquisition for 24,000 acres of marginal cropland and restoring them to diverse grasslands.

Based on this, we estimate the following benefits for wildlife populations over 10-20 years:

Prairie butterflies

Dakota skipper: Approximately 50 percent of the known populations of this butterfly occur on the Coteau. The goal for this species is to arrest an estimated 2% annual decline and allow the species to increase its known occupancy of habitat by 5% per year on average over 10 years, resulting in 40 of 65 occupied sites within the Coteau becoming viable populations.

Poweshiek skipperling: Approximately 30 known populations of the butterfly occur on the Coteau. Too little is known about the species to estimate population goals and thus the potential successes of this initiative, but experts believe it will be possible to secure viability for at least 25 percent of Coteau populations in 10 years.

Regal fritillary: This butterfly has been extirpated from about 40% of its range and is now largely restricted to the eastern Great Plains. Because the Coteau has retained more grassland than most of the agricultural Midwest, a relatively high number of populations of this species are found there. However, there is concern that the species may be under threat in the Coteau for the same reasons that have caused its decline over most of its range: prairie conversion and fragmentation, inappropriate prairie management (especially excessive prescribed burning), and impacts to violets, its larval host plant. The goal of this initiative is to create larger blocks of grasslands with high numbers of violets in Minnesota and to develop management plans favoring the fritillaries in South Dakota.

Western prairie fringed orchid: Thirty-one of the approximately 172 rangewide occurrences of the endangered orchid occur on the Prairie Coteau. However, these 31 occurrences represent only three populations: two in Rock County and one in Pipestone County, MN. There are two historical records from the South Dakota portion of the Coteau and many botanists feel this orchid is no longer extant in the state. However, there are large populations just to the north of the Coteau in the Sheyenne Delta of

North Dakota. The viability of orchid populations have been impacted by prairie conversion, heavy grazing, timing of haying and burning that prevents seed set, drainage that dries the wet-mesic habitat of the orchid, and disruption of orchid's hawkmoth pollinator populations. Seed set has been low in Minnesota populations indicating pollination failure. To rebuild orchid viability in the Prairie Coteau, either new populations must be found or established. The hand pollinating of flowers and hand sowing of seed has had limited success with a closely related species and might be attempted with the Western prairie fringed orchid. The goal of this initiative is to ensure the protection and proper management of the existing population while adding three new populations through either discovery or facilitated movement.

Topeka shiner: Approximately 30 stream segments originating in the Prairie Coteau are known to currently harbor this federally-listed fish. The species is subject to a state management plan in South Dakota and a federal critical habitat designation in Minnesota. The goal of this initiative will be to support the relevant management plans and move towards attainment of the established population indices.

Prairie Grouse: Greater prairie chicken and Sharp-tailed Grouse: Both species were once common in the Prairie Coteau. Although, prairie chickens still exist in the South Dakota portion of the Coteau their numbers are low and have declined by 50% in the past 40 years, according to the Breeding Bird Survey. Protection of critical habitat and enhancement provided by better burning and grazing should increase the population by 20% each in 10 years. Viable populations of prairie chickens require large areas of treeless grassland. As suitable habitat is created in Minnesota, prairie chicken populations can be established there as well. Just east of the Coteau along the Lac Qui Parle and Upper Minnesota River Valleys, a small but fairly stable population has been re-established in the last twenty years. The goal of this initiative for Minnesota should be to re-establish at least two populations of chickens. Sharp-tailed grouse are not uncommon in the Upper Minnesota River Valley region. Sharp-tailed grouse can also be found in the Coteau especially at the northern end. The grouse's preferred habitat of mixed grassland, brushland and open woods is largely missing from the Minnesota portion of the Coteau and the southern end of South Dakota's portion. Further study is needed to determine if sharp-tailed grouse populations can be expanded to the south and east. The goal for now should be to maintain and expand the viability of the existing populations via appropriate management planning.

Grassland birds: The North American Breeding Bird Survey has been estimating population trends of American bird species since 1967. Over that period of time, grassland nesting birds have shown the greatest decline of any group of species. Five species of grassland birds that were thought to be the most threatened in the Prairie Coteau were chosen to represent the trends and serve as indicators of success as conservation strategies are implemented. The following table lists the percentage change of these species from 1966-2007 within the entire states of South Dakota and Minnesota and for the overall survey area in North America. Bold values indicate significance at the $p < .05$ level.

Percent Change per Year	South Dakota	Minnesota	Continental
<i>Grasshopper sparrow</i>	-4.4	-7.4	-3.6
<i>Western meadowlark</i>	0	-7.0	-0.9
<i>Bobolink</i>	2.1	-0.4	-1.8
<i>Dickcissel</i>	-1.7	-4.2	-0.2
<i>Upland Sandpiper</i>	0.9	-1.0	0.4

These results indicate a significant population decline at the continental level for three of the species and non-significant results for the other two. As might be expected, these grassland birds seem to be doing more poorly in Minnesota where little native prairie remains than in South Dakota where more expansive areas of grassland remain. We don't have reliable estimates for the population trends of these birds in just the Prairie Coteau, but future monitoring could provide those results.

A modeling system operated by U.S. Fish and Wildlife Service Prairie Pothole Joint Venture staff allows them to predict waterfowl, shorebird and grassland bird response to prairie protection and habitat activities. For grassland birds, we base our estimates of the benefits that implementation of this plan would provide runs of that model. Our outcomes are the percent of the regional population goal maintained or increased through this plan. The region for which the goals apply is the broad grassland region that covers Bird Conservation Regions stretching from southern Alberta to Ontario and south through the tallgrass and mixed grass prairie Conservation Regions to Oklahoma.

<i>Grasshopper sparrow:</i>	5.3% (26,600 birds)
<i>Western meadowlark:</i>	4.2% (19,800 birds)
<i>Bobolink:</i>	0.8% (15,900 birds)
<i>Dickcissel:</i>	0.7% (1,600 birds)
<i>Upland Sandpiper</i>	Models are not yet available

Wetland birds: In comparison to grassland nesting birds, wetland birds appear to have done somewhat better in the Great Plains during the period of 1966-2007. Data from the Breeding Bird Survey for five key Prairie Coteau species nesting in wetland habitats show that three had population declines in Minnesota but only one in South Dakota; however, none of these changes were significant at the .05 level. The lack of significance is likely due to the low number of survey routes that detected these species. In contrast, two species, the white pelican and sedge wren, recorded positive growth. The goal of this plan will be to at least stabilize declining wetland bird populations in the Prairie Coteau.

Percent Change per Year	South Dakota	Minnesota	Continental
<i>Marbled godwit</i>	3.2	-4.8	-0.9
<i>White pelican</i>	10.5	10.4	2.3
<i>Black tern</i>	-5.2	-3.9	-2.1
<i>Wilson's phalarope</i>	-4.1	-14.2	0.4
<i>Sedge wren</i>	4.9	1.7	1.5

Waterfowl benefits: Prairie Pothole Joint Venture models suggest that 300,000 acres of grassland and wetland protection in the Coteau would ensure that an estimated 930,000 mallard, shoveller, blue-winged teal and gadwall ducks join the central flyway waterfowl population over 20 years. However, this assumes that all acres protected would otherwise have been converted. A more conservative estimate is that approximately 150,000 acres (2%/year) would be converted if unprotected so the range of the estimated benefit for waterfowl is 465,000-930,000 ducks/20 years. If protection efforts are not focused to target core areas with relatively high protection and little fragmentation and areas with highest potential densities of seasonal and temporary wetlands, the benefits could be 50 percent lower.

Climate and Water

The eastern edge of the Great Plains has been one of the most dynamic environments on the continent for the last ten thousand years. During that time, the Prairie Coteau has been part of the transition area between the grassland and deciduous forest biomes. Depending on climatic conditions and the frequency of fire, grassland or woodland could dominate the area. This dynamic tension makes the area particularly sensitive to climate changes. An ensemble of sixteen different climate models predicts that temperatures will rise about three degrees Celsius over the next fifty years in the Prairie Coteau. Over the last 100 years, weather stations in the northern Great Plains have shown a pattern of drier conditions in the west and relatively wetter conditions in the east where the Prairie Coteau lies. If this pattern of warmer and relatively wetter climate change continues, the Coteau will play an increasing role in maintaining the regions reputation as North America's "duck factory". As wetlands dry to the west a greater proportion of the breeding duck populations will be forced to the east. Deep wetlands and shallow lakes will be especially important in the Coteau because they will be the shallow duck brood wetlands of the future.

Climate change is also important because the climate of a region drives its hydrology. Water is a limited resource in the Prairie Coteau and both surface and groundwater supplies could be under increasing demand in the future. Prairie wetlands play a key role in storing surface water and recharging groundwater. There is little likelihood of building more dams to store water in the Prairie Coteau because the relatively flat terrain offers few good sites for large-scale storage and because it is an expensive solution to a water management problem. On the other hand, the restoration of prairie wetlands can be a relatively inexpensive option to storing more water on the landscape for groundwater recharge and future surface use while having an added benefit of retaining flood waters. In the future, new partners such as the Army Corps of Engineers, municipalities, watershed districts, and others may be very interested in prairie wetland conservation and could be an effective force for the restoration and protection of prairie wetland systems.

Economic Drivers: Prairie-based Agriculture

As much as many conservationists would like to see large-scale prairie reserves scattered across the Prairie Coteau, there is neither the funding nor the political will to take large areas out of agricultural production to create large public natural areas. The only real hope to restoring or maintaining large-scale prairie systems is to change the economic equation on private lands to favor grass-based agriculture over marginal row-crop farming.

