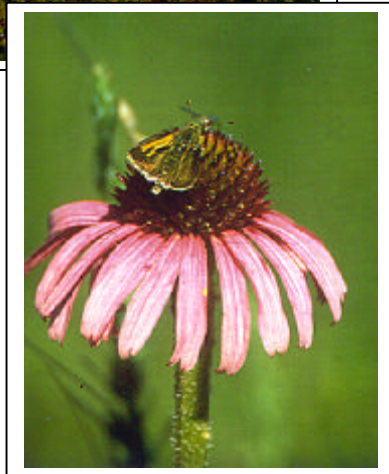


Ecoregional Planning in the Northern Great Plains Steppe



Northern Great Plains Steppe
Ecoregional Planning Team
February 4, 1999

Ecoregional Planning in the Northern Great Plains Steppe



Northern Great Plains Steppe Ecoregional Conservation Team

February 5, 1999

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Cover photos courtesy of Hal Malde (top) and Dan Licht (middle, bottom).

Executive Summary

The conservation goal for the Northern Great Plains Steppe ecoregion is to maintain the long-term viability of all native plant and animal species and examples of all natural communities across their natural ranges of occurrence and variation within the ecoregion, and maintain the natural processes critical to ensuring long-term ecological integrity.

The Northern Great Plains Steppe ecoregion encompasses approximately 250,000 square miles (an area about one and half the size California) and includes parts of five states and two Canadian provinces: Montana, Nebraska, North Dakota, South Dakota, Wyoming, Alberta, and Saskatchewan. The ecoregion's landforms include till and sedimentary plains, eroded badlands, scattered buttes, and island mountain ranges. The vegetation is dominated by mixed-grass prairie, but extensive areas of coniferous woodlands, wetlands, riparian forests, and shrub steppe are also well represented.

Historic and current land use practices have significantly impacted many native species in the ecoregion. Bison and other large herbivores have been extirpated across much of the Great Plains since the 1870's, as have a number of large predators. More recently other grassland species have begun to demonstrate widespread declines, most notable are endemic Great Plains birds which have shown steeper and more consistent declines than any other group of North American species. In the Northern Great Plains Steppe about 60% of the natural vegetation remains intact. The majority of the intact vegetation is located in the western two-thirds of the ecoregion, where landscapes spanning across millions of acres represent perhaps the most intact grasslands in North America.

Planning efforts in the ecoregion were affected by limited data availability from the Natural Heritage Program Network. To address the data gaps planning efforts relied heavily on other sources of information (expert opinion, published literature, satellite imagery, rapid ecological assessments).

The Northern Great Plains Steppe Ecoregional Plan identified 42 primary species, 18 secondary species, 323 natural communities, and two general aquatic communities as targets of conservation. A portfolio consisting of 116 sites was assembled that encompasses approximately 30 million acres (18.5% of the ecoregion). Established goals were fully met 37.5% of primary species targets and 20% of natural communities (ecological complexes). Failure to meet the goals was often due to a general lack of data for specific targets. Outside of the portfolio sites the plan also recognized the critical importance of the ecological context within which the sites occurred. This context (termed the ecological backdrop) consists of the remaining natural vegetation occurring in the ecoregion, which together contribute to the functionality of natural processes, serve to maintain habitat linkages between portfolio sites, buffer sites from incompatible uses, and from which additional portfolio sites may be added as we learn more about the ecoregion.

Much of the portfolio is being maintained by existing land management practices; however, significant threats persist that could either destroy or significantly degrade sites and their conservation targets. Considering the size of the ecoregion and the scale at which conservation will need to occur in order to be successful, the Conservancy will need to strengthen existing partnerships and more effectively reach-out to stakeholders in the ecoregion. A mix of site-based and cross-cutting strategies will need to be employed, with priority placed on those sites with the highest biodiversity values and greatest threat.

Chapter 1:

Ecoregional Planning and the Northern Great Plains Steppe

1.1 BACKGROUND

1.1.1 Introduction

In November 1995, The Nature Conservancy laid out its organizational vision in Conservation by Design: A Framework for Mission Success (The Nature Conservancy 1996a). As set out in that framework, the Conservancy recognized that above all, it “*must identify goals and strategies that generate the greatest conservation impact in the shortest possible time.*” These goals and strategies will both lead the way and provide benchmarks for measuring progress toward mission success.

The Conservancy’s conservation goal is “*the long-term survival of all viable native species and community types through the design and conservation of portfolios of sites within ecoregions.*” The targets of the organization’s conservation work which will enable fulfillment of this goal are “*all viable native community types and all viable vulnerable native species.*” Within each ecoregion, the Conservancy will identify the species and natural communities which will be the targets of conservation action, and develop a portfolio of sites which collectively conserves these targets, both rare and representative. Long-term viability will be ensured by protecting “*multiple, viable or recoverable occurrences*” of targets and conserving or restoring the ecosystem patterns and processes they need to survive.

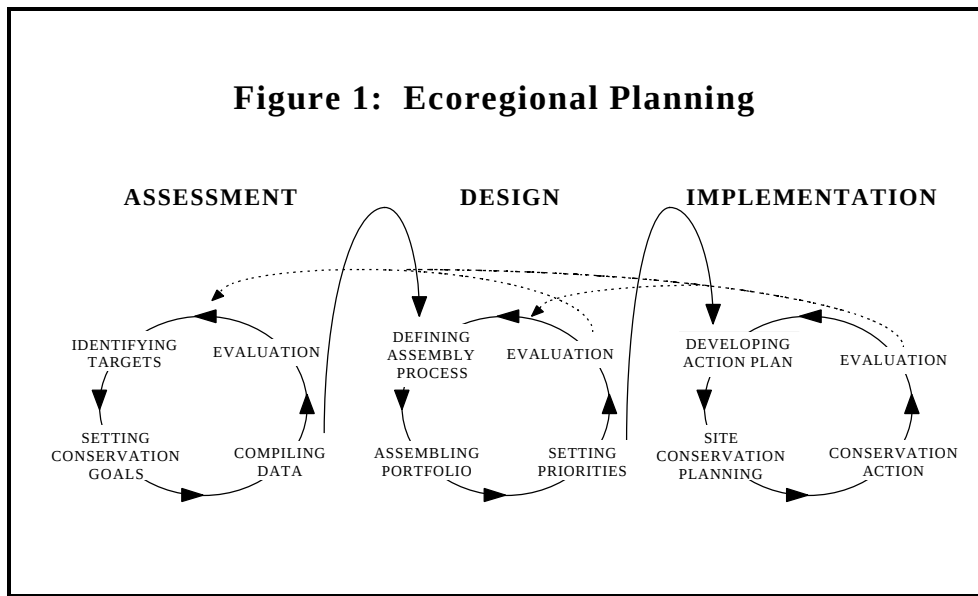
Preferred conservation strategies will achieve the Conservancy’s goal and mission by focusing on “*high-quality sites that simultaneously conserve multiple, unprotected targets,*” and giving preference to “*sites that hold greatest promise for long-term sustainability.*” These strategies are hypotheses as to what will provide maximum return on conservation investment and reap long-term success in conserving the full array of biodiversity in an ecoregion. As information improves and conservation strategies are found wanting, the strategies must change. Responding effectively to a shifting target is at the heart of adaptive ecosystem-based management, and the Conservancy’s new conservation framework seeks to make the organization more adaptive to change.

The use of ecoregions (large geographic areas with similar climate and landform) as planning units will ensure that targets are addressed within an ecological context. The Conservancy has identified ecoregions, largely adapted from Bailey (1995), that will provide structure for ecoregional planning in the United States (The Nature Conservancy 1996b). Ecoregion units for the Canadian Plains tentatively have followed those delineated by the Ecological Stratification Working Group (1995) until formal boundaries are adopted by the Conservancy.

It should be pointed out here that although this is the approach the Conservancy has chosen to address biodiversity conservation, it may not encompass all that could be done to protect biodiversity. Other approaches by other management and conservation agencies/organizations will undoubtedly enhance biodiversity conservation well beyond what is laid out in this report.

1.1.2 The Structure of Ecoregional Planning

In the Northern Great Plains Steppe, ecoregional planning was conceptualized as occurring in three principle stages: Assessment, Design and Implementation (Figure 1). Each stage was envisioned as an ongoing iterative process within a larger effort that through time is refined as new information becomes available. Additionally, each is not exclusive of the others and all may be operating simultaneously.



Assessment has as its goal the identification of conservation targets, setting viability guidelines and conservation goals for those targets, and assembling of the base data required for portfolio design (see Chapter 2).

Design is the process of assembling and prioritizing a suite of sites that most efficiently and sustainably captures an ecoregion’s biological diversity. Inherent within this stage is the development and adoption of a process for assembling the portfolio. Science will provide the key insights for designing a portfolio that will ensure species and community viability (see Chapter 3). Also included within this stage is the prioritization of portfolio sites for conservation action.

Implementation, in its purest sense, is the execution of an action plan to address the long-term protection of biodiversity in the ecoregion and to prioritize and fill data gaps for critical future iterations (see Chapter 4 and 5).

1.2 The Northern Great Plains Steppe

1.2.1 The Northern Great Plains Steppe Conservation Goal

The Conservancy’s conservation goal for the Northern Great Plains Steppe is the long-term survival of all viable native species and community types occurring within the ecoregion. We will contribute to this goal by:

- ✍ designing a portfolio of sites that, when conserved, will serve to maintain this biodiversity over the long term; then
- ✍ identifying and implementing the strategies needed to conserve those sites.

1.2.2 An Ecological Description of the Ecoregion

The Northern Great Plains Steppe ecoregion stretches north-south from just north of the Saskatchewan River in south eastern Alberta, south to the North Platte River in Nebraska and east-west from the central Dakotas to the Rocky Mountains of Montana (Figure 2). The ecoregion covers parts of five U.S. states and two Canadian province and lies on the northwestern corner of the Great Plains. In all, the ecoregion encompasses approximately 250,000 square miles (nearly 322,000 km²) or 19.7 percent of the Plains. The United States portion of the ecoregion is composed of four ecoregion sections from the Great Plains-Palouse Dry Steppe (Bailey 1995): Northwestern Glaciated Plains Section (331D), Northern Glaciated Plains Section (331E), Northwestern Great Plains Section (331F), Powder River Basin Section (331G). In Canada, the ecoregion encompasses the mixedgrass ecoregion in Saskatchewan and the dry mixedgrass subregion in Alberta.

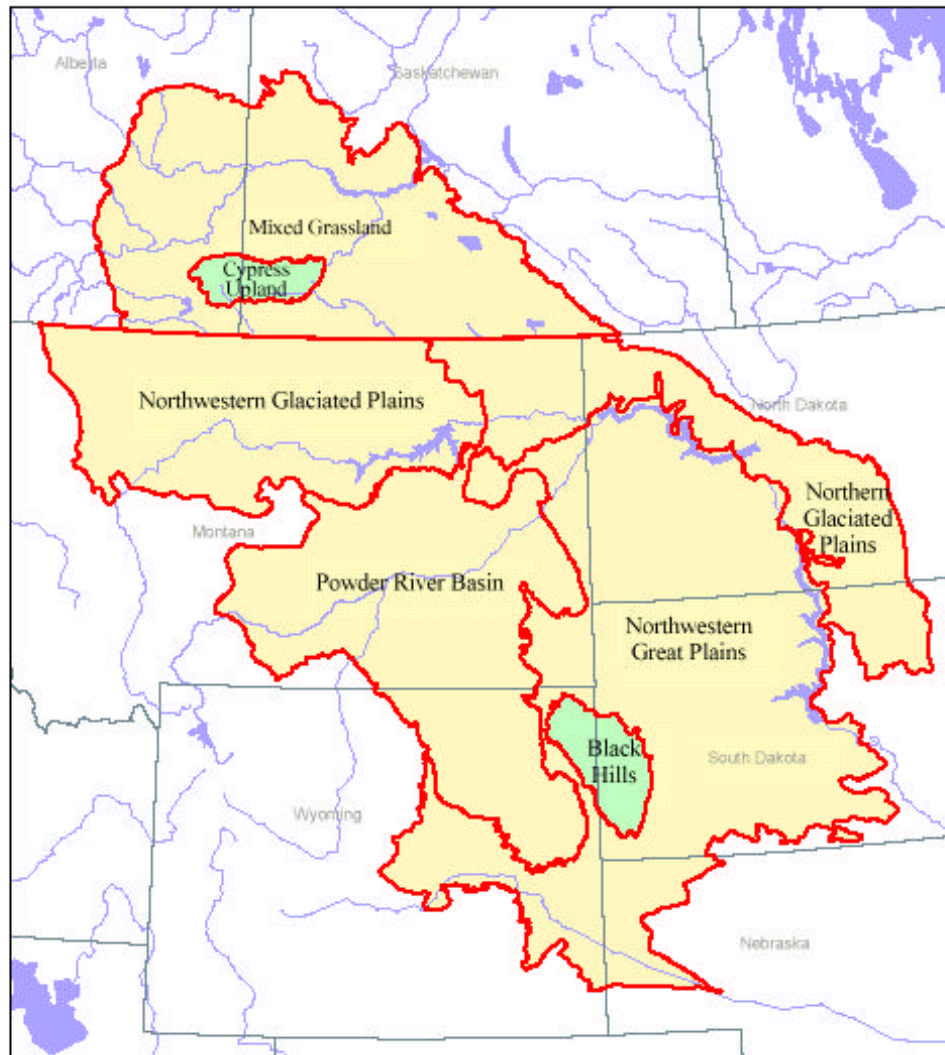
The Northern Great Plains Steppe encompasses a variety of landforms and soils. Continental glaciation shaped much of the Northwestern Glaciated Plains and Northern Glaciated Plains sections. Landforms in these sections are generally characterized as level to rolling till plains and areas of kettles, kames and moraines (McNab and Avers 1994). Soils are predominantly frigid Borolls, Ustochrepts, Natriborolls and Orthents derived largely from glacial till. The Northwestern Glaciated Plains also encompasses several island mountain ranges, most notably the Little Rockies, Bear's Paw, and Highwood Mountains, which attain elevations over 7,000 feet. The Northwestern Great Plains and Powder River Basin Sections are predominantly gently sloping to rolling, dissected plains with scattered buttes and badlands. Principle soil types are mesic and frigid Borolls, Ustolls, Orthents, Orthids, Argids and Fluvents derived from Cretaceous and lower-Tertiary marine and non-marine sedimentary rocks.