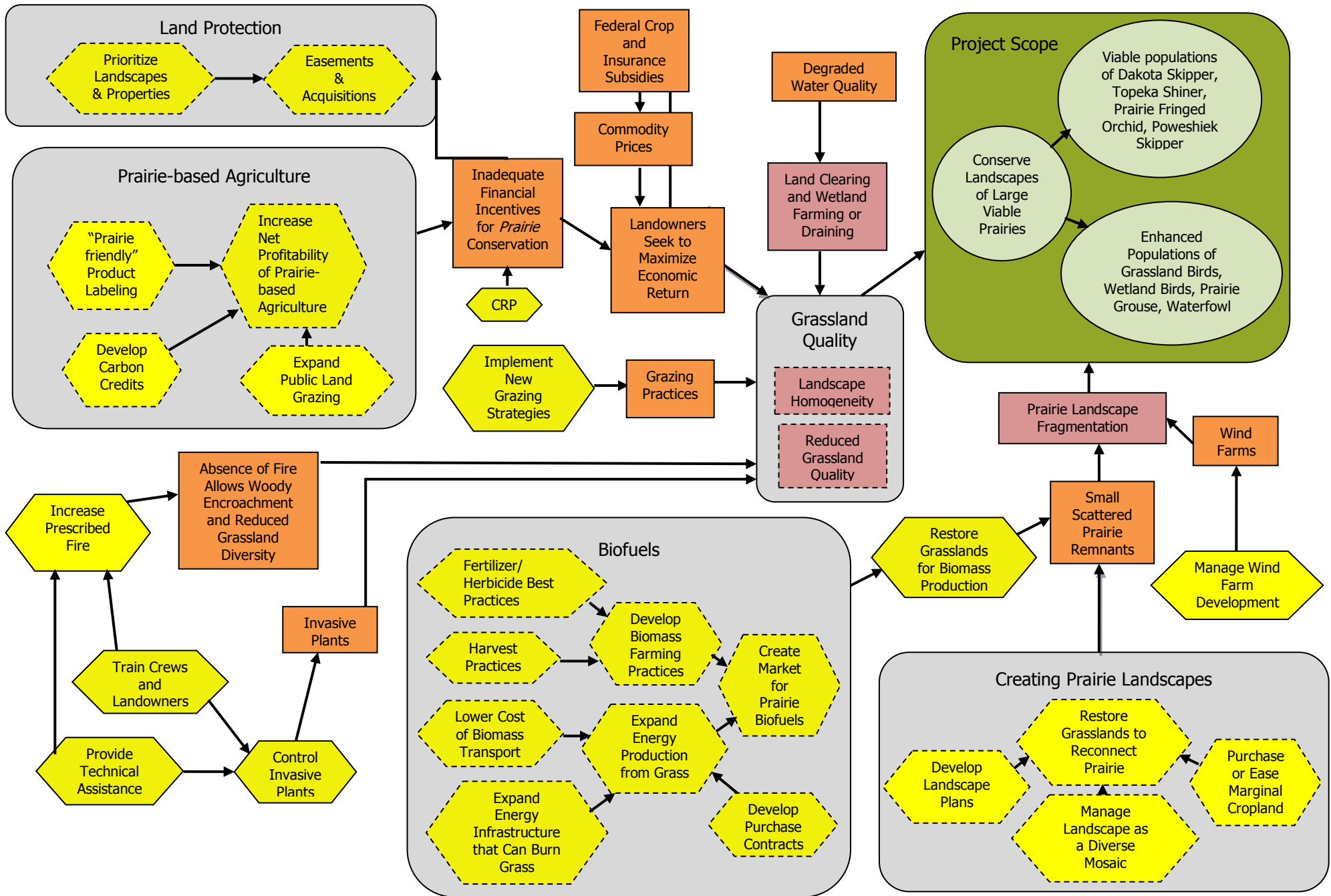
In areas of the world where native grasslands have survived, it is because local residents can earn a greater return from grazing large animals or other uses of grass than they can by converting and farming the land. As the economic return of agricultural crops rises there is increasing pressure to convert existing grasslands to crops. However, the process will also run in reverse if more can be gained by restoring marginal farmland to prairie than continuing marginal row-crop agriculture.

To expand prairie-based agriculture in the Coteau, there will have to be a change in the economics for any given piece of property such that the economic return from grazing, haying, or native-seed production will be greater than for row-crop farming. Federal and/or state government could provide direct annual subsidies to accomplish this, but budgets are already strained and an expensive new program is unlikely in the current economic climate. A more promising approach would be to use available funding to purchase easements or fee title of prairie to protect existing native prairies or in places where prairie is largely gone to buy or ease marginal crop land and restore it back to grassland. If the restored prairie lands were purchased in fee title by public agencies, they could then be leased out to private ranchers or hayers at rates that would be sufficient to cover taxes and management costs but still be low enough to provide an incentive to expand existing grazing operations or create new ones. The incentive for grazing could be increased by developing programs that would pay ranchers a premium for producing organic, grass-fed "prairie beef".

The reason the conversion back to prairie might work economically is the infusion of public or private conservation money. These funds would largely pay for restoration of prairie, development of infrastructure such as fencing and water sources, as well as the cost of land itself. These upfront capital costs are a major barrier for new ranchers or hayers to getting into the business or existing operations from expanding their operations.

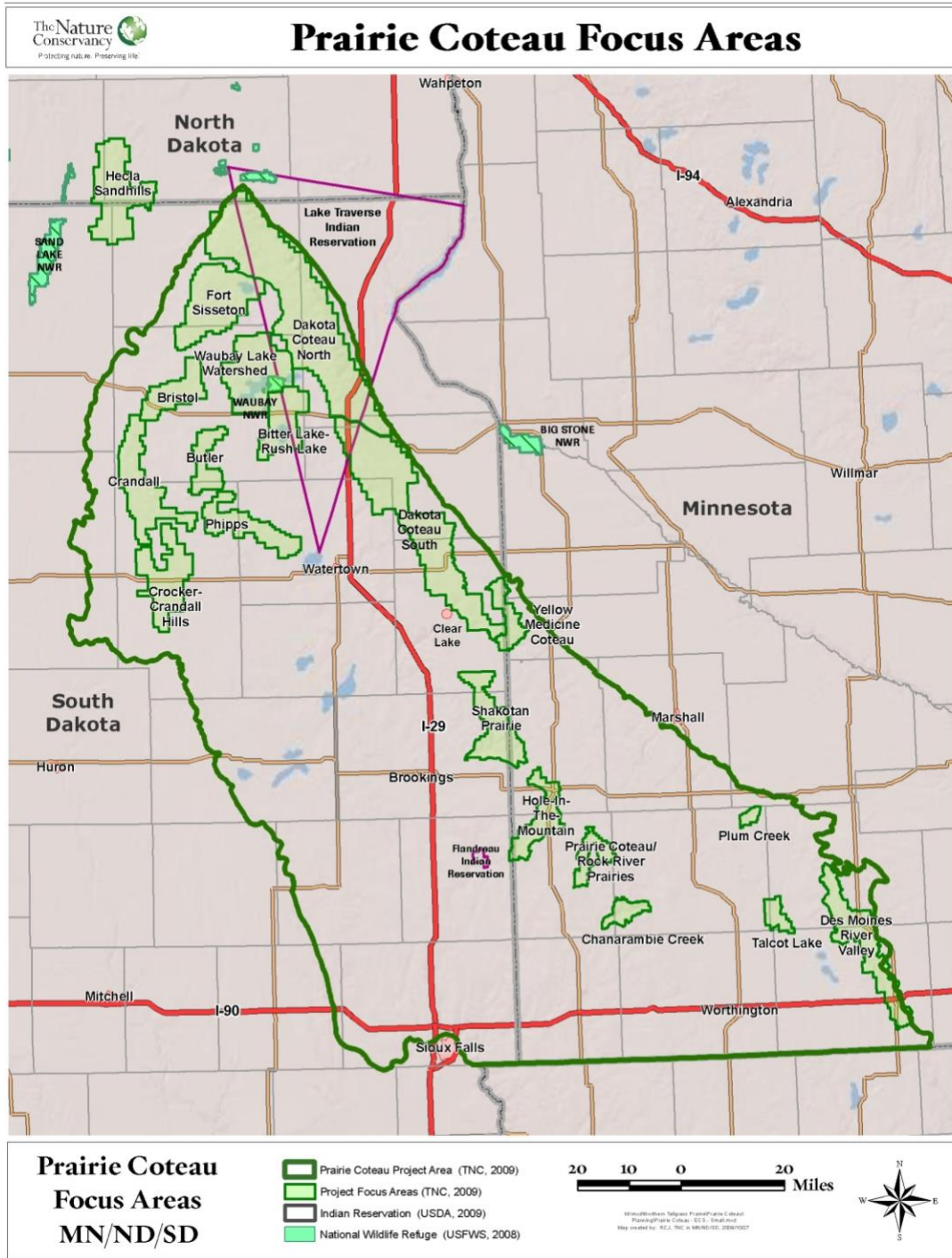
Logic Framework

A logic framework is a diagram of a set of relationships between certain factors believed to impact or lead to a conservation target (species representing Keystone Initiatives). Logic frameworks are typically composed of several chains of logic whose arrows are read as "if-then" statements to help better understand how threats contribute to conservation target declines. Logic frameworks are used to define the conservation problem, assess limiting factors, and prioritize key strategies.



Focus Areas (Prairie Landscapes)

Different strategies to protect the ecosystems and species of the Prairie Coteau are not necessarily most effective at the same spatial scale. In some cases such as public education, the strategies can be targeted at the entire Coteau. However, many other strategies will be most effective if they are applied in a more focused fashion geographically. By targeting areas of high concentrations of native prairie we can work closely with individual landowners within the most important sites for prairie conservation.