Mixedgrass prairie is the dominant vegetation type in the ecoregion, with western wheatgrass (*Pascopyrum smithii*), northern wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), green needlegrass (*Nasella viridula*), blue grama (*Bouteloua gracilis*), and needle-and-thread (*Stipa comata*) as dominant species. Bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. *spicata*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), Sandberg's bluegrass (*Poa secunda*) and thread-leaved sedge (*Carex filifolia*) may become locally abundant (Watts 1960, Kuchler 1964, Coupland 1992, Achuff 1994, McNab and Avers 1994). Ponderosa pine (*Pinus ponderosa*) woodlands are common in portions of the Northwestern Great Plains and Powder River Basin Sections. Additionally, extensive areas of shrub steppe, coniferous woodlands, riparian forests, hardwood draws, and wetlands are found in the ecoregion.

1.3 Trends in Biodiversity

Although human population densities are sparse in the ecoregion, the area plays a critical role in the United States' and Canada's agricultural and energy production. As a result, irrigated and dryland cultivation, together with coal, gas, and oil extraction have significantly impacted the natural systems of the ecoregion over the last 100 years. Today, about 60% of the ecoregion remains in natural or semi-natural vegetation. Level of disturbance and conversion to agricultural land uses (cropland, hayland, or tame pasture) differs by ecoregional section in the United States and by province in Canada. In the United States, the Powder River section has been the least impacted by agricultural conversion (ca. 20%), whereas approximately 70% of the Northern Glaciated Plains section has been altered. The Canadian prairie is among the most intensively developed landscapes in the world (Coupland 1973). Of the arable acres, 81% has been cultivated, and at least 70% of the native prairie has been lost to cultivation, roads,

Figure 2
Northern Great Plains Steppe Ecoregion



- Ecological Section Boundaries
- Excluded from the Ecoregion
- Within the Ecoregion



50 0 50 100 Miles



Montana
Natural Resource
Information System

1515 East 6th Avenue
Helena, MT 59620
(406) 444-0835
Map 10/8/98

urbanization and other factors. Approximately 61% of the prairie in Alberta has been converted, whereas greater than 80% has been destroyed in Saskatchewan (Samson and Knopf 1994).

Historic and current land use practices have significantly impacted many native species in the ecoregion. Bison, once the most significant herbivore on the Plains, has been extirpated from the wild. Black-tailed prairie dog (*Cynomys ludovicianus*), an important herbivore and keystone species on the western Great Plains, has declined by an estimated 98% since European settlement (Knopf 1996). The black-footed ferret (*Mustela nigripes*) is considered the rarest mammal in North America, with declines attributed to the reduction in prairie dogs and introduction of canine distemper (Finch 1992). Grassland birds have shown steeper, more consistent, and more geographically widespread declines than any other behavioral or ecological grouping of North American species (Knopf 1996). Examples of declining birds in the Northern Great Plains Steppe include mountain plover (*Charadrius montanus*) and Sprague's pipit (*Anthus spragueii*).

Based on information from state and provincial Heritage Programs, 34 species are considered globally imperiled in the Northern Great Plains Steppe. Of these, 10 species are listed as threatened or endangered and four species are proposed for listing under the United States Endangered Species Act.

1.4 Ecoregional Planning Team History

The Northern Great Plains Steppe Ecoregional Conservation Team (Team) was initially organized in October 1996 and expanded in the following months. The Team consisted of representatives from each state and provincial Natural Heritage Program and Nature Conservancy Field Office in the ecoregion, and the Great Plains Program. The Team members included: Brian Martin (Assessment Team Leader, MTFO), Lorna Allen (AB NHI), Steve Cooper (MT NHP), Jerry Freilich (WYFO), Bonnie Heidel (MT NHP), George Jones (WY NDD), Marlon Killaby (SK CDC), Darla Lenz (ND NHI), Dave Ode (SD NHDB), Wayne Ostlie (GPP), Andy Schollett (Dakotas FO), and Doug Whisenhunt (NEFO).

Chapter 2:

Ecoregional Assessment

2.1 The Assessment Process: Approach and Rationale

As stated previously, ecoregional planning in the Northern Great Plains Steppe consisted of three distinct stages. Assessment was the stage where conservation targets were identified, target viability guidelines and conservation goals set, and data critical to the process compiled. Information from this stage was used in the design stage to assemble a portfolio of sites and determine what further actions were required.

It was recognized at the initiation of the assessment stage that planning efforts in the Northern Great Plains Steppe would be significantly affected by the lack of Natural Heritage Data Network information. Relative to adjacent areas, there have been few in-depth biological inventories for natural communities or rare species completed in the northern Great Plains by Natural Heritage Data Network staff or other biologists. This dearth of inventory information is perhaps greatest in the Northern Great Plains Steppe ecoregion. For example, the Conservancy's National Terrestrial Community Classification identified at least 323 distinct natural community types within the ecoregion (occurring within 154 alliances), but only about 1,000 occurrences representing these community types have been documented by the Heritage/CDC Network within the ecoregion. Similarly, fewer than 1,000 occurrence records existed for primary conservation targets in the ecoregion. As a result, the Team identified early in the process the need to compile and create additional information to supplement Heritage/CDC Network data.

2.1.1 Information Management

A Geographic Information System (GIS) environment was identified early in the planning process as the most efficient and flexible means of conducting ecoregional assessments and analyses. The system helped clarify the relationships between species and natural community locations, land management, conservation sites, landscapes and other pieces of the biodiversity puzzle. In addition, the ability to create and easily revise informative maps and coverages proved absolutely essential in moving the process along rapidly and in a time-efficient manner. Electronic GIS coverages, data bases and reports generated from data bases were the primary products required to initiate the design stage. GIS products were produced by Ed Madej through a contract with the Montana Natural Resource Information System.

2.2 Assessment Information Sources

The ecoregional Team utilized four primary sources of information to complete the assessment stage, Heritage/CDC element occurrences, rapid ecological assessments, expert workshops, and published literature. These data sources served as the foundation of the assessment process and ultimately the portfolio design. Each of these data sources is described in detail below.

2.2.1 Natural Heritage/CDC Network Data Base

As a first step in the assessment process, it was imperative that an element occurrence data set be assembled from each of the Natural Heritage and Conservation Data Center programs in the ecoregion. Prior to ecoregional planning in the Northern Great Plains Steppe, a multi-state/province Great Plains element occurrence data base had been assembled by the Conservancy's Midwest Regional Office for use by the Great Plains Program. An ecoregional subset of these data was clipped for use by the Northern Great Plains Steppe Ecoregional Team to conduct analyses and construct pertinent data layers. This data set was instrumental in identifying conservation targets and their locations within the ecoregion.

As noted above, relatively limited Heritage/CDC Network data existed for natural communities or species in the ecoregion. Beyond this, there were other limitations associated with the Heritage/CDC Network data. Much of the element occurrence data was poorly distributed geographically across the ecoregion, frequently being concentrated around select managed areas (i.e. Badlands National Park, Little Missouri National Grasslands) (Figure 3). Also, a comprehensive natural community classification had not been developed for many of the states and provinces, leaving in doubt the reliability of the list of communities generated for the ecoregion. It was expected that a number of natural communities were not included, especially for the Canadian portion of the ecoregion which has received limited inventory. Conversely, it is also likely that duplicate associations exist, but are not recognized due to differing nomenclature between states/provinces.

2.2.2 Landscape Analysis

Rapid Ecological Assessments (REAs) have been employed by programs of the Latin American Conservation Data Centre Network to inventory vast areas for rare species and natural communities over short periods of time at low cost. The Northern Great Plains Steppe Team fashioned its inventory efforts after this successful model. The goals of the inventory were to identify the natural communities within the context of identified landscapes, describe their location, extent, and condition, and record current and potential sources and scope of disturbance. The resulting information was at a scale coarser than that used by Heritage/CDC Programs to create element occurrence records, but more detailed than the information generally available through the USGS GAP Analysis vegetation cover layers for the ecoregion.

Due to the large size of the ecoregion and limited financial resources, REAs focused on landscapes, defined as large, relatively intact areas of predominantly natural vegetation. Portions of the ecoregion highly fragmented by agriculture and other land uses were not inventoried. Landscapes within the United States and southern Canada (approximately 60 miles north of the 49th parallel), had been previously identified through a contract with Dr. Larry Tieszen, Augustana College (performed at EROS Data Center in Sioux Falls, SD). Thematic Mapper (TM) satellite imagery was utilized to visually delineate polygons (mapped areas synonymous with landscapes) of relatively unfragmented lands. Initially, these polygons were identified for assessment only if they were at least 50 square miles in size and at least 80% natural or semi-natural vegetation (i.e. not agricultural, mining, or urban lands). The minimum area was reduced to 25 square miles in the Northern Glaciated Plains section because of extensive conversion of natural communities for agricultural uses. From this mapping effort, 208 landscapes meeting these criteria were identified within the ecoregion, ranging in size from approximately 25 square miles to over 1,500 square miles (Figure 4). Using the same landscape delineation criteria, the Saskatchewan Conservation Data Centre identified additional landscapes in the province (north of the imagery coverage noted above) using TM satellite imagery. In Alberta, landscapes had been mapped and inventoried in the early-mid 1990s (Alberta Environmental Protection Natural Resources Service 1997), therefore, rapid ecological assessments were not conducted in the province.

Rapid Ecological Assessments were conducted by Natural Heritage Program and Conservancy staff, and independent contractors from June through October 1997. Because of the number of identified landscapes, the large amount of land to be inventoried, and the short time allotted for completion, inventory within a given landscape was often restricted to public lands. The added time required to gain permission to access privately-owned lands made inventory of these lands inherently difficult. In areas of predominantly private lands, sampling was restricted to observation along public roads. Survey routes were identified on 1:100,000-scale maps prior to sampling and were designed for complete geographic coverage of each landscape; however, lack of access resulted in uneven inventory in some landscapes or portions thereof.

Figure 3
Element Occurrences of Primary Conservation Targets

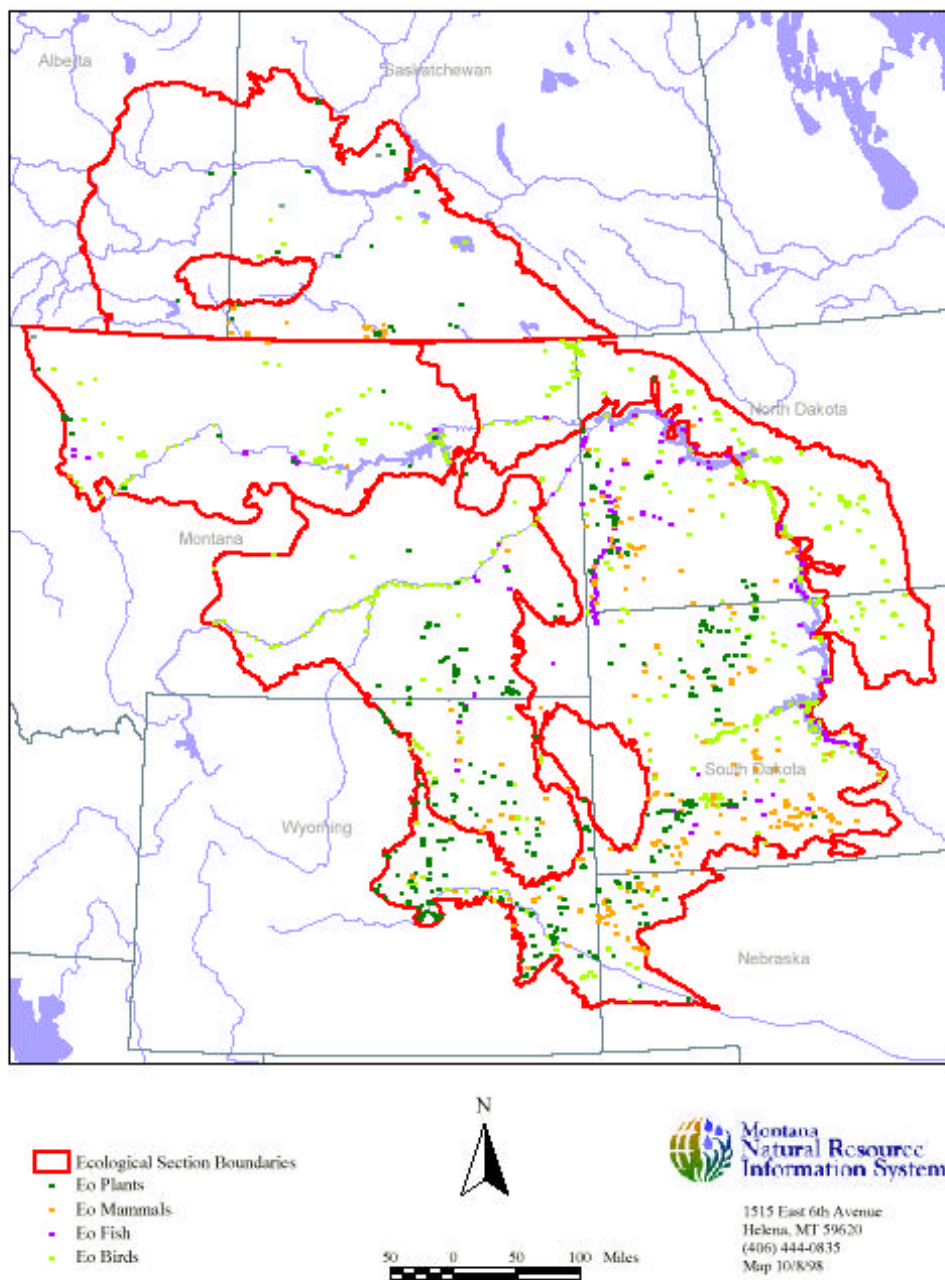
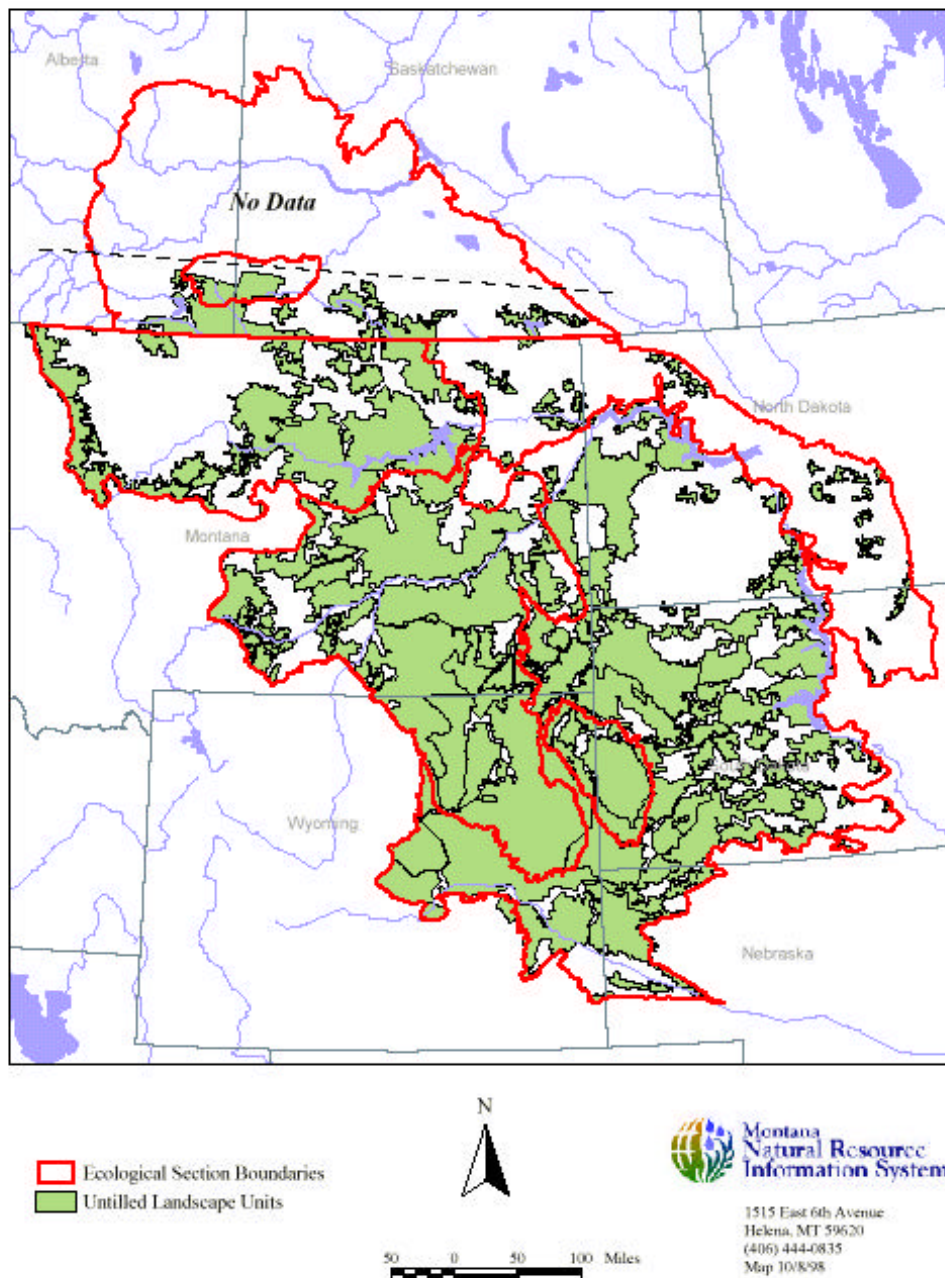


Figure 4
Untilled Landscapes of the United States
and Portions of Southern Canada



Natural communities within each landscape were identified at the association level using two different reconnaissance approaches. The first consisted of selectively establishing stopping points along survey routes. At each stopping point, the ecologist noted plant species composition of the vegetation types present by quickly walking through the area. Efforts were made to disperse the stopping points evenly across the landscape, as access allowed, with at least 10 points per landscape. During the inventory, additional points were added in some landscapes to capture geographically-restricted communities. The second approach utilized “windshield surveys” in which a continuous road log was used to document the natural communities along stretches of the sampling route. This sampling approach was utilized most extensively in the Powder River section, the most vegetatively intact of the ecoregion. In this approach, ground-truthing of the windshield surveys was limited, and ecologists with considerable field experience relied on identification skills and information from previous on-the-ground work in the area. In both sampling approaches, natural communities were identified using dominant plant species, or the anticipated dominants for degraded communities. The communities were then cross-referenced with the existing community classification and identified. Community types not previously identified in the classification were noted and recorded as potentially new types requiring additional inventory and description.

In addition to the identity of natural communities, ecologists recorded other pertinent biotic and abiotic information, including presence of rare species, presence and abundance of exotic plant species, and current or potential disturbances. These disturbances were characterized in two ways on the sampling forms: (1) by type (e.g. mining, exploration and development of oil and gas), and (2) by extent (percentage of the landscape impacted). A short description of the threats was also given. In addition, each landscape was assigned a cropland conversion rating, which was a subjective evaluation of the potential for private lands now in natural vegetation to be converted to cropland. Also, the quality of the natural communities and the ratings noted above were used to assign a preliminary conservation significance rating. Conservation significance is considered a very preliminary rating, since a limited area of each landscape was inventoried. Recognizing that high quality examples of natural communities are not restricted to the highest rated landscapes, ecologists also identified geographic areas or specific locations of high quality natural communities within landscapes as “outstanding sites”. Complete description of each of the landscapes sampled in the United States and corresponding biotic and abiotic information is available in Natural Community Inventory Within Landscapes of the Northern Great Plains Steppe Ecoregion of the United States (Martin et al. 1998).

2.2.3 Experts Workshops

Expert workshops were one of the earliest replicated successes reported for ecoregional planning (i.e. Arizona-New Mexico Mountains and Columbia Plateau ecoregions). Expert workshops were identified as a key opportunity to roll-out the ecoregional conservation approach and also create partner buy-in through solicitation and incorporation of information provided by participants. Although the planning process in the Northern Great Plains Steppe had progressed further than other ecoregions where experts workshops had been utilized, the Team recognized the opportunity and need to gather additional information and engage partners. Workshops were identified as a means to receive feedback and supplement existing biological data for conservation targets, identify and rank best potential conservation sites for conservation targets, and identify data gaps and research needs.

Expert workshops were held in Billings, MT (Feb. 10-11, 1998), Fargo, ND (Feb. 13), Regina, SK (Feb. 16), Calgary, AB (Feb. 17), and Rapid City, SD (Feb. 19). Multiple workshops were held across the ecoregion to facilitate expert participation (reducing travel and time) and ensure that good geographic representation was achieved. In total, over 160 experts attended the workshops. At the workshops, experts were divided into 4 working groups based on their taxonomic or community expertise (birds, fish-

herptiles-invertebrates, mammals, plants-natural communities). Experts provided feedback on the targets list, identified new occurrences for targets, and completed occurrence identification forms. Sites were delineated at each workshop utilizing the information synthesized by the experts. Experts also provided insights on appropriate boundary locations for each of the sites. Threats, conservation targets, and species targets recommended by experts were summarized for each site identified.

Several positive outcomes were achieved as a result of the workshops. First, additional information was collected on the location, viability, and significance of primary conservation targets. Second, numerous species were identified as important secondary target species. Third, a composite map of “expert sites” (Figure 5) was generated that would provide valuable insights during the portfolio assembly process. Fourth, threats were identified for each of the sites. Finally, the workshops provided an opportunity to introduce participants to the Conservancy’s approach to ecoregional conservation. This introduction has the potential to jumpstart ecoregional conservation approaches where the Conservancy has had minimal activity (much of the ecoregion), especially with public land partners.

2.2.4 Published Literature

An extensive literature search was beyond the capacity of this planning effort; however; the assessment and portfolio design stages benefited immensely from published planning efforts in Alberta. The Team utilized the report, The Grassland Natural Region of Alberta (Alberta Environmental Protection Natural Resources Service 1997), extensively for planning information associated with the province. Additional data sources were also consulted for species information or geographic areas to identify locations of species (e.g. endangered species recovery plans).

2.3 Products for Portfolio Assembly

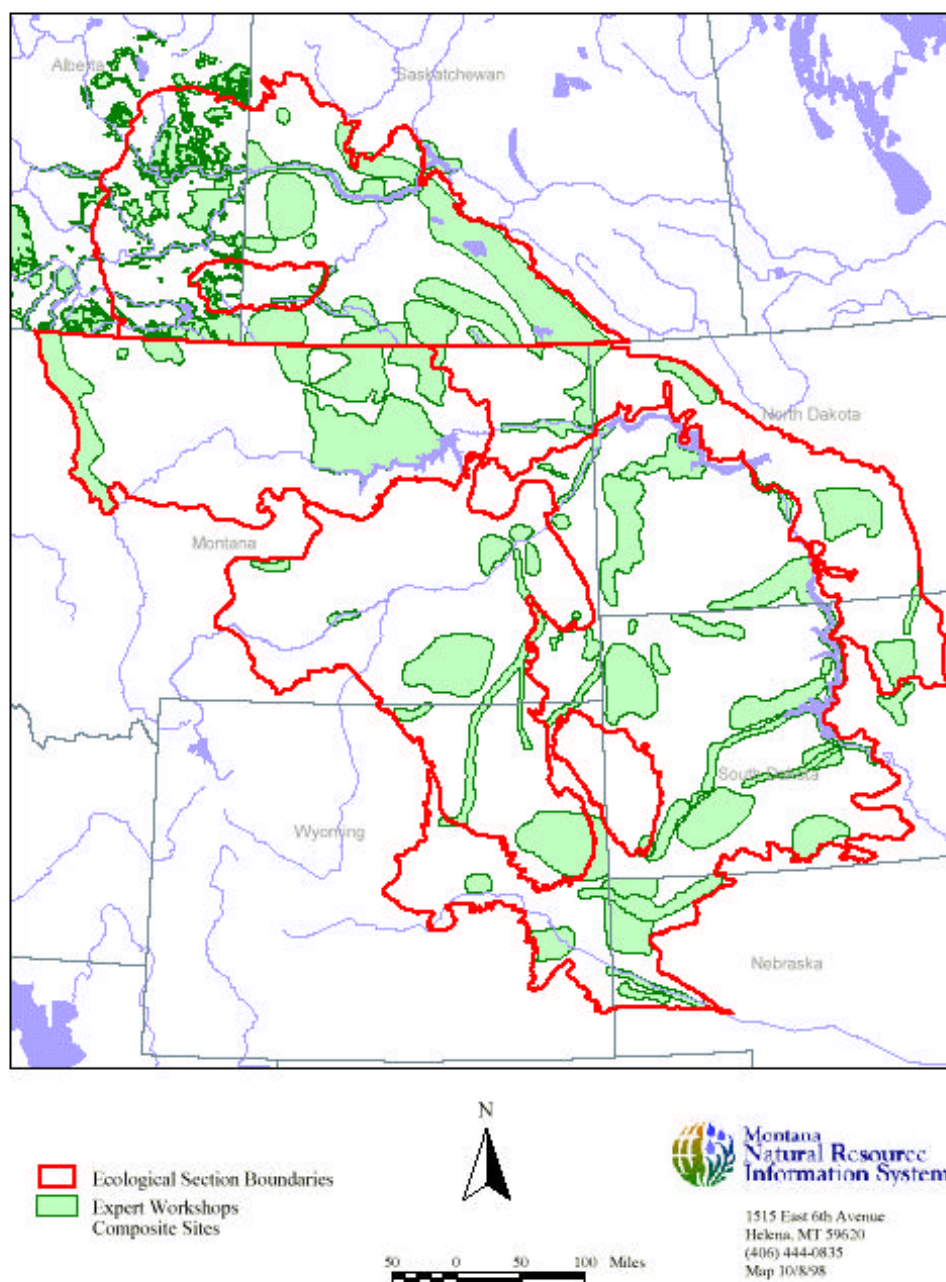
Numerous products critical for the portfolio assembly process (see Chapter 3) were generated from the information sources described above. The products described below are depicted in a linear framework to aid in understanding the planning process; however, product development actually evolved in a non-linear fashion.

2.3.1 Conservation Targets

Traditional conservation targets employed by The Nature Conservancy have included those species and communities considered to be globally imperiled (ranked G1-G3). However, the goal of Conservation by Design (The Nature Conservancy 1996a) is the protection of *all* species, both common and rare. Conservation action for rare species is feasible on a species by species basis, but this approach is not effective for the extraordinarily high number of other, more common species found in an ecoregion. Instead, by protecting a sufficient number of viable examples of each natural community type in the ecoregion, it is assumed that all common species will also be protected. This, in essence, is the full application of the coarse filter/fine filter approach to conservation and is the backbone of Conservation by Design. Because this assumption (i.e., that the protection of all natural community types across their full range of variability will sufficiently encompass all common species as well as those species that are not well known) carries risks, it is imperative that the final portfolio be tested to ensure this assumption.

Once targets had been identified, they were separated into two categories (primary or secondary targets) to delineate the role they would play in the assembly of the ecoregional portfolio (see Section 3.2.1).

Figure 5
Expert Workshops Composite Sites



Primary targets, because of their imperiled nature (G1-G3 species) or their dominant role as a coarse filter in the ecoregion, warrant special consideration. Secondary targets, although important to the integrity of the portfolio design as a whole, are less characteristic of the ecoregion (species largely peripheral to the ecoregion) or less imperiled and more likely to be captured within the coarse filter (G4-G5 species in decline or identified to test the adequacy of the coarse filter). As such, their role in the ultimate shaping of the portfolio design will be less significant than those of primary targets.

Species

Primary species targets (the fine filter) in the Northern Great Plains Steppe included all imperiled taxa (ranked G1-G3, T1-T3) and those listed or candidates for listing by the U.S. government with at least one occurrence in the ecoregion. Analyses of Heritage/CDC element occurrence data identified 42 imperiled species meeting this criteria (Appendix 1). Extirpated species were not considered as targets.

Some relatively common (G4-G5) species inhabiting the ecoregion were identified as secondary targets (Appendix 2). Species included in this list centered on those that were:

- ≡ exhibiting consistent, long-term, rangewide declines, or
- ≡ area-dependent species, or
- ≡ endemic to the ecoregion.

Because it was felt that the use of natural communities as a coarse filter largely was an untested assumption, additional common species from an array of taxonomic groups and with varying habitat needs were identified for inclusion to the secondary species list.