Another reason for targeting conservation efforts within focus areas relates to the importance of size in maintaining the functioning of prairie systems. Many ecological processes such as nutrient cycling, disturbance regimes, and population dynamics operate at large spatial scales. In particular the maintenance of viable populations of many prairie animal species requires tens of thousands of acres of appropriate habitat. If we want to maintain and enhance these species and processes, we will need to influence how a substantial proportion of the land within areas at this scale is managed. Conservation results covering thousands of acres are much more likely if activities are focused in a few places than if they are randomly scattered over wide areas.

The individual focus areas were delineated in a multiple step fashion. In the Minnesota portion of the Prairie Coteau, initial boundaries were identified by the Minnesota County Biological Survey of the Minnesota Department of Natural Resources. Lines were drawn such that concentrations of native prairie were captured within the identified polygons. These polygons were then refined with information from the USFWS Habitat and Population Evaluation Team (HAPET) Office Fergus Falls to capture more habitat essential to waterfowl and select grassland birds. In South Dakota, the Bismarck HAPET office identified the boundaries of the focus areas based on modeling of waterfowl and grassland birds. The boundaries of all the focus areas were further adjusted to better reflect watershed boundaries and capture additional grassland and rare species occurrences.

Implementation Plan

The following strategies address the most important threats that currently face these wildlife species and the tallgrass prairies of the Prairie Coteau. The strategies and outputs described are intended to take place over 10 years. Although additional threats affect these species and prairie, the group of experts who helped develop this plan prioritized threats and the emphasis of this plan is on the highest priority threats. There are rough 10-year budget numbers assigned to some of the activities herein. If there is no budget next to an activity that activity is not clearly identified as required in order to achieve the biological impact described above (however in some circumstances, those activities are necessary but are already covered through other agency budgets or staff time).

Addressing Threat 1- Conversion of Prairie and Grasslands

The conversion of prairie, grasslands, and wetlands into row crop agricultural has been occurring since this region of Minnesota and South Dakota were first settled by Europeans in the nineteenth century. New technologies have continually been developed that allow more land to be converted than were possible in earlier generations. Large-scale drainage of wetlands has grown with time as the technology of drain tiles and fields has developed. Rocky soils are increasingly subject to conversion as rock removal and "rockpicker" technology has grown more efficient. Larger farm equipment means more soil can be moved to help level fields. All of this conversion has been driven by the price of commodity crops, particularly corn and soybeans. The prices are driven in part by U.S. Farm Policy but also by market demand such as occurred when a growing ethanol industry required large amounts of corn. When commodity prices are high, as they were in 2006 to 2008, there is strong pressure to convert grassland to crop land and to remove land from conservation programs to place it back in production.

Other long term drivers of conversion are scientific advances such as the increasing drought resistance now available in many commodity crop varieties. Corn and soybeans can be grown in drier conditions than they could just a few decades ago allowing dryland production to move further west into what was once solely cattle country. Tax policy has also helped drive the conversion of prairie. The South Dakota Legislature recently passed a law requiring the assessment of all potential farmland at its highest and best use, i.e. as actual crop land. The resulting higher tax assessment on some rangeland is forcing landowners to look for higher returns from their property.

Strategy 1 —→ Protect native prairie through voluntary easements

Many landowners running cattle operations in the Prairie Coteau are willing to partner with government or non-government partners who offer to provide a payment to guarantee that wildlife benefits provided by a private property are not plowed up in the future. This payment does not directly make the agricultural operation more profitable in and of itself but provides a sufficient additional new one-time source of income for landowners that it is very attractive to landowners. Indirectly, when the payment is coupled with conservation programs and cost-share options for improved grazing systems, the easement program can indeed equate to more sustainable and more profitable grazing operations.

The Foundation is potentially able to fund only a small portion of this demand, but the goal of this plan is for other partners to cover sufficient easement costs to allow an additional 300,000 acres to be protected over 10 years, bringing about 40 percent of remaining untilled prairie in the area under permanent legal protection preventing conversion.

Activity 1 Assess high priority grassland landscapes - \$40,000

Given a base of more than 500,000 acres of unprotected native prairie remaining which is being lost at a rate of approximately 2 percent (10,000 acres) per year, it is essential to prioritize future investments in landowner outreach and easement acquisition. Priority needs to be given to gaps

in landscapes that already have a high degree of protection and to secure or improve the viability of high priority wildlife species. Information on the current distribution of species and where they are restorable has not been fully analyzed but it needs to be to set geographic priorities for protection.

Activity 2 Expand outreach efforts in high priority prairie conservation areas - \$400,000

Not all grasslands are of equal value – some host Dakota skipper or Powesheik skipperling populations, some have high densities of temporary and seasonal wetlands that are most important for waterfowl production, others are important because they prevent future fragmentation of already protected grasslands. A decision matrix strategy within the framework of available easements has been developed to identify high priority ownerships for outreach and possible conservation. As Activity 3 (below) is expanded, it will be important to support additional landowner outreach to expand enrollments in the grassland regions that are of highest value for the wildlife targeted through this plan.

Activity 3 Fund existing easement backlog and expand easement acquisition - \$36 million

At present the U.S. Fish and Wildlife Service Wildlife Management Districts that manage the Coteau landscape in South Dakota (Madison and Waubay WMDs) have a backlog of 260 landowners wanting to sell 50,000 acres of easements to the agency. On average, grassland easements in South Dakota cost \$400 per acre and wetland easements cost \$550 per acre (and are more expensive because they are often cropped wetlands). USFWS and other programs that can protect grasslands and wetlands need to be expanded in the Coteau to achieve this goal. One problem with utilizing federal funds to purchase easements is that state or private funds are often required to match the federal contribution. The amount of funding available for match is frequently limited in South Dakota. To overcome this problem, either more state and private funds must be found, state and private match on the Minnesota side of the Prairie Coteau could be counted toward projects on the South Dakota side of the border, or funds from the sale of the federal Duck Stamps could be counted as private funds (currently they are considered federal monies). To protect 50,000 acres of native prairie in South Dakota would cost about \$24 million.

In Minnesota, the Native Prairie Bank Program would like to see about 10,000 acres of native prairie protected in the Prairie Coteau portion of the state over the next 10 years. The easements could be a combination of Prairie Bank easements and USFWS grassland easements. The payment rate for a Prairie Bank easement that prohibits grazing and haying is 58.5% of the average assessed valuation of cropland within the township in which the prairie is located. At cropland prices of \$2000 this would yield a payment of about \$1200 per acre. The payment rate would be lower if grazing or haying rights were retained by the owner. Most USFWS grassland easements in Minnesota do not prohibit grazing or haying and as a result payment rates are below \$1200 per acre. To protect at least 10,000 acres of native prairie in Minnesota's portion of the Coteau would cost about \$12 million.

In addition to the USFWS grassland and Minnesota Native Prairie Bank easements, there are other conservation programs that can provide funding for grassland conservation easements. Programs in the U.S. Department of Agriculture such as the Grassland Reserve Program, Farm and Ranch Land Protection Program, and the Wetland Reserve Program can all be used to pay for all or a portion of permanent conservation easements of rangeland or grassland buffers

Activity 4 Increase the donation of conservation easements. - \$300,000

Not all conservation easements must be purchased. In some cases landowners are willing to permanently give up the right to plow or develop their property without payment in order to ensure that their property will be protected and/or to gain tax benefits. For some high income

landowners the tax deduction for a charitable donation may be nearly as valuable as a sale of the easement. For other landowners a donation of an easement can lower the value of the land for property or estate tax purposes. The addition of a part-time position to contact and educate potential donors could greatly increase the number of landowners willing to consider a gift of a conservation easement.

Strategy 2 Protect Native Prairie through Acquisition

The purchase of native prairie in fee title is often the preferred means of protection in places where grassland easements don't offer the level of protection desired or complete management control is needed to protect rare or threatened species and plant communities. Purchase of prairie will be more common in the Minnesota's fragmented portion of the Coteau than in the more intact portion found in South Dakota. The Minnesota County Biological Survey has identified about 29,000 acres of native prairie in the Coteau. Of this total, about 20,000 acres lack any permanent legal protection from conversion (easement or fee title). Native prairie is a target for acquisition of both the Scientific and Natural Areas Program and the Wildlife Management Area system in Minnesota. In South Dakota, public ownership of native prairie has mostly been within the Waterfowl Protection Areas or National Wildlife Refuges of the U.S. Fish and Wildlife Service or Game Production Areas of the South Dakota Department of Game, Fish, and Parks.

Activity 1 Complete the legal protection of 75% of the native prairie currently lacking protection within the Minnesota portion of the Prairie Coteau - \$10 million

With a protection target of 15,000 acres (75% of the unprotected prairie), 10,000 acres will be protected through Native Prairie Bank and other grassland easements leaving 5,000 acres to be protected via fee acquisition in the next 10 years. Assuming a value of \$2000 per acre, the acquisition cost would be about \$10 million.

Activity 2 Expand the public ownership of native prairie in the South Dakota portion of the Coteau by 4000 acres - \$6 million

Due to the large remaining areas of native prairie, there is less need to purchase fee title of prairie in South Dakota. The most common exception would be inholdings within existing managed areas where management would be facilitated with more legal control. Assuming an average acquisition cost of around \$1500 per acre for 4000 acres, the total will come to \$6 million.

Strategy 3 Increase the Net Profitability of Prairie-based Agriculture

Almost all the remaining native prairie on private land in the Prairie Coteau is grazed by cattle. A significant fraction of the ungrazed private grasslands is former cropland that has been enrolled in the USDA Conservation Reserve Program (CRP) and replanted with native or non-native grasses. Ranchers are converting their prairie pasture and rangeland cattle operations to wheat, corn or other row crop operations because the profit margin is higher (or is perceived to be so). Also, it can seem easier to convert prairie pasture to cropland and rent it to row crop producers. The owner then becomes once-removed from the input expenses associated with cattle or raising their own crops and is guaranteed a predictable rental payment. Other landowners are removing land from CRP to return to crop production, because harvest net revenue will potentially exceed government compensation for CRP participation. Unless market forces or government subsidy systems change, parties interested in grassland conservation must develop ways to increase the economic returns from grasslands.