Natural Communities

All 323 terrestrial natural community types identified as occurring in the ecoregion were considered conservation targets. These terrestrial natural plant community types were taken from a natural vegetation classification system developed by the Conservancy and its Heritage/CDC partners (Faber-Langendoen 1996, Grossman 1998).

In response to the paucity of Heritage/CDC data for natural community associations or alliances in the Northern Great Plains Steppe, the Team adopted surrogates for natural community associations, referred to as “ecological complexes”. Ecological complexes were defined largely from the National Natural Community Classification, and represented taxonomically-related associations and alliances, or easily identified (ecologically) assemblages of natural communities (i.e. riparian types) that could be incorporated in landscape-based conservation action (Appendix 3). Thirty-four ecological complexes were identified by the Team. For ease of organization, the ecological complexes were placed in vegetation or geomorphic aggregates (i.e. forest/woodland, wetland). Note that for sandhills, badlands, and tallgrass prairie that there was only a single ecological complex (Table 1).

Ecological complexes were assigned a characteristic size class (small, medium, and large) that is analogous to patch size developed for the Northern Appalachians ecoregion (small patch, large patch, matrix) (Anderson 1997) and used extensively elsewhere (e.g. The Northern Tallgrass Prairie [The Nature Conservancy 1998a]). This helped the Team better understand the spatial pattern and scale of each of the units, and how to determine appropriate size of sites required to sustain the ecological complexes.

Table 1. Northern Great Plains Steppe Ecological Complexes.

<u>Ecological Complex</u>	<u>Size</u>	<u>Ecological Complex</u>	<u>Size</u>
Wetland		Tallgrass Prairie	M
• Pothole	S		
• Lake	M	Mixed-grass sod	
• Alkali/Saline	M	• Prairie sandreed	S
• Fen	S	• Western wheatgrass	L
• Playa	S	• Northern wheatgrass	L
		• Needlegrass	L
Wooded Draw		Mixed-grass bunch	
• Shrub	S	• Idaho fescue	M
• Deciduous	S	• Rough fescue	L
• Deciduous-coniferous	S	• Bluebunch wheatgrass	M
		• Little bluestem	S/M
Riparian			
• Herbaceous	S		
• Shrub	S		
• Cottonwood	M		
• Deciduous-Coniferous	S		
Sandhills	M/L		
Badlands	L		
Forest/Woodland			
• Deciduous	S		
• Low elevation coniferous	L		
• High elevation coniferous	M		
Shrublands			
• Big sage	M		
• Basin big sage	S		
• Bird's foot sage	S		
• Black sage	M		
• Mountain mahogany	M		
• Nuttal's saltbush	M		
• Greasewood	M		
• Silverberry	S		
• Creeping juniper	S		

Aquatic Communities

Two general targets were selected as surrogates to capture aquatic communities in the ecoregion, large high-quality riverine aquatic communities (large was defined as first order streams) and small, high-quality riverine aquatic communities (small was defined as second and third order streams). The team made the assumption that representative communities were most likely to be captured from streams or segments of streams that were hydrologically intact (i.e. retaining all or most of the natural flow and flooding regimes). Only riverine communities were considered since wetland and lake aquatic communities had been addressed through wetland ecological complexes (pothole, alkali/saline, lake, fen, playa).

General hydrologic information and fish assemblages were used extensively to identify high-quality riverine aquatic communities. Fish were the only species utilized to evaluate streams due to the paucity of information for other aquatic species. Heritage/CDC Data Network provided data for many of the rare fish species, which was particularly useful in evaluating stretches of the Missouri River and other large rivers. Expert opinion (solicited at expert workshops) served as the primary source of information regarding high-quality streams; however, information was restricted almost exclusively to first order streams, leaving a substantial data gap for second and third order streams.

2.3.2 Information Confidence Levels

As noted above, several different data sources (Heritage/CDC Network, rapid ecological assessments, experts, and literature) were used during the assembly stage. Recognizing the variability in the rigor of this information, confidence levels (high, medium, low) were subjectively assigned to each conservation target occurrence selected. Only targets with a high or medium level of confidence were considered for portfolio assembly to ensure that the portfolio was constructed from the highest quality occurrences and future conservation efforts would focus on the best sites. Confidence levels were defined as:

- High: The presence of a target occurrence had been documented, with good information on its quality and geographical extent (i.e. Heritage EOs).
- Medium: The presence of a target occurrence had been documented or reported by reliable sources (i.e. rapid ecological assessments or experts), but overall quality and extent of the occurrence was not known.
- Low: A target occurrence was suspected to occur in an area, but has not been documented in the field or reported through a reliable source (i.e. experts).

2.3.3 Viability Assessment

Viability refers to the ability of a conservation target to persist over time (The Nature Conservancy 1996b). The goal of a viability assessment is to identify under what conditions a target occurrence is likely to remain extant over the long-term. The Conservancy and its Heritage/CDC partners use a methodology called Element Occurrence Ranking as a means of assigning viability estimates to target occurrences (see below). When available, Element Occurrence Ranking Specifications (EORANK SPECS) were used as the primary means of assessing the viability of target occurrences. These SPECS were developed in a global context and are based on a knowledge of historic evidence and current status, and include threshold values for assigning the viability of target occurrences. As such, EORANKs provided a succinct assessment of predicted viability based on condition, size, and landscape context (as discussed in the Conservancy's Element Occurrence Data Standard [The Nature Conservancy 1997]).

They enable a meaningful comparison of all occurrences of a given target across the ecoregion and throughout its range.

The element occurrence rank (EORANK) definitions are as follows:

- A = excellent predicted viability
- B = good predicted viability
- C = fair predicted viability
- D = probably not viable

For purposes of assessing target occurrence viability in the ecoregion, A-, B-, and C-ranked occurrences were considered viable. However, because C-ranked occurrences are at the lower margin of viability, only A- and B-ranked occurrences were used to meet established ecoregional conservation goals (see Section 2.3.4 below) and incorporated into the portfolio. Also, because of the large data gaps in the ecoregion and the high probability that other A- and B-ranked occurrences existed in the ecoregion. It was decided that the initial portfolio would be assembled with the most viable occurrences of each target possible.

The use of EORANKs as indicators of viability for conservation target occurrences in the Northern Great Plains Steppe was problematical. As with many facets of ecoregional conservation in the Northern Great Plains Steppe, viability assessment for species and natural communities were significantly affected by information limitations. Viability assessments for both species targets and ecological complexes (as surrogates for natural communities) were inhibited by three major factors: 1) population viability analyses and associated guidelines (as set in EORANK SPECS) were not available for most targets in the ecoregion, 2) Heritage/CDC data frequently lacked occurrence ranks (EORANKs), and 3) supplemental information lacked the rigor and systematic methodology used by the Heritage/CDC Network to effectively and consistently assign ranks to occurrences. Additionally, the new Conservancy data standard utilizing condition, size, and landscape context had not been applied to target occurrences, therefore, existing EORANKs were based on condition alone. Although it would have been preferable to apply EORANK SPECS to each occurrence in the ecoregion, the immense time sink, lack of funds, and other associated factors made this endeavor impossible.

To complete the viability assessment, the Team relied extensively on expert opinion of Heritage/CDC staff and other experts (solicited at expert workshops). Prior to selection of conservation targets to achieve the ecoregional portfolio, the Team ranked each of the known species occurrences using the EORANK SPECS criteria. The Team operated under the assumption that each of the selected species occurrences selected needed to have at least good predicted viability, the equivalent of a B-ranked occurrence. Viability of ecological complexes and aquatic communities was assessed during portfolio assembly. As with the species conservation targets, each ecological complex identified for meeting the ecoregional portfolio goal was evaluated using the EORANK SPECS criteria and needed to have at least a good predicted viability.

2.3.4 Ecoregion Conservation Goals

Conservation goals set both the number and geographic distribution of viable occurrences required for the long-term viability of each target species and community, both across the full range of the target (Rangewide Conservation Goals) and within the ecoregion (Ecoregion Conservation Goals). Ecoregion goals are based on rangewide goals, and as such, require an assessment of the ecoregion relative to the rangewide distribution of each target.

Species

Development and adoption of species goals closely followed planning efforts in the Northern Tallgrass Prairie and Central Shortgrass Prairie ecoregions. Species conservation goals were derived from three principle sources: federal recovery plans, expert knowledge, and general scientific principles for long-term viability. When federal recovery plans were available for a given species, guidelines suggested therein were assessed and generally followed. For many of the animal targets, expert opinion was used extensively. Expert workshops significantly contributed to the level of knowledge and allowed for comparisons between populations. For species for which little or no information was available, conservation goals followed conservation theory suggested for some larger vertebrate animals (i.e. 10 occurrences of 200 individuals [Cox et al. 1994]). This approach was frequently used for plants because of the lack of more definitive information. Goals for each species were also weighted based on the level of endemism within the ecoregion (Table 2).

Table 2. Conservation Guidelines for Species Targets.

Endemic Species: • Protect 10 viable occurrences within the ecoregion. Species occurring mostly within the ecoregion: • Protect 6 viable occurrences within the ecoregion. Species occurring mostly outside the ecoregion: • Protect 3 viable occurrences within the ecoregion. Peripheral species: • Protect 1 viable occurrence within the ecoregion.

Ecological Complexes

Goals for each ecological complex were developed on a section-by-section basis during portfolio assembly (Figure 6). This approach recognized that the vast geographic area encompassed by the ecoregion may result in different natural community representation within each complex. Goals were developed using an iterative process during portfolio assembly (Figure 7), largely derived from team expertise using the following criteria:

- historic prominence within the Section,
- degree of fragmentation,
- intactness of ecological processes or their restoration potential,
- degree of threat.

Three possible outcomes occurred through this process:

- the goal was not reached, i.e. more areas needed to be identified,
- the goal was reached,
- the goal was exceeded and sites were prioritized and lower quality areas were deleted.

The outcome of this process is presented in section 3.3.1.

Aquatic Communities

As with ecological complexes, goals for aquatic communities were established through an iterative process. At the portfolio assembly meeting, Team members established a goal of six large river systems with good geographic distribution across the ecoregion. This relatively modest goal was established in an effort to produce the most efficient portfolio. The Team believed this goal could capture all of the aquatic biodiversity in the ecoregion, due to the extensive area of intact, large riverine systems in the ecoregion (i.e. Yellowstone River, the largest unregulated river in the United States) and the relatively limited aquatic diversity in the ecoregion (compared with other portions of the continent).

A goal was not established and therefore no sites were selected for second and third order streams, due to a lack of information for this surrogate across most of the ecoregion. Numerous small stream systems were captured within landscape-based terrestrial sites, however, the streams were not identified as conservation targets in the sites. Future site conservation planning in landscape scale sites should consider small streams as potential conservation targets.

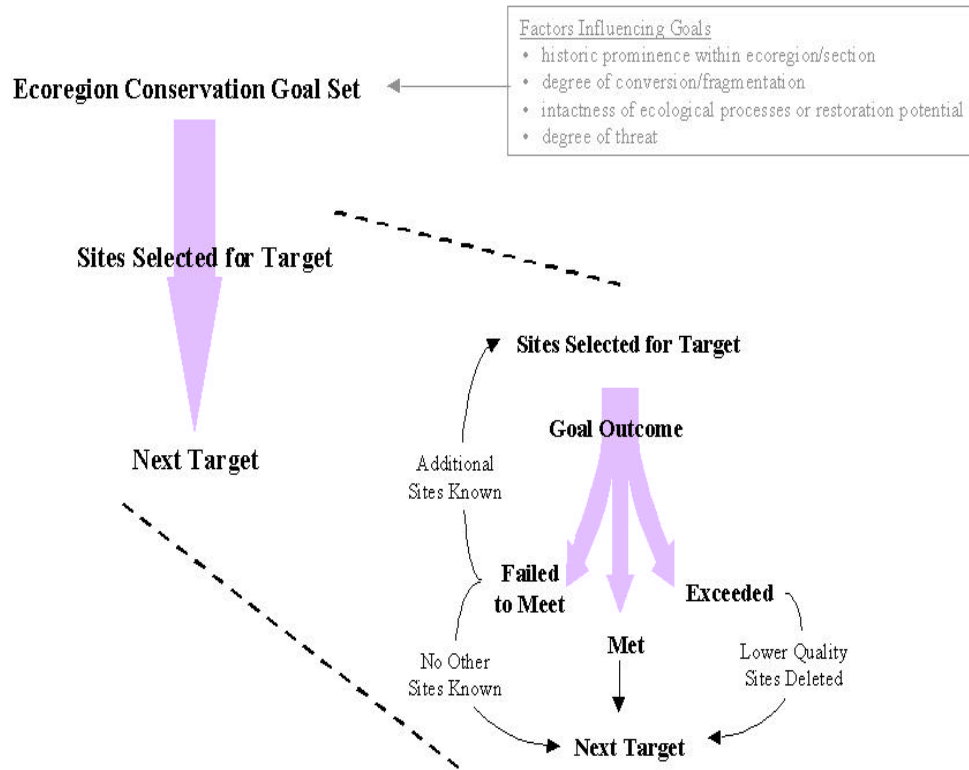
Figure 6. Selection Sequence for Ecological Complexes

**Selection Sequence for
Aggregates of
Ecological Complexes**

Ecological Complexes



Figure 7. Target Selection Sequence



2.3.5 Ecological Backdrop

The extensive areas of intact natural vegetation within portions of the Northern Great Plains Steppe were recognized as having critical importance in connectivity, ecological context, and function of natural processes. This connectivity was viewed as especially important for wide ranging species, such as grassland birds, which are characterized by dispersion and opportunism. As a group these species and others respond to drought and other short-term habitat altering factors by wide-ranging movement through the ecoregion to suitable habitat. Recognizing that a credible portfolio could not include all intact natural landscapes, the value of these areas in which the portfolio was imbedded needed to be acknowledged. To address this issue, the Team identified an “ecological backdrop”, which was comprised of large landscapes identified through satellite imagery analysis described in section 2.2.2. These expansive areas of natural vegetation metaphorically are comparable to the dough of a chocolate chip cookie which holds together the chips (in an ecological context, the sites).

In addition to playing a crucial role in the maintenance of ecological processes (and consequently biodiversity) within the ecoregion, it is anticipated that the ecological backdrop will yield additional conservation sites in future iterations critical to the conservation of biodiversity. Also, the ecological backdrop serves to buffer portfolio sites from incompatible land uses and their impacts on the viability of targets contained within portfolio sites. Although the ecological backdrop is not a portfolio conservation site per se, it remains an integral piece of the biodiversity puzzle that must be maintained. The ecological backdrop is differentiated from conservation sites by the anticipated lower level of on-the-ground conservation suggested by this iteration of the portfolio design. As such, it is expected that strategies, for the backdrop will be focused on large scale policy issues, such as multi-site or regional threat abatement. Full biodiversity conservation will be achieved best through a marriage of broad, over-arching and site specific strategies.

2.3.6 Managed Area Identification

Areas managed for conservation purposes are found throughout the Northern Great Plains Steppe (in both the U.S. and Canada), most being publicly-owned lands. However, there is often great disparity between the degrees to which these areas offer long-term protection to biodiversity. As a component of ecoregional assessment, it was beneficial to identify those managed areas that offered some minimum level of long-term protection. Most useful as an electronic GIS coverage, this data layer enabled a characterization of the level of conservation work already underway in portfolio sites, but will be most useful in the implementation of the ecoregional plan during site conservation planning. Existing GIS coverages were compiled from across the ecoregion. Managed area data was obtained from Alberta, Saskatchewan, Montana, and Wyoming at a 1:100,000 scale. Managed area coverages from Nebraska and North and South Dakota were available only for U.S Forest Service, U.S. Fish and Wildlife Service, and National Park Service administered lands at a 1:2,000,000 scale. Conservancy protected properties were provided for each state at a 1:24,000 scale. It is important to note that inaccuracies exist in these coverages (i.e. TNC preserve coverage does not capture recent acquisitions).

Chapter 3:

The Ecoregional Portfolio Design

3.1 Background

This chapter discusses the assembly process developed for the Northern Great Plains Steppe ecoregion and resulting portfolio. The design stage of ecoregional conservation uses the information compiled in the assessment stage to assemble a portfolio of conservation sites that achieves the Conservancy's ecoregional conservation goal. Inherent within this stage was the development of a site selection methodology that would fill the portfolio in a scientifically sound and efficient manner. The assembly framework and process was drafted by a subset of the Ecoregion Team and presented to the entire Team for review. With minor modifications, it was adopted by the Team at the ecoregional portfolio assembly meeting in March 1998. Methods described in this chapter will likely require modification in future iterations as new information becomes available and scientific models yield additional insights into conservation strategies.

3.2 Assembling the Portfolio of Sites

Conservation by Design: A Framework for Success (The Nature Conservancy 1996a) laid out general guidelines for the assembly of ecoregional portfolios. These guidelines stressed the following attributes of a valid ecoregional assembly process:

- ✎ **Viability:** The target occurrences for which a site is selected for the portfolio can be maintained over the long term. Ecological processes are largely intact or restorable.
- ✎ **Biodiversity Value:** The sites to be included in the portfolio have high quality occurrences of conservation targets.
- ✎ **Efficiency of Action:** The sites have multiple viable examples of conservation targets.
- ✎ **Complementarity:** The sites capture targets that have not been adequately incorporated into the portfolio.

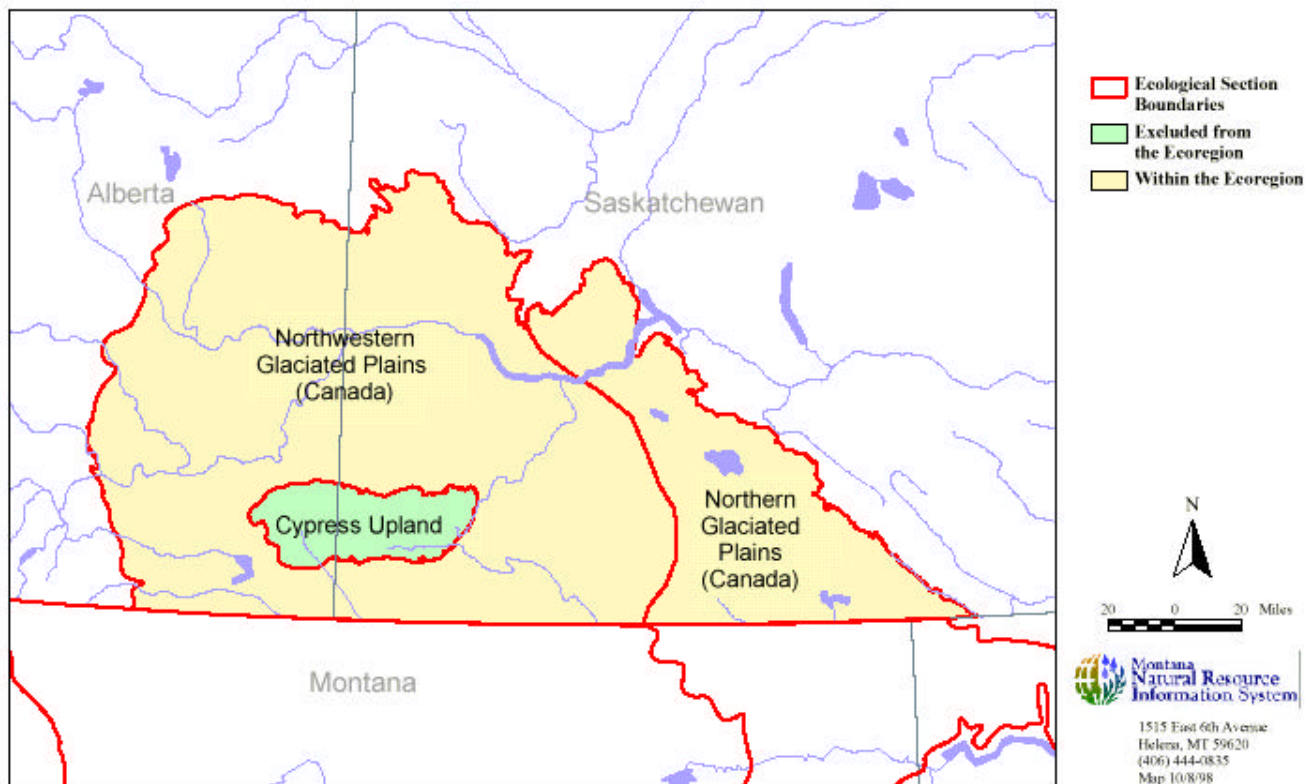
These parameters were used by the Northern Great Plains Steppe Team to develop a framework for assembling the ecoregional portfolio of conservation sites (outlined below).

3.2.1 Assembly Sequence

Due to the size of the ecoregion and significant geologic (glaciated versus non-glaciated) and associated biotic differences between its component sections, conservation targets were considered on a section-by-section basis (4 sections within the ecoregion). Since sections had not been delineated for Canada, the Missouri Coteau (a distinct geologic feature) portion of Saskatchewan was considered as a component of the Northern Glaciated Plains section, while the remainder of southwestern Saskatchewan and Alberta was considered as a component of the Northwestern Glaciated Plains section (Figure 8).

The assembly process placed selection priority on high-quality occurrences of primary conservation targets. Selection of target occurrences for the portfolio were addressed in the following sequence: species, natural terrestrial communities (ecological complexes), and aquatic communities. This order deviated from Great Plains ecoregional assembly sequences utilized to date (Northern Tallgrass Prairie and Central Shortgrass Prairie), which have used high quality natural communities as the first step in portfolio selection. This alternative approach utilized data with consistently higher confidence levels, allowing for the “most certain” identification of conservation sites with targets. Frequently, natural

Figure 8 Ecological Sections Delineated for the Mixedgrass Ecoregion of Canada



community (ecological complexes) information was then supplemented to sites initially identified for species, expanding and strengthening site mapping to capture viable habitat and multiple targets.

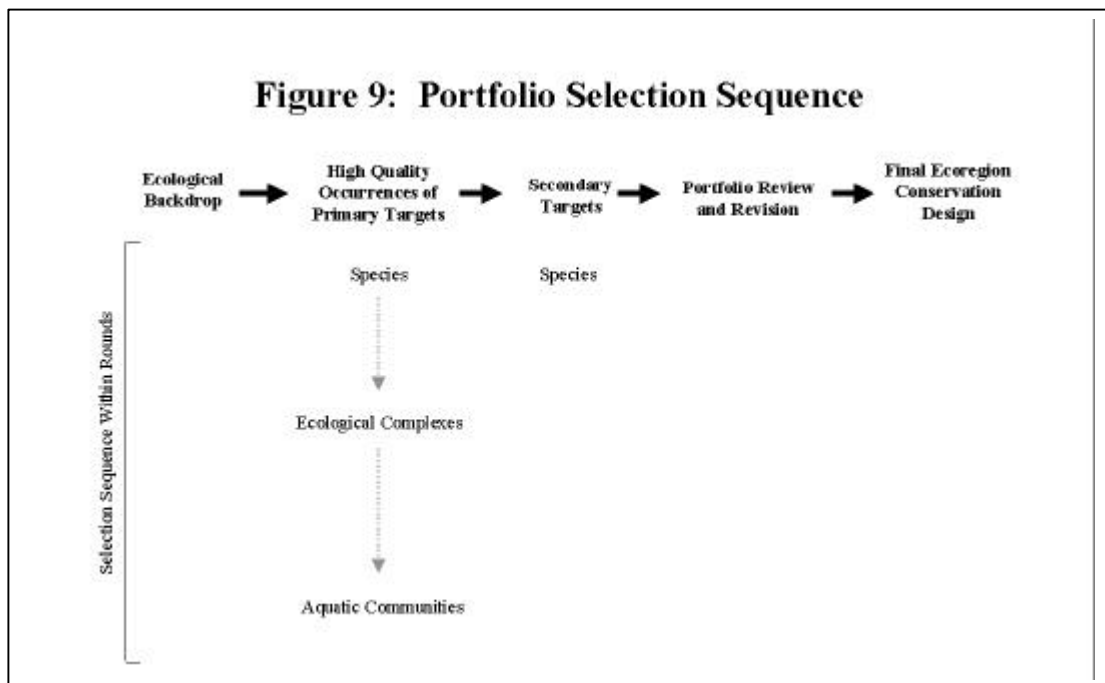
The Four Rounds of Portfolio Assembly

⌘ **Round 1:** Selection of ecological backdrop.

The ecological backdrop was defined as the composite sum of all large untilled landscapes remaining in the ecoregion (see section 2.2.2 for minimum area of landscapes). As the first step in the design process, the ecological backdrop was reviewed by Team members and additions or deletions made (many Team members had participated in the REAs and possessed a good working knowledge of portions of many of the landscapes).

⌘ **Round 2:** Selection of Primary Target Occurrences with Excellent to Good Predicted Viability.

First, species target occurrences with excellent to good predicted viability (see section 2.3.3) were incorporated into the portfolio (Figure 9). Selection was based on all viable occurrences within the ecoregion. Second, ecological complexes with at least good predicted viability were selected within sections (Figure 7). Third, riverine aquatic community targets were selected from across the ecoregion. Each of the primary target selections was hand drawn on 1:250,000 scale maps.



⌘ **Round 3:** Assessment of the Portfolio and Selection of Secondary Target Occurrences

The adequacy of the coarse filter in capturing the full array of common species is a largely untested assumption. Therefore, it is imperative that the draft portfolio be assessed as to whether it captures sufficient populations of the more common species to ensure their long-term viability. These secondary targets included an assemblage of species characteristic of the ecoregion, common species in significant decline and species with large habitat needs. If deemed insufficient, additional sites could be selected to meet the needs of these species.

⌘ **Round 4:** Reassessment and Critical Review of the Portfolio Design

A final assessment and critical review of the draft ecoregion portfolio design by the Team members allowed for modifications based on scientific rationale and feasibility analyses.

3.2.2 Site Mapping

Draft ecoregional conservation sites were mapped on 1:250,000 scale maps during the assembly meeting at the conclusion of round 2 of the portfolio assembly process. Site boundaries were drawn to encompass the area needed to maintain viable populations or processes (for ecological complexes) for each target selected to meet ecoregional conservation goals. When multiple occurrences overlapped, the site boundary encompassed the needs of all target occurrences as a whole. Aquatic communities were mapped using approximate stream reaches. Draft site boundaries were sent out for review and modification prior to finalization. It should be recognized that site boundaries as depicted in the portfolio reflect the inherent variability in occurrence information quality. Detailed boundaries of these portfolio sites will need to be developed through site conservation planning. The boundaries depicted in this plan represent approximations designed to assist conservation practitioners, however, projects should neither be adopted nor dismissed simply because of their location within or outside of a given site.

In April 1998, each of the site boundaries was digitized to develop an electronic Arcview coverage. Two electronic layers were used to further inform boundary locations. The first of these was the GIRAS landuse/landcover (U.S. only), which provided information on coarse scale vegetation cover. Although this electronic coverage was relatively old (1980s based imagery), we felt it provided a good approximation of current land use (based on use during rapid ecological assessments) and it was easier to use than satellite imagery. The second layer was species conservation target locations from the Natural Heritage/CDC Network. Use of this layer ensured that mapping errors were not made by excluding targets when copying boundary locations from hard-copy maps to electronic versions. Maps (1:250,000 scale) with the conservation site boundaries over the GIRAS landuse/landcover (U.S. only) were provided to each of the team members for their review in May, and revisions were completed over the next couple months with a final portfolio completed in September 1998 (Figure 10).

3.3 The Portfolio Design

The resulting portfolio consisted of 116 sites (Appendix 4). Sites ranged in size from approximately 2,000 acres to over 2.5 million acres, with mean area equaling 256,000 acres. Total land area captured within the portfolio was approximately 29,700,000 acres or about 18.5% of the ecoregion. Of this area about 25,430,000 acres is located in the U.S. (20% of the ecoregion in the U.S.) and approximately 4,300,000 acres in Canada (13% of the ecoregion in Canada). As noted in site mapping, the current boundaries are coarse and will require considerable refinement, therefore, these figures truly are

approximations. In comparison with the two ecoregional plans completed to date in the Great Plains, total land area captured by the portfolio is similar to the Central Shortgrass Prairie (22%), whereas, the highly fragmented Northern Tallgrass Prairie plan captured about 3% of the ecoregion (Ostlie and Haferman In Press).

The size of sites in this portfolio reflect the ecological parameters and the scale of the information used to design the sites. The ecological parameters driving site delineation included the scale of ecological processes required to sustain species and communities, and the size of viable occurrences of several of the conservation targets (i.e. grassland ecological complexes). The lack of fine-scale information required the Team to think (and draw) big to ensure that sites sufficiently captured conservation targets. Considerable effort will be needed to further inventory these sites and more accurately define site boundaries in the future.