There are two means to increase the net profitability of prairie-based agriculture. One is to decrease the input costs of production and the other is to increase the value of either existing products or create new high-value ones. A direct way to decrease costs for grazers is to remove the upfront costs of acquiring land and developing the infrastructure of fences and water sources. Conservation easements that permit

continued grazing result in a lowering of the capital invested in grazing land even though the actual resale value of the land may not decrease.

One potential problem with grazing native prairie is the introduction of invasive species in manure if livestock had fed earlier on hay or in pastures infested with weeds. Some sort of quarantine system may be needed if high quality native prairie is to be opened to grazing for the first time.

Activity 1 Use carbon credits to protect native prairie from conversion - \$2 million

Converting native prairie to cropland results in the release of about 40% of the soil organic carbon in the top 12 inches of soil over 20 years. Paying ranchers to keep their land in grassland can maintain wildlife habitat, reduce carbon emissions, and can provide economic support to ranching communities. Permanent grassland easements can generate carbon offsets for Avoided Rangeland Conversion (ARC). ARC carbon offsets would be sold on the voluntary carbon market, providing increased funding for grassland easements that can alter the economic equation determining whether grass-based agriculture or marginal cropland is more profitable.

ARC projects require an up-front investment of capital to purchase grassland easements, but carbon offsets from avoided emissions are only generated over time based on the rate of carbon dioxide release from farmed soils. This raises the question of how to generate the initial investment. One potential solution to this problem is the creation of a revolving fund. The revolving fund would be used to purchase the easements and then would be replenished as carbon credits are generated and sold. Investments in such a fund would be stretched to protect many times the amount of grassland than would otherwise be possible. An initial fund of **\$2 million** would allow the development of a test program.

Activity 2 Create a 'prairie-friendly' label for livestock products - \$240,000

Cattle producers in the Prairie Coteau are helping preserve one of America's last great tallgrass prairies but get no brand recognition or market return for doing so. Developing certification standards, labeling, and marketing prairie-friendly beef would create new value for locally produced beef. Some of the most important standards include: 1) livestock are grazed under a rotational grazing plan that maximizes heterogeneity of habitats, 2) cattle are excluded from riparian zones, 3) no broadcast spraying of invasive plants is done if doing so would affect native butterflies, and 4) minimum planting of non-native grasses and other species. Further value would be derived with if the products could also be certified as organic and grass-finished.

Activity 3 Create grazing opportunities on public lands to support local grass-based agricultural economies - \$500,000

In Minnesota, public prairies and planted grasslands within Wildlife Management Areas and on other state lands have been managed mainly with prescribed fire and brush hogging. There is a large potential to expand conservation grazing as a management tool in these areas. Increased grazing for conservation purpose will have the added benefit of providing an economic opportunity for local grazers and generate lease income to the public landowner. This lease income could be used to pay property taxes and defray management costs. Obstacles to this approach are the lack of grazing infrastructure (fences, corrals, and water sources) on public lands, insufficient private grazing lands nearby to supplement those on public lands (grazers need a stable season-long forage base) and a shortage of available livestock in certain areas to graze public lands. In addition, many of these properties were purchased through hunting excise taxes and waterfowl stamps requiring managers to manage for the benefit of game species. Game species management can be coupled with ecological grazing, but balancing hunting and habitat with income-driven grazing may present unique challenges. Many of these types of problems could be solved by concentrating efforts within prairie landscapes. This will ensure that within the mosaic of prairie and grasslands of the prairie landscape there would be a stable

forage base of sufficient area to draw grazers to the area or to entice the creation of new grazing operations. Funding from a variety of sources will be needed to develop the necessary grazing infrastructure on public lands.

Activity 4 Create new markets for prairie-based products - \$200,000

One quickly-growing prairie industry is the production of native prairie seeds. Prairie restoration is increasing rapidly and with the re-creation of prairie landscapes there will be an even greater demand for prairie seeds. Minnesota's emphasis on local ecotypes also ensures that the production capacity of seeds will need to be widespread and probably locally-based. Locally produced seed harvested from native prairie tracts instead of cultivar fields is an important part of this equation. Similarly, acceptance of bulk-harvested native prairie seed as an alternative planting strategy within USDA farm programs is a critical market step that would need to be achieved.

Another proven prairie-based business is bison production. To date, buffalo is a "niche" product that sells for a premium. If bison production could expand and consumer cost brought down to a level no more than 10-20% above that of corn-fed beef, buffalo could gain acceptance as a staple in the American diet. To reach this level of cost reduction would require a remaking of the way animals are harvested and the meat packed. Bison do best when they graze in large herds on open rangeland; they do less well in confinement. The highest quality meat results from field harvest and rapid transport to local packing plants.

Similar to the bison model above, a potentially more practical system that requires less infrastructure is the grass-finished beef industry. The return of this old approach capitalizes on specific beef breeds and sub-breeds that are efficient converters of grass to animal mass. The cultural belief that a beef animal can only be successfully 'finished' in a grain-fed feedlot system is due for change. One way to promote grass-finished beef is to serve it at conservation fund-raising events such as the banquets of local wildlife groups.

A more systematic approach to identifying new markets and prairie-based products is required to expand prairie-based agriculture. To encourage the development of new businesses, an important first step would be to conduct economic analyses of the new opportunities and develop business plans that demonstrate the income potential and expected costs of the opportunity in a particular place. Prime candidates in the Prairie Coteau would be the creation of a prairie honey or prairie cheese industry.

Addressing Threat 2 - Fragmentation of Prairie Landscapes

In addition to the destruction of native prairie, another major problem for the viability of wildlife populations is the fragmented distribution of the remaining prairie. Most animals require a minimum area of contiguous habitat to maintain a viable population. If connections between habitat patches are broken, the movement of individuals between the patches will decline and the effective population size will be reduced. Since long-term viability of populations is an inverse function of population size, large blocks of prairie and restored grassland will be needed to ensure that the complete suite of prairie species, including hunt-able game species, continues to survive in the Prairie Coteau.

Large blocks of prairie or grasslands are also needed to maintain some functions of prairie systems as well as a diverse array of prairie habitat types. Our knowledge about the ecosystem services that prairie systems provide is growing although we still lack a clear understanding of how those services vary with the spatial extent of ecosystem patches. For example, erosion control, capture of airborne dust and other particulates, water quality improvement, flood retention, the production of pollinators and natural enemies, and carbon sequestration are all important services that prairie habitats provide. However, we don't know whether there are minimum areas of habitat that are required to ensure that these ecosystem benefits are produced at the scales human society needs.

It is probably not feasible to recreate landscapes entirely composed of native community types. A more reasonable goal is to establish prairie mosaics within each landscape area. This concept is based on the idea that if a high percentage of a landscape is in native grasslands and wetlands, the landscape will be able to provide most of the ecological services a fully undisturbed landscape would. For example, Minnesota's Working Land Initiative has established a goal of 40% grassland, 20% wetland, and 40% cropland within their project areas postulating that such a percentage will maintain healthy populations of ducks and pheasants. The mosaic concept as applied to prairie landscapes assumes that there will be a variety of land uses and resulting habitat types within the landscape and that if all those habitats are managed as a whole, they can maintain the full diversity of prairie plants and animals as well as important ecosystem services.

Marginal croplands that are restored to grassland to create buffer and connections often can be used for more intensive economic activities than native prairie. One example is the harvest of hay for livestock or as feedstock for bioenergy uses. Whereas the time window for harvest of hay from native prairies without harming wildlife or altering the composition of the prairie can be very short, more flexibility is possible on planted grasslands. In addition, restored grasslands can be hayed more frequently. A growing concern about biomass energy production is the types of species that will be used for hay production. The conservation value of restored grasslands will be reduced if they are large monocultures of even native species such as switch grass. Even more troubling would be the use of exotic species such as *Miscanthus spp.* (Elephant grass and relatives). The whole concept of promoting biomass energy will be self-defeating if native prairie is plowed in order to create more productive but less diverse planted grasslands.

Strategy 1 Restore Grasslands on Marginal Crop Lands to Reconnect Native Prairies

In the Minnesota portion of the Prairie Coteau, native prairie occurs as scattered remnants. To re-create prairie landscapes in that part of the Coteau will necessitate substantial restoration of marginal crop lands back to diverse grassland plantings. A number of obstacles must be overcome to create grassland mosaics on the scale of tens of thousands of acres. A sufficient level of funding is essential as restoration is an expensive business. In addition, owners of appropriate marginal cropland must willingly agree to restoration on their land or be a willing seller of the land to a public agency that will conduct the restoration.

Activity 1 Identify lands appropriate for restoration within each prairie landscape and develop a restoration plan for the landscape - \$450,000

In many prairie landscapes found within the Prairie Coteau, restoration of marginal cropland to connect and buffer existing native prairie will be required to reach the minimum area needed to maintain viable grassland animal populations. A planning process that prioritizes lands for restoration within the prairie landscapes is needed. In addition, site specific restoration plans are required to detail the type of site preparation that is needed, the plant community type and species that will be planted in each place, the techniques that will be used, and the timing of each restoration step. In Minnesota, all restorations using public funds must use "local genotype" seeds and have a diverse seed mix of up to 40 species. At an estimated \$25,000 per landscape, restoration planning within the Coteau will cost about \$450,000.