Several sites cross into adjoining ecoregions, especially along the western border of the Northern Great Plains Steppe. One of these sites, the South Snowy Mountains is technically within the boundaries of the Idaho Batholith, but was retained within the portfolio since it occurred on the border of the ecoregion and supports characteristic Great Plains species. Generally, the Team did not delineate site boundaries outside of the ecoregion, due to limited information on conservation targets in adjoining ecoregions. In the future, there will be a need to adjust (merge) boundaries of sites that are adjacent to one another in two or more ecoregions.

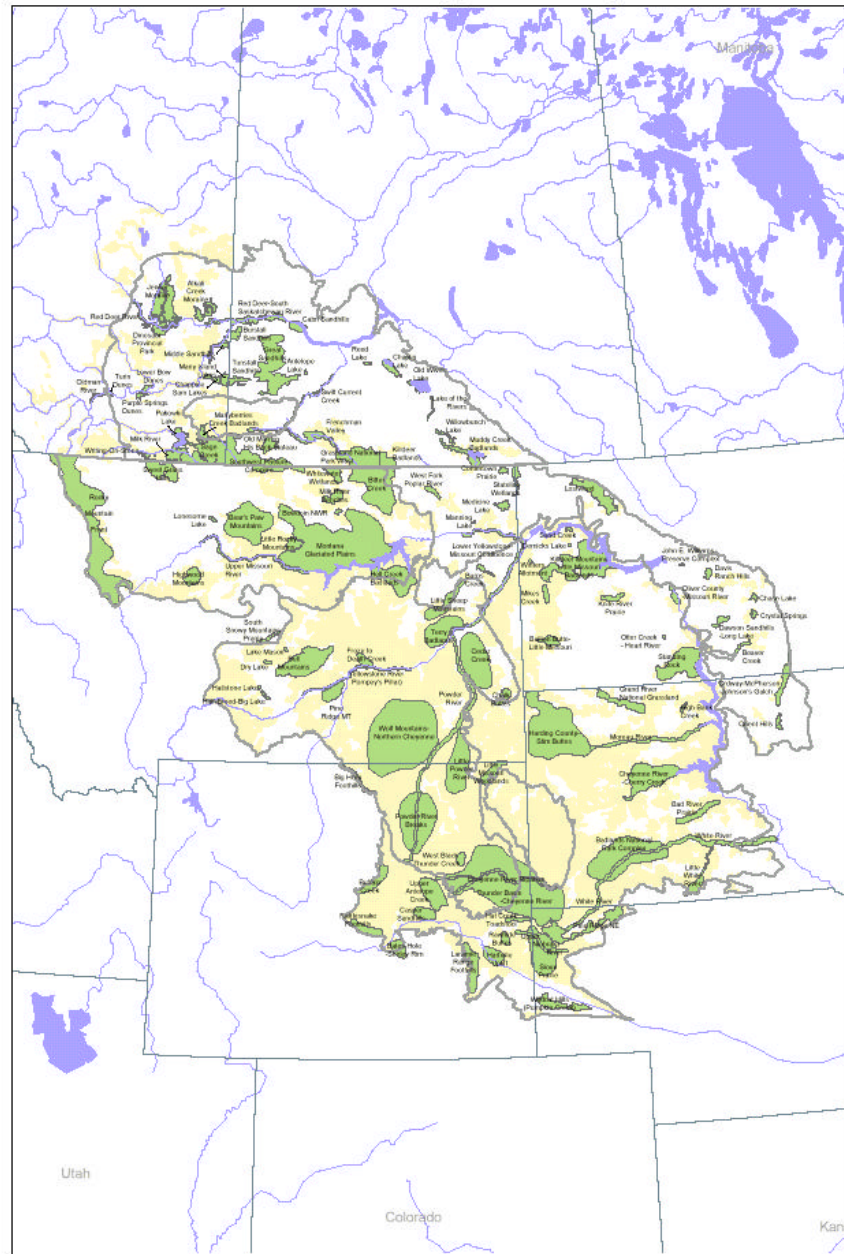
3.3.1 Meeting Target Conservation Goals

Conservation goals were fully achieved for 10 of the 19 primary animal targets (53%) and 5 of the 21 primary plant species targets (24%) (Table 3). Conservation goals can also be evaluated based on the total number of occurrences captured by the portfolio. Of the 150 occurrences of primary species conservation targets established for the ecoregion, 90 were captured in the portfolio (Appendix 5). Conservation goals were met for 88% (54 of the 62) of the animal conservation targets and 41% (36 of 88) of plant species targets. In general, animal target goals were easier to meet due to availability of information through either Heritage programs or experts. In contrast, several of the plant species targets were not tracked by one or more of the Heritage programs. Lack of tracking often was associated with subspecies with T-ranks of 1-3 and G-ranks of 4 or 5. For example, secund bladderpod (*Lesquerella arenosa* var. *argillosa*) is a G5T3-rated species that is tracked by the South Dakota Heritage Data Base but not by Wyoming Natural Diversity Database, which considers the plant to be globally secure.

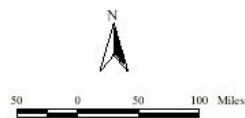
At first glance, it appears that the portfolio captures a fair component of the rare species in the ecoregion, especially for animal targets. This is true, but the extent to which this is the case may be an artifact of a number of anomalies. In some instances, there were difficulties in setting meaningful goals. The most problematic were for species that required additional populations to be established to ensure that the species would persist in the future, and capturing species that demonstrated a high degree of dynamism in breeding location from year to year. The best example of this was the piping plover (*Charadrius melodus*). This species is declining about 8% annually in the Great Plains and utilizes more than 100 sites in the northern Great Plains. Use of these sites and abundance of individuals varies tremendously depending upon weather conditions (directly affecting habitat variables). Therefore, planning for certain species does not fit well into the spatial and temporal constraints of ecoregional planning and will need to be accounted through alternative planning and conservation approaches.

Across the ecoregion, 7 of the 35 (20%) ecological complexes were adequately captured within the portfolio design (Table 4). Based on the total number of occurrences, the portfolio appears to be more effective in capturing ecological complexes, with 277 of 384 (72%) of the identified occurrences contained within the portfolio (Appendix 6). Within sections, ecological complex goals were best met in the Northwestern Glaciated Plains (85%), followed by the Northwestern Great Plains (71%), Powder River (69%), and the Northern Glaciated Plains (55%). The Northern Glaciated Plains is by far the most impacted by agricultural conversion of the ecoregion sections. Rapid ecological assessments, the primary source of information for identifying ecological complexes, were directed towards large landscapes and best captured geographically extensive associations (large patch and matrix); therefore; it is not unexpected that ecological complex goals were least often achieved in this section. Future ecoregional conservation efforts in this section would benefit from a systematic inventory in order to yield a more complete conservation portfolio.

Figure 10
Northern Great Plains Steppe Portfolio Design



- Ecological Section Boundaries
- Portfolio Sites
- Ecological Backdrop



 **Montana
Natural Resource
Information System**
1515 East 16th Avenue
Helena, MT 59620
(406) 444-0835
Map 10/23/98

Table 3. Occurrence Goal and Number of Occurrences Captured for Primary Conservation Target Species within Sites in the Northern Great Plains Steppe.

Species	Occurrence Goal	Occurrences in Portfolio Sites
BIRDS		
American White Pelican	5	5
Bald Eagle	1	2
American Peregrine Falcon	1	0
Whooping Crane	0	0
Piping Plover	Much of population ¹	12
Mountain Plover	5	4
Interior Least Tern	4	3
FISH		
Pallid Sturgeon	2	2
Lake Sturgeon	1	1
Sturgeon Chub	6	4
Sicklefin Chub	6	3
Blue Sucker	3	2
MAMMALS		
Fringe-Tailed Myotis	2	2
Swift Fox	5	8
Black-Footed Ferret	4	2
Black-Tailed Prairie Dog	10	10
Gray Wolf	1	1
Grizzly Bear	1	1
INSECTS		
Dakota Skipper	3	3
Regal Fritillary	2	1
DICOT PLANTS		
Taprooted Fleabane	3	2
Alpine Fever-Few	6	3
Great Plains Stickseed	10	0
A Fendler Rock-Cress	1	0
Virgate Halimolobos	3	1
Secund Bladderpod	10	2
Wooly Twinpod	3	1
Persistent-Sepal Yellow-Cress	1	0
Smooth Goosefoot	6	8
Barr Milk-Vetch	6	4
Andean Prairie-Clover	3	0
Dakota Wild-Buckwheat	10	7
Dense-Flower Knotweed	10	2
Purpus' Sullivantia	1	1

1. Recovery plan calls for population recovery goal which can only be met through conservation of numerous sites (50+) due to the widespread and low population density of the species.

Table 3 (continued). Occurrence Goal and Number of Occurrences Captured for Primary Conservation Target Species within Sites in the Northern Great Plains Steppe.

Species	Occurrence Goal	Occurrences in Portfolio Sites
DICOT PLANTS		
Erect Cryptantha	1	0
Wyoming Dodder	6	0
MONOCOT PLANTS		
Ute Ladies' Tresses	2	2
An Indian Ricegrass	3	1
PTERIDOPHYTE PLANTS		
Western Moonwort	1	1
Stalked Moonwort	1	0
Prairie Dunewort	1	1

Table 4. Number of Ecological Complexes Selected and Goal for each by Section in the Northern Great Plains Steppe Ecoregion.

<u>Ecological Complexes Selected/Ecological Complex Goal</u>					
<u>Community Unit</u>	<u>No. Glac. Plains</u>	<u>NW Glac. Plains</u>	<u>Powder River</u>	<u>NWGreat Plains</u>	<u>To</u>
Wetland					
• Pothole	6/8	6/7	0/0	0/0	13/
• Lake	4/7	2/5	4/4	1/2	11/
• Alkali/Saline	9/9	6/6	0/0	1/1	16/
• Fen	3/4	1/3	0/0	0/0	4/
• Playa	0/0	0/0	1/1	0/0	1/
Wooded Draw					
• Shrub	0/2	2/5	3/6	0/0	5/
• Deciduous	3/7	8/8	3/5	8/10	22/
• Deciduous-Coniferous	0/2	0/0	1/2	6/8	7/
Riparian					
• Herbaceous	1/2	2/6	3/6	5/8	11/
• Shrub	2/4	10/10	1/5	2/3	15/
• Cottonwood	0/1	7/7	3/5	4/4	14/
• Deciduous-Coniferous	0/2	0/0	0/2	1/4	1/
Sandhills					
• Sandhill	2/3	9/9	0/0	2/3	13/
Badlands					
• Badland	0/0	4/4	4/4	6/6	14/
Forest/Woodland					
• Deciduous	1/1	4/4	0/0	2/2	7/
• Low elev. coniferous	0/0	1/1	6/7	7/7	14/
• High elev. coniferous	0/0	4/4	0/0	1/1	5/

Table 4 (Continued). Number of Ecological Complexes Selected and Goal for each by Section in the Northern Great Plains Steppe Ecoregion.

<u>Ecological Complexes Selected/Ecological Complex Goal</u>					
<u>Community Unit</u>	<u>No. Glac. Plains</u>	<u>NW Glac. Plains</u>	<u>Powder River</u>	<u>NWGreat Plains</u>	<u>To</u>
Shrubland					
• Big sage	0/0	1/1	3/5	1/2	5/1
• Basin big sage	0/0	0/0	0/0	1/1	1/1
• Black sage	0/0	0/0	0/0	2/2	2/2
• Birdsfoot sage	0/0	0/0	1/1	0/0	1/1
• Mountain mahogany	0/0	0/0	0/0	3/4	3/4
• Nuttall's saltbush	0/0	0/0	1/3	1/2	2/2
• Greasewood	0/0	2/2	0/0	0/0	2/2
• Silverberry	1/2	0/0	0/0	0/0	1/1
• Creeping juniper	0/0	2/2	0/0	0/0	2/2
Tallgrass Prairie					
• Tallgrass Prairie	4/6	0/0	0/0	2/5	6/1
Mixed-grass sod					
• Prairie Sandreed	0/2	4/5	4/4	0/4	8/1
• Western Wheatgrass	2/6	5/6	5/7	3/6	16/1
• Thickspike Wheatgrass	1/2	2/4	0/0	0/0	3/1
• Needlegrass	6/10	7/7	5/7	5/6	23/1
Mixed bunch					
• Idaho Fescue	0/0	1/1	1/1	0/0	2/1
• Rough Fescue	0/0	3/3	0/0	0/0	3/1
• Bluebunch Wheatgrass	0/0	4/4	6/6	1/2	11/1
• Little Bluestem	3/6	0/0	4/4	6/6	13/1

Chapter 4:

From Assembly to Implementation

4.1 Introduction

Once the ecoregional portfolio had been assembled, it became necessary to pull together additional information and conduct assessments to guide conservation action. To this end, several assessments were completed, each of which is discussed within the context of this chapter:

- ✎ Threats to Biodiversity at Portfolio Conservation Areas,
- ✎ Multi-Site Strategies for the Abatement of Threats,
- ✎ Feasibility Assessment,
- ✎ Prioritization of the Portfolio for Conservation Action, and
- ✎ Managed Area Assessment.

4.2 Portfolio Threats Assessment

Successful implementation of the ecoregional plan will hinge on the ability of the Conservancy (and its partners) to develop strategies to abate existing and future threats to the biodiversity of the ecoregion. Depending on the circumstances, strategies for tackling these threats may be site-specific and implemented at individual sites, or may be more regional in scope and require implementation at broader levels. However, as a first step it was critical that the threats are identified and the severity each posed to the biodiversity of the ecoregion assessed. Description of threats is provided in Appendix 7. It should be noted that this does not identify all of the threats across the ecoregion, rather it was an initial attempt to capture the most pervasive ones.

To achieve this goal, Team members knowledgeable about the portfolio were asked to identify and rank the severity of all known threats to biodiversity at each conservation site (Appendix 8). Threat severity was scored into one of three categories (High, Medium or Low) based on the degree of negative impact a given threat poses to the biodiversity of a conservation area. Severity estimates were subsequently given a numerical score for use in analyses: High = 5 points, Medium = 3 points and Low = 1 point. From this data, several analyses were made for the ecoregion as a whole and by sections. Analyses were completed by section to reflect the differences in land-use patterns and variation in targets captured by the portfolio in the respective sections.

4.2.1 Frequency of Occurrence

The first analysis of the threats data was to determine the frequency of occurrence of each threat across the full portfolio. An analysis of the threats data revealed that a small number of identified threats were pervasive across the full suite of sites. Four threats were widespread across the ecoregion (identified in 50% or more of the sites), exotic species, poor grazing management, conversion of natural communities for agricultural production, and loss of fire regime (Table 5). From an ecoregional perspective it may be beneficial to address these threats using multi-site abatement strategies.

While the four threats noted above were consistently among the most frequent identified in each of the sections, other threats gain significance when the sections are analyzed individually (Appendix 9). Since ecological features and land-uses may vary widely between sections in the Northern Great Plains Steppe, analysis by section provides additional insights about threats. For example, elevated predator populations were noted to be a threat in over half (11 of 19) of the sites in the Northern Glaciated Plains section. Predators have been identified as one of the primary causes for the continued decline of the Great Plains

population of piping plover, a target species found predominantly in the Northern Glaciated Plains section of this ecoregion. In contrast, predator populations were identified as a threat in only 4 other sites in the ecoregion.

Table 5: Northern Great Plains Steppe Portfolio Threat Analysis.

Threat	Score	Frequency	Mean	Index
Poor grazing management	211	80	2.64	1.82
Loss of fire regime	200	67	2.98	1.72
Exotic species	193	93	2.07	1.66
Habitat conversion: agriculture	175	67	2.61	1.51
Habitat conversion: oil and gas	135	52	2.60	1.16
Hydrologic alteration	85	41	2.07	0.73
Prairie dog/ground squirrel control	70	28	2.67	0.60
Residential development	44	14	3.14	0.38
Elevated predator populations	35	15	2.33	0.30
Habitat conversion: mining	29	10	2.90	0.25
Recreational use	28	19	1.32	0.24
Wetland drainage/filing	25	19	1.32	0.21
Pesticide drift/application	15	11	1.36	0.13
Rail line construction	15	3	5.00	0.13
Habitat conversion: poor logging practices	14	8	1.75	0.12
Commercial uses	1	1	1.00	0.01

4.2.2 Severity of Threat

Although frequency was a useful tool in identifying the threats most pervasive across the portfolio, it was not useful in ranking threats for abatement action. To address this issue, two separate threat severity analyses were conducted using the numerical scores assigned to the varying levels of threat (see above).

Mean Threat Severity: Conservation Area

Mean threat severity was calculated by adding a threat score across the entire portfolio and then dividing by the frequency of occurrence in which the threat was present. Of the threats occurring frequently in the ecoregion, agricultural conversion was consistently among the most severe threats, both across the ecoregion and in the sections. In regard to other threats, severity varied widely by section. For exotic species, the most frequent threat, mean severity ranged from 1.39 in the Northwestern Glaciated Plains section to 2.75 in the Powder River section. Poor grazing management, the second most prevalent threat, possessed a relatively high mean threat severity of 2.97 in the Northwestern Glaciated Plains and a low rating of 1.75 in the Powder River section.

Threat Severity Index: Portfolio

In this analysis, scores for a given threat were added across the entire portfolio, then divided by the total number of portfolio sites (116) to yield a threat severity score indexed for the full portfolio or individual sections (threat severity index). This analysis delineated the threats that posed particularly severe problems across the full portfolio. Results of this analysis revealed that across the portfolio, exotic

species, poor grazing management, habitat conversion to agriculture, loss of fire regime, and conversion related to oil and gas development were the most severe threats throughout the ecoregion.

4.2.3 Analysis and Abatement of Threats

Threats to biodiversity in the Northern Great Plains Steppe can be broken down into two general types, habitat destruction and habitat degradation. Of the habitat destruction threats, conversion of natural vegetation for agriculture (cropland) is the most frequent and severe across the ecoregion. Given the extensive conversion of natural vegetation across the entire Great Plains, it was not surprising that this was a primary threat in this ecoregion and in the Central Shortgrass Prairie ecoregion (The Nature Conservancy 1998b). Abatement of this threat will require multi-tiered strategies ranging from changing federal farm programs that encourage conversion to individual site approaches. Conversion related to oil and gas development was the other primary habitat destruction threat. Given the priority placed on petroleum development in the United States and Canada (if it's there go get it), the best opportunities to address this threat may be on a site-by-site basis that reduces impacts to significant ecological features.

The remaining top threats across the ecoregion (exotic species, poor grazing management, and loss of fire regime) fall within the realm of land stewardship. In general, these threats will require abatement at individual sites, however; multi-site strategies may also be employed working cooperatively with agencies established for land management assistance (i.e., Natural Resource Conservation Service). Exotic species and poor grazing management (lack of grazing as well as over grazing) both offer opportunities to build relationships and partnerships with private landowners and public land management agencies that can contribute to all facets of biodiversity conservation in the ecoregion.

Control of black-tailed prairie dog and ground squirrels represents a significant threat that did not stand out in the analysis, probably due to the fact that colonial populations of these species have been eliminated across a significant portion of the ecoregion. Also, many of the sites selected intrinsically do not provide habitat for these species. As a keystone species, prairie dog colonies have been widely recognized for the beneficial role they play in creation of habitat and as forage sources for other species, most notable of these is the black-footed ferret. Ground squirrel colonies in the northern portion of the ecoregion appear to be analogous to prairie dogs. Threats to these species were considered in the area of direct control (i.e., poisoning, shooting); however, future iterations should also consider sylvatic plague, an introduced pathogen that can kill all individuals within a colony.

4.3 Feasibility Assessment

With the portfolio assembly complete, it became necessary to check the results from a site perspective to determine if current circumstances made long-term conservation success at some areas impossible. Only viable target occurrences were selected for inclusion in the portfolio, therefore, all of the sites were considered capable of sustaining the targets identified within them over the long-term. Conservation in the Northern Great Plains Steppe is problematic from the perspective of resource limitations and the expanse of the ecoregion. Additionally, conservation through land acquisition is hampered in North Dakota by state law designed to limit new purchases by conservation organizations or federal agencies (i.e., Fish and Wildlife Service). Therefore, feasibility of site conservation in this ecoregion is constrained primarily by capacity of conservation entities and the desire of society to sustain the biological features, neither of these issues could be adequately addressed by the Team. Conservation success in this ecoregion will require leadership and a significant investment of resources by the Conservancy beyond those currently expended.

4.4 Site Prioritization for Conservation Action

All sites in the portfolio are highly important toward meeting the Conservancy's conservation goal for the ecoregion. However, the urgency for conservation action at some areas is elevated above others due to current and imminent threats to the biodiversity therein. Also, some areas (relative to others) have a disproportionate number of conservation targets located within their boundaries. With the large number of sites requiring action, a means of prioritizing where conservation action is most critical is necessary.

A common theme running through the ecoregional portfolio has been its concerted focus on biodiversity. Assembly of the ecoregion portfolio largely was based on the quality of the target occurrences, and not on other factors (e.g., containment within existing managed areas). Similarly, portfolio prioritization largely was based on the merits of each site toward meeting the Conservancy's ecoregional goals. To this end, the portfolio prioritization of sites in the Northern Great Plains Steppe was based upon a two-part assessment of:

- ✎ the biodiversity value of portfolio conservation areas, and
- ✎ the urgency of threats to the biodiversity of these areas.

As such, the prioritization process did not consider an array of other potential ranking factors (e.g., the ability of the Conservancy to raise funds or identify partners). Although factors such as these do have value in detailing where the Conservancy might want to work, it was felt that (as a first cut) it was important to have a clear prioritization of the portfolio from a biodiversity standpoint. The product of such a prioritization will be useful as a point of reference to the Conservancy and all partner conservation organizations and management agencies. Additional revision of this priority list for programmatic reasons is a necessary step that should occur in concert with the development of an action plan for the ecoregion.

4.4.1 The Prioritization Matrix

As envisioned for the Northern Great Plains Steppe, prioritization of conservation areas was determined through a standard 3x4 matrix, with biodiversity value and threat urgency constituting the x- and y-axes, respectively. Priorities for conservation action would be determined by the placement within the matrix, giving equal weight to biodiversity value and urgency of threat (Figure 11). The means of assessing each of these factors is discussed below.

Biodiversity Value

The Biodiversity value for each site was assigned by team members. This value was weighted based on the number of target occurrences (meeting ecoregional conservation goals) for which the site was selected and the irreplaceability of a conservation area for targets (e.g., the sole or best site for an ecoregional endemic). If a site possessed a single-site endemic, for example, it was elevated to a higher category. Similarly, all targets that were endemic or largely restricted to the ecoregion were assessed to ensure that at least one of the conservation areas in which it occurred was highly ranked. It should be stressed that the biodiversity value data used to rank conservation areas represents the current level of biodiversity knowledge in the ecoregion. A given area may actually have a far greater biodiversity value that is currently assigned, but because of insufficient inventory is not adequately represented here.

Figure 11: Portfolio Site Prioritization Matrix

Threat Urgency	High	M	H	VH	VH
	Medium	L	M	H	VH
	Low	L	L	M	H
		Low	Medium	High	Very High
Biodiversity Significance					

A notable exception to this process was site ranking in Alberta. Sites in Alberta had been previously assigned a biodiversity value of internationally, nationally, or provincially significant (Alberta Environmental Protection Natural Resources Service 1997). Generally, the Alberta rankings were correlated to ranks of very high, high, and low for use in this planning effort.

Urgency of Threats

Threat severity was developed from the information compiled during the portfolio threats analysis (see Section 4.2.2). From this information, conservation areas were placed into one of three categories based on the perceived urgency required to abate these threats: High (targets would be seriously degraded if no action occurred within 10 years), Medium (within 15 years), and Low (after 15 years).

4.4.2 Results: Conservation Priorities for the Northern Great Plains Steppe

After all sites were assessed for biodiversity value and urgency of threats, they were plotted within the 4x3 matrix to tentatively set priorities for conservation action in the ecoregion (Figure 12). This prioritization matrix identifies the number of sites falling within each priority level: Very High (17), High (26), Moderate (36), Low (37). All sites are listed relative to the appropriate priority level in Appendix 10 and visually depicted in Figure 13.

There are several trends relating to the sites and their corresponding ratings in the ecoregion. Most of the sites ranked as very high are large landscapes (100,000+ acres) that support numerous conservation targets. Conversely, many of the low rated sites support few conservation targets (often 1) and are relatively small. In the United States, most of the very high and high ranked landscape scale sites encompass extensive acreages of multiple-use public lands (i.e. BLM, USFS). These public lands have been critical for maintaining landscape integrity of these sites by preventing conversion to other land-uses

(primarily cropland). It is critical that conservation action within these sites employ both private and public land strategies.

4.5 Managed Areas Assessment

With the ecoregion portfolio design finalized and tentative priorities set among the portfolio conservation areas, a managed area assessment relative to the portfolio was in order. This assessment was conducted in order to identify potential partners and stakeholders within each of the respective conservation areas and across the portfolio as a whole. The resulting information could be used to:

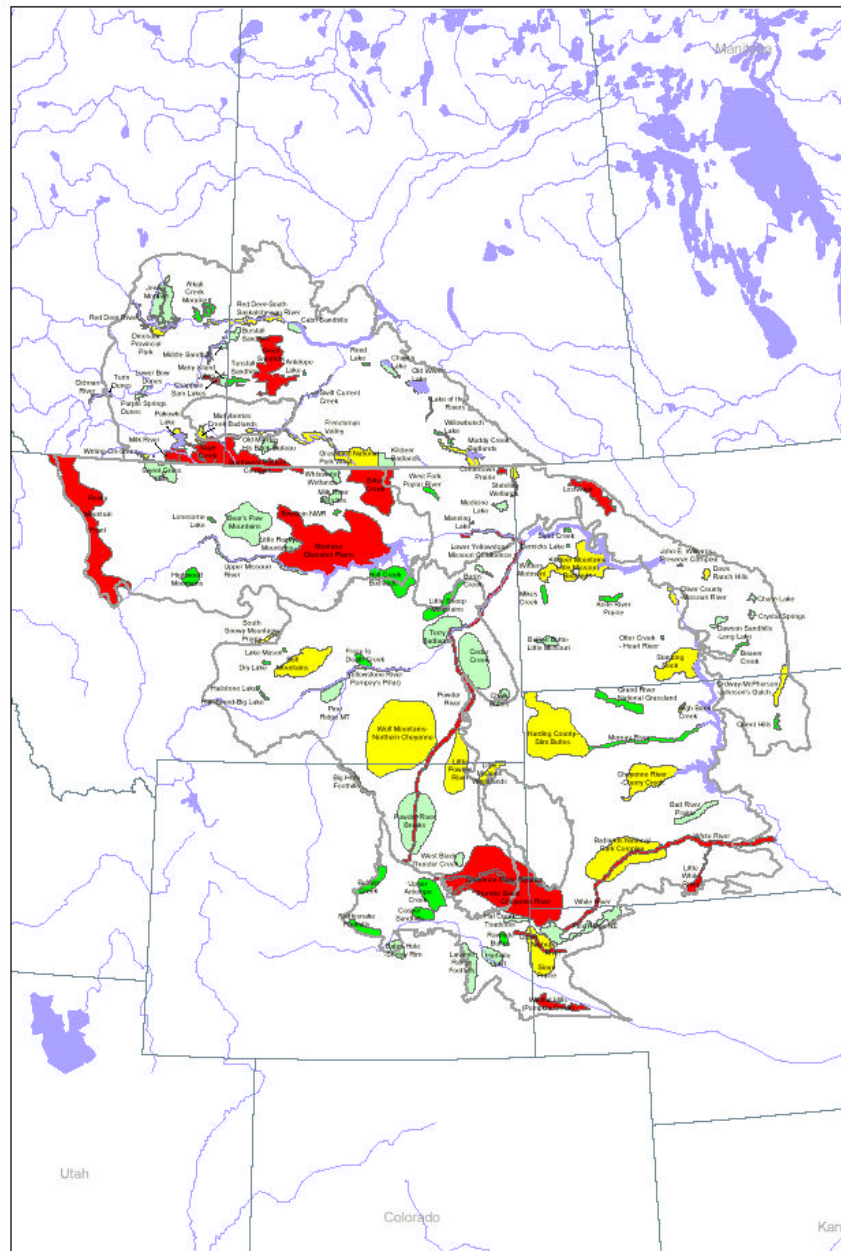
- ⌘ Determine what potential partners might take the lead for coordinating conservation activity within a given site,
- ⌘ Provide stakeholder information critical to site conservation planning, and
- ⌘ Determine the level of current conservation action occurring at each site (Table 6).