Activity 2 Purchase marginal cropland from willing sellers adjacent to or near native prairie and restore to high diversity grassland - \$25 million (\$20 million acquisition, \$5 million restoration)

In Minnesota, most of the identified prairie landscapes currently consist of less than 10% native prairie. If a goal of 60% grassland and wetlands were chosen, substantial amounts of current cropland will need to be restored back to diverse grasslands. Within the prairie landscapes of the

Minnesota portion of the Prairie Coteau, as many as 50,000-80,000 acres of current marginal cropland will need to be restored to reach a goal of 40% grassland in each prairie landscape. The amount restored on public land could vary but if half were done there and half on private lands, 25,000-40,000 acres would be purchased and restored. Over the next 10 years, a reasonable goal might be 12,000 acres. Conservation organizations, state agencies and federal programs are all potential owners of restored grasslands, but to maintain local support for the projects the land will need to be available for local economic uses, especially grazing and haying.

Activity 3 Use conservation easement programs to protect grassland restored on private cropland - \$20 million (\$14 million easement, \$6 million restoration)

The restoration of high diversity grassland can take place on private lands as well as public lands. There are current USDA and state programs that retire marginal cropland for planting back to wetlands and grasslands. There are other public programs that can help pay the restoration expense. Due to the expense of restoration, easements that protect the restored grassland should be permanent. Assuming the same 50:50 split of restoration on private vs. public lands, 25,000-40,000 acres of current marginal cropland would be placed under a conservation easement and restored. Over 10 years, 12,000 acres of restoration could take place on private lands.

Activity 4 Develop training programs in prairie restoration - \$300,000

Prairie restoration is a site-specific endeavor. Each site will require a different set of techniques, a different species mix, and different follow-up treatments depending on the planting results. Expertise in restoration is not available in many localities and a local base of knowledge will need to be built up to ensure ongoing successful restoration projects. Some restoration work can be carried out by landowners but in some cases restoration businesses will need to do the work. A training program in restoration methods and science will be needed with landowners, agency staff and business start-ups as the customer base.

Activity 5 Build up restoration capacity across the Prairie Coteau by promoting the expansion or creation of private restoration companies and native seed producers

Within the next decade there will be opportunities to establish locally owned and operated restoration businesses in the Prairie Coteau. An important question is how to make these new endeavors viable and sustainable for the long-term. State policy could require state agencies to offer technical support and preference for contracts to locally owned companies.

Strategy 2 Increase the market for hay by expanding the demand for biofuel feedstock

Today's liquid biofuels (ethanol and biodiesel) industry is based on first generation technologies that rely on commodity crops, principally corn and soybeans. The sudden expansion of first generation biofuel production prior to 2008 caused a spike in commodity prices and accelerated the on-going shift from pastoral agriculture to row crop agriculture. Federal and state programs designed to stimulate creation of a large cellulosic biofuels market could either be an additional threat fueling grassland conversion or a significant market opportunity to return value to grass-based agriculture. The outcome depends on how policy, feedstock development and other forces play out well beyond the scope of this initiative.

However, today there are emerging bioenergy technologies and parallel markets coming into existence between current commodity-based ethanol/biodiesel and future cellulosic market. Gasification, combustion and pyrolysis technologies are expanding and all have the potential to create new markets for grass-based agriculture and reduce the cost for managing conservation lands. These technologies use combustion for steam and electricity generation or conversion to

synthetic natural gas. Successfully leveraging these markets will help to reduce the cost of conservation practices and reduce the leakage effect, where by one piece of land is protected but another is converted instead. A principal focus of this plan is to help the biofuel feedstock market expand in a way that has benefit to the Prairie Coteau while serving as a model for other prairie regions. In particular, efforts need to be focused on activities that will create economic returns that help keep degraded and planted grasslands in grass in the critical areas that buffer high quality untilled prairie.

Activity 1 Improve gasification, combustion, pyrolysis and cellulosic ethanol technologies and take more prototypes into production

This is not an area in which the Foundation will invest and is not part of the budget estimated for this initiative, but significant state, Department of Energy and private funds are currently being spent to commercialize these potentially profitable production methods, all of which could use native grass as a feedstock.

Activity 2 Develop and demonstrate techniques to sustainably harvest grass - \$1.4 million

Commodity crop production is historically one of the country's most intensively researched and studied industries. Therefore, production techniques, crop genetics and economics are well understood. Conversely, the prairie based biomass industry is in its infancy and is fraught with uncertainty and questions from producers and end users alike. Basic questions including best harvest techniques; transportation and handling costs and methods; optimum establishment and harvest timing; stand maintenance; and others must be quantified and tested before landowners will widely adopt new cropping regimes on their farm. Support for on-the-ground and applied demonstrations and tests to answer these questions are crucial to adaptive implementation of new practices. Priorities for investment include projects that evaluate wildlife impacts of harvest height, frequency, planting mixes, and heterogeneity of grass harvest. All of this work must also be coupled with data on energy and economic returns associated with harvest and harvested biomass.

Activity 3 Test simple versus complex grasslands for economic and ecologic performance - \$405,000

Recent research suggests that diverse plantings of native prairie species results in higher yields than single or few species plantings. However, the history of agronomic production suggests that the biofuels industry will migrate to a single species monoculture. To ensure that cropping regimes accrue all potential benefits, including those for wildlife, it is important that these benefits be quantified through a scientifically rigorous process.

Activity 4 Develop certification or labeling standards for 'wildlife friendly' prairie biomass grass production and harvest - \$255,000

Knowledge gleaned from activities 2 and 3 can be applied to develop industry leading certification standards. Implementation of a certification system may lead to industry wide acceptance of those standards or at least may become incentive for premium pricing to certified producers.

Activity 5 Test burn and collect emissions data to support air quality permitting

Very limited data exists on air emissions from biomass combustion and gasification operations that in turn create permitting hurdles for facilities that could burn or otherwise utilize a diversity of grass feedstocks. Variability in the water and silica content of different grasses and grass/forb mixes also create uncertainty in permitting. This is not an area in which the Foundation will invest, but it is important to recognize that existing data and permitting processes likely create a disincentive to use native prairie versus commodity monoculture feedstocks.

Activity 6 Assess cost-competitive opportunities to deploy small scale combustion facilities - \$100,000

Development of a Prairie Coteau-friendly biomass industry is a 'chicken and egg' problem. Facilities won't be built until there is demand and demand won't exist without an identified, branded, and grid-connected supply. An opening already exists to expand biomass-to-heat generation because there is unrecognized demand by small scale industrial, institutional and municipal facilities in the region that pay extremely high prices or have an unreliable supply from existing fossil fuel infrastructure. For example, industrial facilities heated with propane because they are removed from natural gas pipeline infrastructure pay a price premium that makes biomass combustion heat economically attractive. Municipal and industrial user surveys and economic analysis are needed to identify boilers and other existing infrastructure that could be replaced with current biomass heat generation infrastructure in a cost-competitive way.

Activity 7 Stimulate end user demand for sustainable-grass biomass produced within the Coteau - \$275,000

Outreach to municipalities and other owners who are planning projects that would utilize biomass heat options must proceed prior to construction or installation of new gasification, combustion and pyrolysis facilities. This can be accomplished through information outreach, technical assistance and facilitation of innovative public/private partnerships. This activity will spur new markets for prairie biomass for energy while protecting and enhancing the resource base for potential new developments in the cellulosic transportation fuels arena.

Activity 8 Help secure startup capital and economic assurances for landowners interested in adopting biomass cropping - \$240,000

Federal farm program subsidies and crop insurance alleviates most of the producer risk associated with commodity crop production. Similar incentives and assurances are not available for grass producers. Helping to secure long-term purchase contracts for grass biomass and providing up-front cost-sharing for a three year establishment phase are critical incentives to developing a robust grass-based bioenergy economy.

Activity 9 Facilitate innovative value added businesses

New technology begets new business opportunities. The development of new biomass end user facilities will encourage new businesses to supply them with product. As businesses providing custom harvesters, transportation services, equipment manufacturing, biomass densification (pelleting), and other services come on line they will help drive additional demand for sustainable grass production and the development of even more markets.

Strategy 3 Manage the Development of Wind Farms to Reduce Impacts on Prairie Wildlife

One of the fastest growing sources of fragmentation in the Prairie Coteau is the development of wind power to generate electricity. Most of current work is being done along the eastern edge of the Inner Coteau Subsection, a feature called the "Buffalo Ridge". Large wind farms are already in place and more are planned for construction in the next several years. The wind turbines, access roads, and transmissions lines all contribute to fragmentation of the prairie landscape. Greater prairie chickens are particularly sensitive to tall structures located within their potential habitat, and the concern of bird avoidance over time remains an unanswered question. Another potential problem is the introduction of invasive weeds into native prairie areas with the soil disturbance that accompanies the construction of roads, towers, and turbines.

Activity 1 Develop a voluntary certification program in South Dakota and strengthen the current permitting process in Minnesota to reduce the impact of wind developments -\$100,000

Both certification and permitting can be used to direct wind developments away from the most sensitive prairie areas and to minimize the fragmentation impacts to large blocks of prairie vegetation. In both cases, the siting of turbines and transmission lines on native prairie should be minimized without substantial mitigation. Mandatory “set-backs” from native prairie are useful. Best practices for planning, construction, operation, and decommissioning can be required for certification or permitting to reduce both fragmentation and direct mortality on prairie animals.

Activity 2 Monitor the impact of wind development on prairie wildlife in the Prairie Coteau - \$500,000

The impact of the construction of wind farms and transmission lines is poorly known for many prairie species. Direct mortality of birds and bats does not appear to be as big a concern for some species as once speculated, but that may change as the size of turbines continue to increase. A more open question is whether large structures near an open prairie affect the behavior of species. For example, prairie chickens seem to avoid areas near tall structures presumably because they can serve as perches for predatory hawks and owls. More study is needed to examine how behavior and populations of different prairie species change after turbines and transmission towers are installed.

Addressing Threat 3 - Degradation and Homogenization of Native Habitats

Much of the native prairie in the Prairie Coteau looks the same. Years of continuous grazing with a lack of fire usually result in low diversity prairies often of very low stature. Weeds have invaded even the best prairies and cool season grasses such as smooth brome are now often co-dominants. Probably more so than grazing, the large-scale application of herbicides and the over-seeding of exotic cool-season grasses threatens to impact species diversity on grazed prairies.

Before European settlement, the prairie consisted of patches of different species and communities spread across the landscape. Within this mix there was habitat for species that specialized in short statured vegetation as well as those requiring taller more dense stands.

Strategy 1 Manage prairie landscapes as Mosaics of Diverse Habitats

Each property within prairie landscapes is currently managed independently of others. To the extent that all owners are trying to achieve the same goal, this can create great homogeneity. The most common manifestation occurs when most owners are trying to maximize economic returns through season-long continuous grazing or the opposite extreme when owners are trying to preserve prairie by removing all disturbance. One situation results in large areas of over-grazed pastures, the other results in dense vegetation dominated by the most aggressive species. An alternative to independent prairie management is to manage the landscape as a whole. This approach would strive to maintain a diversity of prairie habitats, both qualitatively where different plant species dominate and quantitatively where the time since last disturbance and disturbance intensity (e.g. grazing) varies. In this scenario, it would be possible to have tall, dense prairies that have been undisturbed for three or more years within the same mosaic where there were recently grazed prairies with short statured vegetation.

Activity 1 Form a Partners Group or Cooperative in each prairie landscape to coordinate and oversee management - \$100,000

The key to creating a diverse mosaic of habitats within prairie landscapes is to coordinate the landuse practices employed at any given time. Public grazing lands will play a key role in complementing the landuse patterns on private lands. Private landowners will make their own decisions on how to manage their property, but those decisions can be influenced with incentives. The concept of grassbanks can provide an incentive to modify management on

private lands: private landowners can acquire rights to graze on public land if they employ conservation practices on their own land. The landowners within a landscape, both private and public, will need to jointly develop a vision of what their landscape should look like in the future. This vision could set goals on the percent of the landscape that should be grassland or prairie, a desired level of water quality, the size of the prairie grouse population, the level of prescribed fire, and potentially many more goals. Decisions could also be made on the number of livestock animal units the prairie landscape could support and how those units should be distributed over the season and in what parcels. Together these decisions would form the basis of a landscape management plan that would drive on-the-ground management decisions.

Activity 2 Implement landscape management plans under the oversight of a prairie landscape manager \$1.5 million

The responsibility of the landscape manager would include not only the coordination of conservation efforts but also the implementation of a landscape grazing plan, the delivery of prescribed fire, and an invasive weed strategy. One benefit of allowing grazing on public lands is that lease income will be generated that potentially could be used to pay taxes and management costs. Changes in state law or rules may be needed to allow funds generated on public lands within a prairie landscape to stay in accounts dedicated to the conservation of that landscape. If sufficient funds are generated long-term, a prairie landscape manager could be hired to coordinate and implement the landscape management plans. Start-up funds from other sources may be needed to fund this position until enough public lands are included in the landscape to generate sufficient funds on an annual basis from lease income.

Strategy 2 Increase the use of prescribed burning in the Prairie Coteau

Prairies evolved under a regime of frequent fire and require periodic burning to remain vital. Burning reduces invasion of prairies by woody plants, suppresses cool-season exotics, and returns nutrients to the soil that are otherwise locked-up in above-ground detritus. Since European settlement, however, fire has become an increasingly infrequent phenomenon on the prairies. Grassland fragmentation inhibits wildfires and coupled with human efforts to suppress wildfires, means only controlled fires are allowed. Unfortunately, very few landowners have the expertise, resources, training, or understanding to use fire as a tool, so prairies go unburned. In addition, most data regarding the economic benefits to fire implementation are observational, and producers have not yet been exposed to sound economic data supporting burning over grazing their grasslands.

Activity 1 Document the impact of prescribed fire on economic return on ranch operations in the Prairie Coteau - \$500,000

The most serious issue facing the expansion of prescribed fire in the Prairie Coteau is the lack of conclusive evidence that fire can improve ranch economics in the Northern Great Plains. Research is needed to study the relationship of prescribed fire management and economic return of grazing on real world ranches in the Prairie Coteau. An economic cost-benefit analysis detailing the costs of fire equipment and training investments versus the increased returns from cattle grazing within fire managed pastures is needed. Producers will invest in fire management systems if they felt the economic return is there.

Activity 2 Work with University Extension staff to advance understanding among landowners of the value of prescribed fire - \$30,000

The Prairie Coteau Habitat Partnership will work with University Extension staff in South Dakota and Minnesota to provide demonstration sites and monitoring results that support the benefits of prescribed fire for cattle weight gains. Jointly, the Partnership and Extension Service can sponsor training sessions to demonstrate how to conduct safe and effective prescribed burns, lead field days to show neighbors how prescribe fire can result in healthier pastures and more productive

cattle herds, and produce marketing materials to help disseminate information about prescribed fire to Coteau landowners.

Activity 3 Increase capacity to conduct prescribed fires - \$250,000 for equipment, \$2.0 million for seasonal assistance

The most serious issue limiting the use of prescribed fire as a management tool is the lack of equipment and trained personnel to implement. A necessary step for the Prairie Coteau Habitat Partnership is to secure sufficient equipment and salary resources to support four additional seasonal burn crews. Many landowners are unable to fully pay for prescribed burning services. Burn crews that could provide their services at reduced or no cost would greatly expand the use of prescribed fire in the Prairie Coteau. These crews and equipments would work from a prioritized list to burn key private and public parcels when landowner capacity is lacking.

Activity 4 Create a Coteau-wide Burn Coordinator position to develop and coordinate comprehensive annual burn plans - \$750,000

In order to optimize use of burn crew and equipment, a Burn Coordinator needs to be hired or appointed to help local landowners develop plans for all private land burns. The Coordinator will work with all partners to identify lead agency on each burn, develop burn plans that meet NWCG standards, ensure all burns are conducted according to plans, and coordinate monitoring protocols post-burn.

Activity 4 Organize private land fire cooperatives - \$300,000

Within prairie landscapes, groups of interested landowners and managers need to organize to share resources for prescribed burning, coordinate burning activities and to help set priorities for action based on a landscape burn plan. Each Cooperative will develop a vision to how they would like to utilize prescribed fire to help manage their landscape, prioritize lands needing burns, and set a schedule to accomplish the goals they set.

Strategy 3 Expand adoption of ecologically-sound grazing practices

While cattle grazing can emulate disturbance patterns once created by wild ungulates, modern cattlemen use standard grazing approaches. The result is a very homogenous grazing pattern across the landscape. Coupled with the lack of fire, these anthropomorphic phenomena result in a much less diverse landscape than existed prior to settlement which in turn fosters a less rich biotic diversity. The U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program currently works with landowners throughout the Coteau to restore or create wetlands and help pay for the costs of new grazing systems (e.g. fences). High costs associated with establishing rotational grazing systems are the first hurdle to getting landowners to implement this practice. The second problem is that landowners are often not familiar with this approach or aware that of the benefits of increased cattle weight gains and increased prairie forage production.

Activity 1 Provide information and demonstration opportunities through the Extension Service – \$250,000

The Prairie Coteau Habitat Partnership will work with Extension staff to compile information about rotational grazing systems, establish field days to demonstrate on-site how systems work, and provide information directly to targeted landowners to solicit their participation.

Activity 2 Develop and conduct grazing schools to teach conservation grazing to private landowners within the Prairie Coteau of South Dakota - \$250,000

For a more in-depth treatment of conservation grazing, multiple day sessions are required. These grazing schools will cover the principles of rotational grazing, responses of key grass and forb species, pasture set-up, stocking rates, movement schedules, patch-burn grazing, grassbanking cooperatives, and special problems. Several sites will be visited to discuss pros and cons of different approaches and the results that can be expected.

Activity 3 Provide cost-share assistance for conservation grazing through FWS - \$155,000

Funding through US Fish and Wildlife Service can be matched with funding from USDA-NRCS to install and maintain rotational grazing pastures. Key landowners wishing to initiate a conservation grazing system will be offered 75% cost share to install new fencing and implement rotational grazing according to a plan developed jointly with Extension Service. Grazing schedules will be structured to optimize habitat diversity.

Strategy 4 Manage invasive species

Invasive species directly and indirectly result in prairie degradation. First, they are often serious competitors with native species, often overtaking prairie landscapes and crowding out desired species. Second, invasive species can greatly reduce the forage value of pastures. Landowners often combat the invasive species by applying non-selective herbicides that also kill desirable forb species. When “prairie-friendly” control methods for invasive species can be shown to work at an economical scale, landowners will embrace and use the technology.

Activity 1 Identify new invasive species infestations - \$200,000

Work with Extension agents and state invasive weed specialists to learn of invasive species moving into the region, advise and educate landowners on what to watch for, and keep current a database on invasive species locations within the Prairie Coteau. Work with Extension agents and other biologists to identify proven technologies for invasive species control.

Activity 2 Offer training to private landowners on invasive species control - \$250,000

Conduct field days and other training opportunities to landowners in order to instruct them on the identification of invasive species, biocontrol methods, sources of biocontrol agents, types of prairie-friendly herbicides, application techniques and rates, proper timing of activities, and sources of assistance. After training, provide follow-up information to answer questions as they arise.

Activity 3 Conduct independent testing of herbicides to verify their selectivity - \$200,000

An indirect way that invasive species threaten prairie diversity is the use of herbicides to treat invasive plant species within native grasslands. Some herbicide manufacturers claim that their product will impact only the target weeds when used properly while leaving native prairie plants relatively untouched. In some cases prairie plants are negatively impacted when the chemicals prove to kill many species or when they are used improperly. Independent analysis is needed to test the selectivity of chemicals in field situations and to determine what application techniques are feasible and reliable. The results of these tests can be passed on to private and public grass managers via extension and other venues.

Activity 4 Provide cost-share to landowners to aggressively control invasive species - \$250,000

Working with local soil conservation districts, identify sources of funding for the cost-share of invasive species control on private lands. Document control efforts and locations and monitor response of infestations.

Strategy 5 Restore and Buffer Wetland and Riparian Habitat within the Prairie Coteau

In the past, the Prairie Coteau was the location of some of the finest waterfowl habitat and hunting in the world. For example, Heron Lake in Jackson County, Minnesota was once a waterfowling mecca known throughout North America. Duck numbers there and elsewhere in the agricultural portion of the Coteau have declined greatly. The primary cause of this decline is the destruction of wetlands and shallow lakes through draining and tiling. Over 95% of the wetlands in the Minnesota portion of the Coteau are now gone. There is a critical need for nesting, feeding, and migratory habitat to restore populations to even a portion of their former abundance.

The deeper lakes of the Prairie Coteau have increasing importance in the face of climate change. As most of South Dakota becomes hotter and drier, the prime duck production areas will move eastward. North America's future duck "factory" may be located in western Minnesota and the Prairie Coteau. Deeper wetlands will be especially important as the shallower ones dry and become grassland.

Other key aquatic habitats for the Coteau include streams and riparian corridors. Where the streams leave the elevated area of the Coteau, they often cut deep ravines called "coulees" by local residents. These coulees and other streams support what was once about the only woody vegetation in a grassland dominated landscape. The wooded coulees are being threatened by overgrazing in the riparian areas, water quality deterioration, and the invasion of exotic species.

Activity 1 Work with federal agencies to enroll landowners in conservation programs - \$200,000

Provide salary assistance for private lands biologist to conduct landowner outreach. Use existing Partners funding to enroll 20 miles of important stream corridors into long-term protection. Solicit participation in USDA continuous CRP program to enroll buffers into 15-year contracts and in longer-term CREP contracts if they are available. Promote habitat conservation activities under USDA Wildlife Habitat Incentives Program (WHIP).

Activity 2 Educate landowners about riparian values - \$25,000

In cooperation with the NRCS, develop and provide educational materials – brochures, factsheets, and mass-media video – on the importance of managing riparian areas for ecological health and the well being of cattle operations. Raise awareness of the problems created downstream from improper water management (channelization, riparian vegetation elimination, wetland drainage, etc.).

Activity 3 Use WRP easements and other programs to protect and restore key wetlands - \$20 million

One of the most promising ways of restoring wetlands and grasslands on current marginal cropland is the Wetland Reserve Program. Funds from this program plus state match can be used to purchase permanent conservation easements. Other sources of funding can aid private landowners to restore the land to its native natural communities, particularly wetlands.

Activity 4 Develop incentives and regulations to control shoreline use and development on lakes - \$500,000

Although many of the larger and deeper lakes in the Minnesota portion of the Coteau now have residential development on their shores, there are still many lakes, especially in South Dakota, that have minimal structures. The development of these lakes has already started and the momentum is growing as people from outside the Coteau discover that recreational lakeshore is available nearer than the traditional lake country in northern Minnesota. With congestion on roads heading north from the Twin Cities and the improvement of highways to the south, it is now easier for some urban residents to come to the Prairie Coteau.

Currently there is little oversight of shoreline development in the Prairie Coteau. A Private Lakes Specialist position is needed to explore mechanisms to protect lake shoreline, develop lakeshore owners groups, promote conservation programs to landowners, encourage the enforcement of existing regulation and conduct planning and coordination of enhancement and restoration work on shallow lakes.

Addressing Threat 4 - Threats Unique to Specific High Priority Species

The strategies and activities outlined above are expected to be broadly effective in helping prairie species in the Coteau continue to thrive or hold their own, but additional targeted investments will be necessary to ensure that individual species can benefit from broader habitat protection and management activities. In every case ongoing monitoring and survey will be needed to track the current distribution and health of Prairie Coteau populations of high priority species.

Strategy 1 Conduct ongoing monitoring and survey

Activity 1 Conduct a baseline survey of each high priority species - \$300,000

In order to develop plans to increase the abundance of high priority species it will be necessary to work with the Minnesota Department of Natural Resources, the South Dakota Department of Game, Fish, and Parks, USFWS, USGS, university researchers, and other interested parties to determine the current distribution and status of each priority species within the Coteau. The baseline survey should also identify potential habitat that is not currently occupied. The results of the survey will direct species specific work towards the places where key species are under the most stress. The inventory will also provide a starting point that conservation progress can be measured against.

Activity 2 Continue ongoing monitoring of key species- -\$800,000

The only way to be sure that conservation activities are having their desired impact is to follow how target species are responding. Different techniques and timing are often required for detailed results on each species although some groups of species such as grassland birds, prairie butterflies, and wetland birds can be tracked simultaneously using the same monitoring technique. Monitoring will need to continue over multiple years due to natural year-to-year variability as environmental conditions vary. To observe the impacts of conservation protection and management will require teasing out real impacts from this natural variability. For \$80,000 per year at least two monitoring projects can be carried out during the field season. Compared to the overall costs of the projects described in this initiative, a monitoring commitment of 1% to 2% will produce compelling evidence of the success or failure of conservation efforts.

Strategy 2 Alter management regimes to meet the need of high priority species

Management activities that increase the health of prairie vegetation are usually beneficial for the animals that utilize those habitats. However, in a few cases the new management can have a detrimental effect. Changing grazing and fire management plans to meet the needs of these species should not raise the cost of developing the plans if they are included while the plans are being developed.

Activity 1 Change rotational grazing and prescribed burning prescription to include the needs of prairie butterflies

It may be necessary to set aside some temporary ungrazed and unburned 'butterfly sanctuaries' to protect local populations of the imperiled Dakota skipper, Poweshiek skipperling, and regal fritillary butterflies and other vulnerable species. Since these butterflies live primarily in above-ground vegetation, either burning or grazing can kill them and remove their habitat and food. When conducting burns in areas with the butterflies present, it is important to leave areas unburned so that caterpillars and pupae persist to re-colonize habitat enhanced by burning.

Similarly, rotational grazing can create taller and more diverse habitat and refugia for butterflies. Study is needed to determine which high priority species need special management prescription.

Activity 2 Include impacts on Western prairie white-fringed orchid in burning and grazing management plans

Although the Western prairie white-fringed is now believed to be extirpated in South Dakota there are still viable populations in the Minnesota portion of the Coteau. The orchid is particular sensitive to overgrazing, improperly-timed haying or burning, and herbicide treatments. The presence of the orchid in a management unit is an important factor in how management plans are written.

Strategy 3 Facilitate the movement of high priority species into unoccupied habitat

As marginal cropland is restored back to diverse grassland and degraded prairie is rejuvenated with new management approaches, there will be opportunities to reintroduce high priority species back into habitat where they once occurred. In many cases, species will be able to re-colonize former habitat on their own, but in some cases the natural process will be too slow or is unlikely to occur. In those situations, it will be possible to be proactive and facilitate the recolonization. The agency or organization undertaking the project will need to obtain the necessary permits and authority and conduct a cost/benefit analysis to help determine whether the reintroduction makes sense.

Activity 1 Reintroduce prairie chickens and sharp-tailed grouse into suitable habitat - \$100,000

These two prairie grouse were once abundant throughout the Prairie Coteau but are now missing from most of the southern and eastern portions of the Coteau. As large expanses of treeless grasslands are re-created, potential range expansion is possible. Before translocation of birds occurs, an in-depth habitat analysis is needed to ensure that all prairie grouse habitat needs are met in their potential new home. Study of the possibility of natural recolonization of recreated habitat is also advisable. Prairie chickens were recently re-established in the Lac Qui Parle area of Minnesota, just to the northeast of the Coteau. A similar effort of habitat improvement and multiple releases of birds may be needed in the Coteau if new populations are to be successful there.

Activity 2 Assess the likelihood of recolonization of suitable but unoccupied habitat by priority species - \$50,000

This activity will become increasingly important as the impact of climate change is more strongly felt. The Prairie Coteau area will likely become warmer and drier and the species or genotypes most suited for the new environmental conditions are likely living in regions south of the Prairie Coteau. A great deal of caution is needed in determining the costs and benefits of assisting species in moving northward. Particular consideration should be given to the Western Prairie Fringed Orchid, especially in South Dakota where it is now known only from historical records.

Funding Needs

Success in achieving the goals of this business plan depends upon the Foundation raising and spending at least \$10.0 million over 10 years on the strategies described herein. It also depends upon government and non-government agencies and organizations and mitigation funding providing an additional \$120 million over 10 years.

Other partners who are already committed to making investments to conservation include: U.S. Fish and Wildlife Service, South Dakota Game, Fish and Parks, Minnesota Department of Natural Resources, Minnesota Board of Water and Soil Resources, and The Nature Conservancy.

Threat	Strategy	Activity/Subactivity	Estimated Costs (thousands)					
			Y1	Y2	Y3	Y4-10/yr	Total	
Conversion of prairie and grassland	Protect native prairie through voluntary easements	Assess high priority grassland landscapes	\$40	\$0	\$0	\$0	\$40	
		Expand outreach efforts in high priority prairie conservation areas	\$0	\$0	\$50	\$50	\$400	
		Fund existing easement backlog and expand easement acquisition	\$3,600	\$3,600	\$3,600	\$3,600	\$36,000	
		Increase the donation of conservation easements	\$30	\$30	\$30	\$30	\$300	
	Protect Native Prairie through Acquisition	Complete the legal protection of 75% of the native prairie within Minnesota	\$1,000	\$1,000	\$1,000	\$1,000	\$10,000	
		Expand the public ownership of native prairie in the South Dakota by 4000 acres	\$600	\$600	\$600	\$600	\$6,000	
	Increase the Net Profitability of Prairie-based Agriculture	Use carbon credits to protect native prairie	\$0	\$1,000	\$1,000	\$0	\$2,000	
		Create a 'prairie-friendly' label for livestock products	\$0	\$50	\$50	\$20	\$240	
		Create grazing opportunities on public lands	\$50	\$50	\$50	\$50	\$500	
		Create new markets for prairie-based products	\$0	\$40	\$20	\$20	\$200	
	Fragmentation of prairie landscapes	Restore Grasslands to Reconnect Native Prairies	Identify lands for restoration within restoration plan for each prairie landscape	\$100	\$50	\$50	\$50	\$450
			Purchase marginal cropland and restore to high diversity grassland	\$1,000	\$1,500	\$1,500	\$3,000	\$25,000
Use conservation easement programs to protect grassland restored on private cropland			\$2,000	\$2,000	\$2,000	\$2,000	\$20,000	
Develop training programs in prairie restoration			\$100	\$30	\$20	\$20	\$300	
Promote the expansion of private restoration companies and native seed producers							\$0	
Increase the demand for biofuel feedstock		Improve biomass technologies and prototypes					\$0	
		Develop grass harvest techniques	\$200	\$300	\$200	\$100	\$1,400	

		Test diverse/monoculture energy performance	\$0	\$100	\$200	\$15	\$405
		Certification standards for wildlife-friendly biomass grass	\$0	\$50	\$100	\$15	\$255
		Air quality burn testing					\$0
		Assess combustion facility opportunities	\$50	\$50	\$0	\$0	\$100
		Stimulate end-user demand	\$0	\$50	\$50	\$25	\$275
		Capital and contracting for landowners	\$0	\$0	\$30	\$30	\$240
		Innovative value-added businesses					\$0
Manage the Development of Wind Farms	Develop a voluntary certification in South Dakota and strengthen permitting in Minnesota	\$0	\$50	\$50	\$0	\$100	
	Monitor the impact of wind development on prairie wildlife	\$50	\$50	\$50	\$50	\$500	
Degradation and Homogenization of Native Habitats	Manage prairie landscapes as Mosaics of Diverse Habitats	Form a Partners Group in each prairie landscape to coordinate and oversee management	\$10	\$10	\$10	\$10	\$100
		Implement landscape management plans with a prairie landscape manager	\$150	\$150	\$150	\$150	\$1,500
	Increase the use of prescribed burning in the Prairie Coteau	Document impact of prescribed fire on economic return	\$150	\$150	\$200	\$0	\$500
		Work with Extension to increase understanding of the value of prescribed fire	\$10	\$10	\$10	\$0	\$30
		Increase capacity to conduct prescribed fires	\$200	\$200	\$200	\$200	\$2,000
		Hire a Burn Coordinator to develop and coordinate burn plans	\$75	\$75	\$75	\$75	\$750
		Organize private-land fire cooperatives	\$30	\$30	\$30	\$30	\$300
	Expand adoption of ecologically-sound grazing practices	Provide information and demonstration opportunities through the Extension Service	\$25	\$25	\$25	\$25	\$250
		Develop and conduct grazing schools in the Prairie Coteau of South Dakota	\$50	\$0	\$50	\$25	\$250
		Provide cost-share assistance for conservation grazing through FWS	\$0	\$0	\$50	\$15	\$155
	Manage invasive species	Aggressively identify new invasive species infestations	\$20	\$20	\$20	\$20	\$200
		Training on invasive species control	\$25	\$25	\$25	\$25	\$250

		Conduct independent testing of herbicides	\$20	\$20	\$20	\$20	\$200
		Provide cost-share to aggressively control invasive species	\$50	\$50	\$50	\$50	\$500
	Manage water quality and buffer habitat for wetlands	Work with federal agencies to enroll landowners in conservation programs	\$20	\$20	\$20	\$20	\$200
		Educate landowners about riparian values through NRCS	\$2.5	\$2.5	\$2.5	\$2.5	\$25
		Use WRP easements to protect and restore key wetlands	\$2,000	\$2,000	\$2,000	\$2,000	\$20,000
		Shoreline and shallow lake protection	\$50	\$50	\$50	\$50	\$500
	Threats Unique to Specific High Priority Species	Conduct ongoing monitoring and survey	Conduct a baseline survey of each high priority species	\$150	\$150	\$0	\$0
Continue ongoing monitoring of key species			\$0	\$0	\$100	\$100	\$800
Alter management regimes for high priority species		Change rotational grazing and prescribed burning to include the needs of prairie butterflies					\$0
		Burning and grazing impacts on prairie white-fringed orchid					\$0
Facilitate movement of high priority species into unoccupied habitat		Reintroduce prairie chickens and sharp-tailed grouse into suitable habitat	\$0	\$50	\$50	\$0	\$100
		Assess the likelihood of re-colonization of unoccupied habitat by priority species	\$0	\$0	\$50	\$0	\$50
TOTAL						\$133,665	

Evaluating Success

All conservation investments are made with a desire to have something change. Monitoring tells us whether that change is occurring. Evaluation tells us whether the combined set of investments being made are being designed and implemented to maximize that change.

The principal measure of success for the Prairie Coteau Initiative will be the creation of large-scale, functioning, and sustainable prairie landscapes. If these areas have long-term protection, proper management, and are valued by local residents we predict that they will provide the habitat needed to maintain viable populations of the native prairie plants and animals. Our first-tier measures of success will be focused on the landscapes and health of the prairie. The second tier will involve monitoring of the priority species to ensure that they respond as expected to the improving condition, intactness, function, and size of their prairie habitat.

The following measures of success are a partial list of the types of metrics that can be used to evaluate progress towards success in improving the health and viability of tallgrass prairie in the Prairie Coteau.

Measures of Prairie Size:

- Percentage of native prairie protected in Minnesota through easement or fee title acquisition
- Acres of native prairie placed under protective easement or acquired in South Dakota
- Total acres of grassland (including prairie) in the Prairie Coteau.

Measures of Prairie Intactness (Fragmentation):

- Number of blocks of contiguous prairie exceeding 2000 acres in size
- Acres of grassland restored
- Number of wetlands and shallow lakes restored

Measures of Prairie Condition:

- Acres of prairie that have been burned in the past four years
- Increase in number of grazing operations using conservation rotational grazing
- Reduction of the number and size of invasive species infestations

Measures of Prairie Function:

- Improvement of water quality in watersheds found within prairie landscapes
- Increases in population size and viability of priority prairie species
- Increased retention of water following rainfall events
- Larger populations of pollinators
- Total carbon captured on restored prairies
- Value of products from prairie-based agriculture

The Foundation will work with outside experts to prioritize proposals based on how well they fit in with the results chains and priorities identified in this plan. Success of funded projects will be evaluated based upon success in implementing proposed activities and achieving anticipated outcomes. As part of each project's annual (for multi-year awards) and final reports, individual grantees will provide a summary of completed activities and key outcomes directly to NFWF. These would likely include outcome metrics identified at the initiative scale.

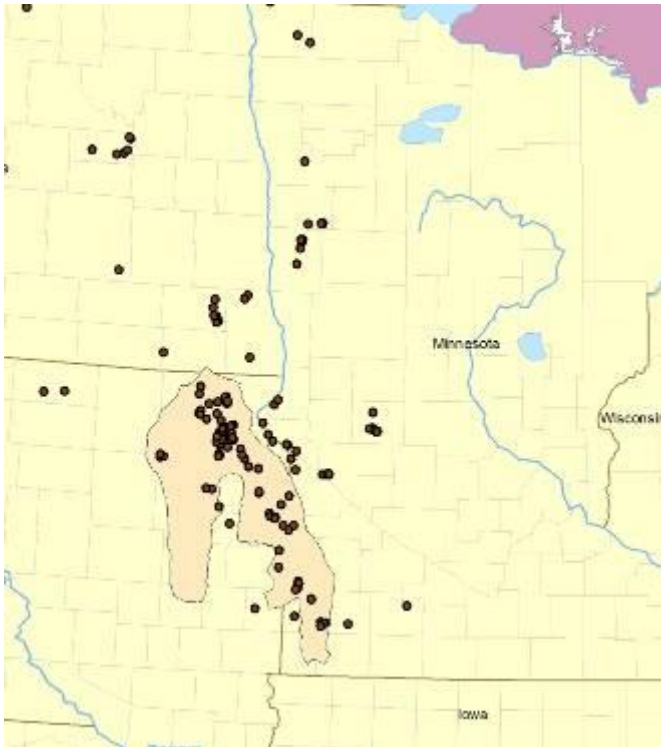
Periodic expert evaluation of all investments funded under this initiative will occur and will help grantees to monitor key indicators to ensure that data across individual projects can be scaled up to programmatic and initiative levels. Findings from monitoring and evaluation activities will be used to continuously learn from our grant making and inform future decision-making to ensure initiative success. The success of this plan would ideally be measured by changes in prairie health and the increased viability of priority

prairie species. However, populations may not respond quickly to some of these activities. Activities remain to be described that will allow the Foundation and others to monitor the success of these activities in achieving the conservation goals described above.

Appendices

The Dakota skipper and Poweshiek skipperling are restricted primarily to tallgrass prairie habitats throughout the northern Great Plains and populations for both species are concentrated around Prairie Coteau grasslands (maps from Selby 2005, and Delphey 2009).

Dakota skipper



Poweshiek skipperling