As with all components of this ecoregional plan, the managed area assessment suffered from an information bottleneck, principally a lack of detailed electronic managed area coverages for all of the states/provinces. Sufficient information was available to assess the importance of managed areas in a general sense for each of the sites (Figures 14 through 19) with limited discussion provided below. Detailed coverages for Montana and Wyoming provided an opportunity to identify land ownership by site in each of those states and is presented in Appendix 11. It should be noted that the coverages for the Dakotas (Figure 18) and Nebraska (Figure 19) highlight the administrative boundaries of several land management agencies and Indian reservations and do not accurately portray private lands owned within the boundaries.

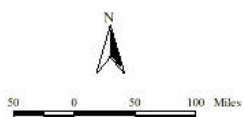
Figure 12: Portfolio Site by Priority

Threat Urgency	High	2	6	4	2
	Medium	11	22	17	11
	Low	20	7	12	3
		Low	Medium	High	Very High
Biodiversity Significance					

Figure 13 Conservation Priorities for the Northern Great Plains Steppe



Site Priority
 Very High
 High
 Medium
 Low



Montana
 Natural Resource
 Information System

1515 East 16th Avenue
 Helena, MT 59620
 (406) 444-0835
 Map 10/8/98

Table 6: Managed Areas Classification

The following classification of protected areas (modified from Caicco et al. 1995) was used as an operational measure of a long-term commitment to the management of these areas for their biodiversity value. Although not specifically mentioned, areas with conservation easements may occupy levels 1-3 depending on the level of restrictions they impose.

Level 1: Highly Protected Managed Areas. An area maintained in its natural state with an active management plan. Natural disturbance events are allowed to proceed without interference or are mimicked through management activities. This level includes areas, such as those "dedicated" under appropriate statutes, which specifically prohibit removing the existing, strong, legal protection without obtaining the approval of higher levels of government and without following very specific procedures. Examples include: most national parks, Nature Conservancy preserves, some wilderness areas, Audubon Society preserves, some national wildlife refuges, ecological reserves, and Research Natural Areas.

Level 2: Moderately Protected Managed Areas. An area that is generally managed for its natural values but may receive use that degrades the quality of natural communities that are present. This level is for protected areas often allowing habitat manipulations for game species, song bird cover, etc. Examples include: most wilderness areas, national wildlife refuges managed for recreational uses, state/provincial wildlife management areas, federal waterfowl production areas, some state/provincial parks (those managed largely for their natural value) and Bureau of Land Management Areas of Critical Environmental Concern.

Level 3: Managed Areas of Low Protection. This level encompasses areas generally managed for consumptive or recreational values, but also which may maintain some natural value. This includes most nondesignated public lands, including Forest Service, Bureau of Land Management, Prairie Farm Rehabilitation Administration, and some state/ provincial park lands (managed primarily or exclusively for recreational value). Legal mandates prevent permanent conversion to anthropogenic habitat types (with some exceptions, such as tree plantations) and confer some protection to populations of species federally listed as endangered or threatened and candidates for listing. Private land which have a signed management agreement with a public or private conservation agency/organization specifically addressing native species and natural community protection, are of this level.

Level 4: Areas with No Protection. All land in public or private ownership without an existing easement or management agreement that maintains native species and natural communities. These are managed primarily or exclusively for intensive human activity, including urban, residential and agricultural lands, public buildings and grounds, and transportation corridors. This also includes private lands that may or may not be managed for intensive human activity and may have significant biological value.

Managed areas have played a critical role in preserving many of the large landscapes and other significant sites in this ecoregion. Within the United States, the Northern Great Plains Steppe contains more public lands than any other ecoregion in the Great Plains. Much of these managed areas in the ecoregion provide relatively low protection (level 3) as multiple-use lands administered by the Bureau of Land Management, U.S. Forest Service, and Prairie Farm Rehabilitation Administration (Saskatchewan). However, much of the lands administered by these agencies are utilized for livestock grazing, frequently a compatible land use with biodiversity conservation in the ecoregion. There are also significant areas of highly to moderately protected managed areas (level 1 and 2) in the ecoregion. The Northern Great Plains Steppe hosts the largest prairie National Parks (Badlands, SD and Grasslands, SK) in the Great Plains. The U.S. Fish and Wildlife Service manages an extensive network of National Wildlife Refuges and Waterfowl Production Areas across portions of the ecoregion. The Service also administers the Charles M. Russell National Wildlife Refuge, the third largest refuge (ca. 1 million acres) in the contiguous 48 states.

The Nature Conservancy has been active in the Northern Great Plains Steppe since the mid-1970s. To date, the Conservancy has acquired preserves in all of the states within the ecoregion, except Wyoming. All of the current preserve holdings fall within portfolio sites. In fact, all of the current preserves are within sites rated as high or very high.

4.6 Data Gaps

The lack of comprehensive data will always be an impediment toward reaching the ultimate goal of developing an ecoregional plan that ensures the long-term viability of all native species and natural communities. These data gaps were omnipresent throughout this planning process.

General reference to data gaps and inventory needs for each of the portfolio sites is provided in Appendix 12. Across the ecoregion, data gaps for primary target species vary by taxa group and level of endemism in the ecoregion. In general, all of the bird and most of the mammal primary targets have been well inventoried, especially those species that have been listed federally as threatened or endangered. Among these two taxa groups, data gaps are greatest for black-tailed prairie dog (relatively complete inventories of towns in some states, i.e., Montana) and fringe-tailed myotis (a peripheral species). Fish species have been variously inventoried. Many of the target species have been documented in the Missouri and Yellowstone rivers and additional inventory is on-going in smaller streams; however, there is a strong need for information relating to population size and trend. Insects have been poorly inventoried across most of the ecoregion and the inventories that have been completed have frequently focused on butterflies. Exceptions to this include intensive sampling for many species of insects in Grasslands National Park and inventory efforts for American burying beetle in South Dakota, among others. Plants have been variously inventoried. In general, the rarest species have been better inventoried. Overall, plants and insects appear to be in the greatest need of additional inventory among the taxa groups. In general, comprehensive inventories do not exist for secondary target species.

Extensive data gaps exist for natural communities and there are several issues relating to nomenclature and identification of natural communities. The lack of natural community information is by far the largest data gap in the ecoregion and should be a priority for all information and conservation entities to fill. Approaches for filling the data gaps will be addressed in the following chapter.

Figure 14
Portfolio Sites and Managed Areas in Alberta

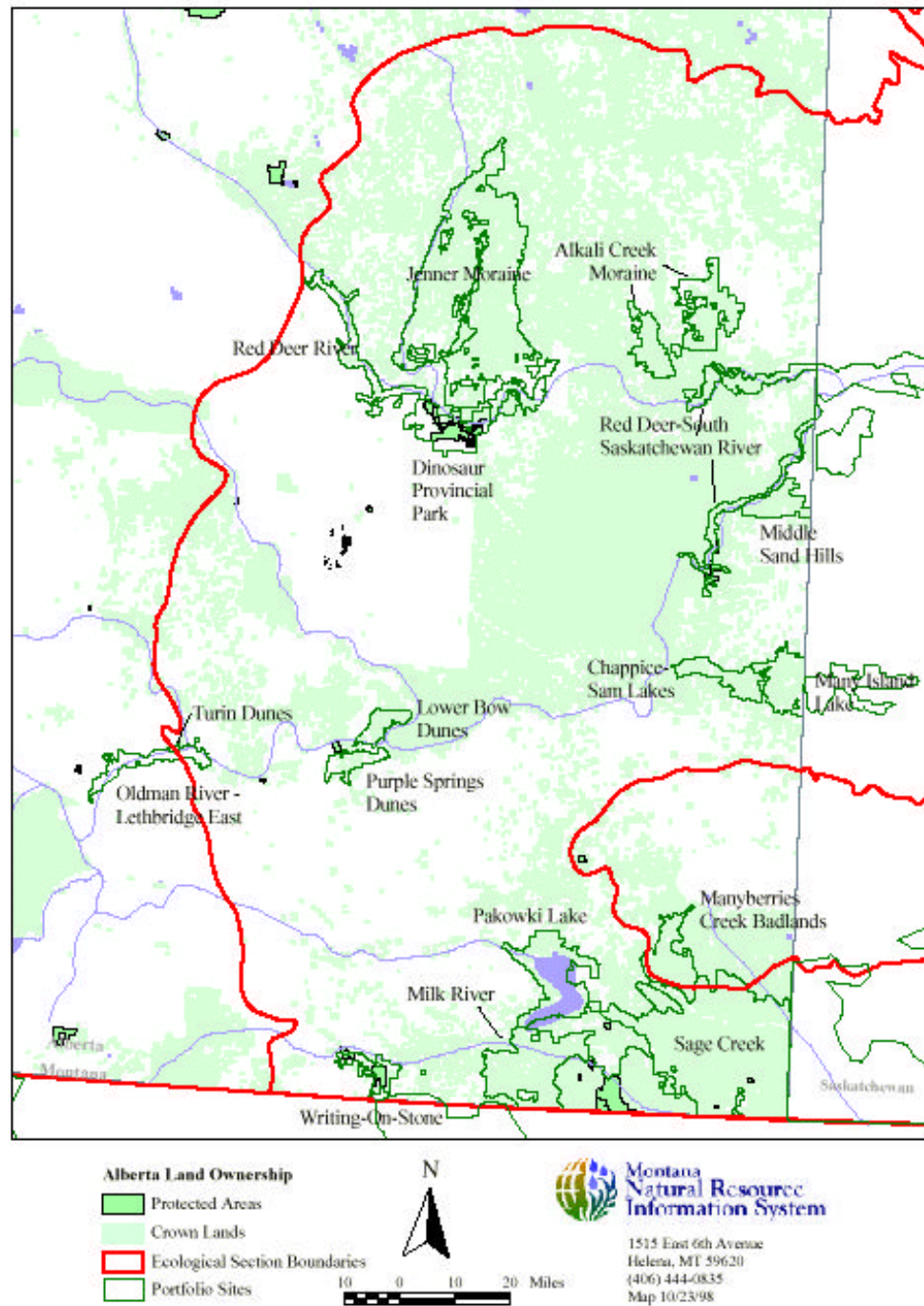


Figure 15 Porfolio Sites and Managed Areas in Saskatchewan

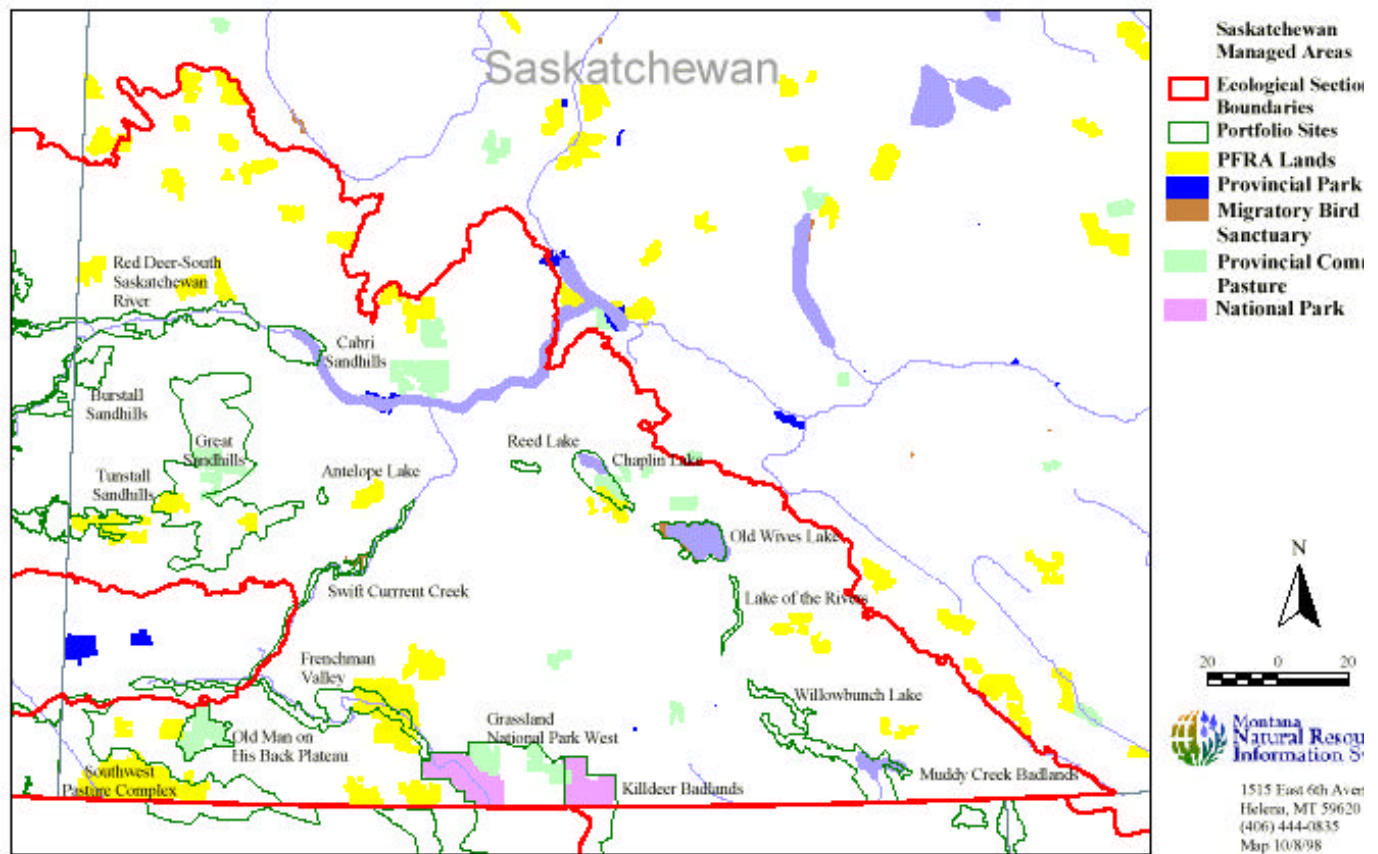


Figure 16
Portfolio Sites and Managed Areas in Montana

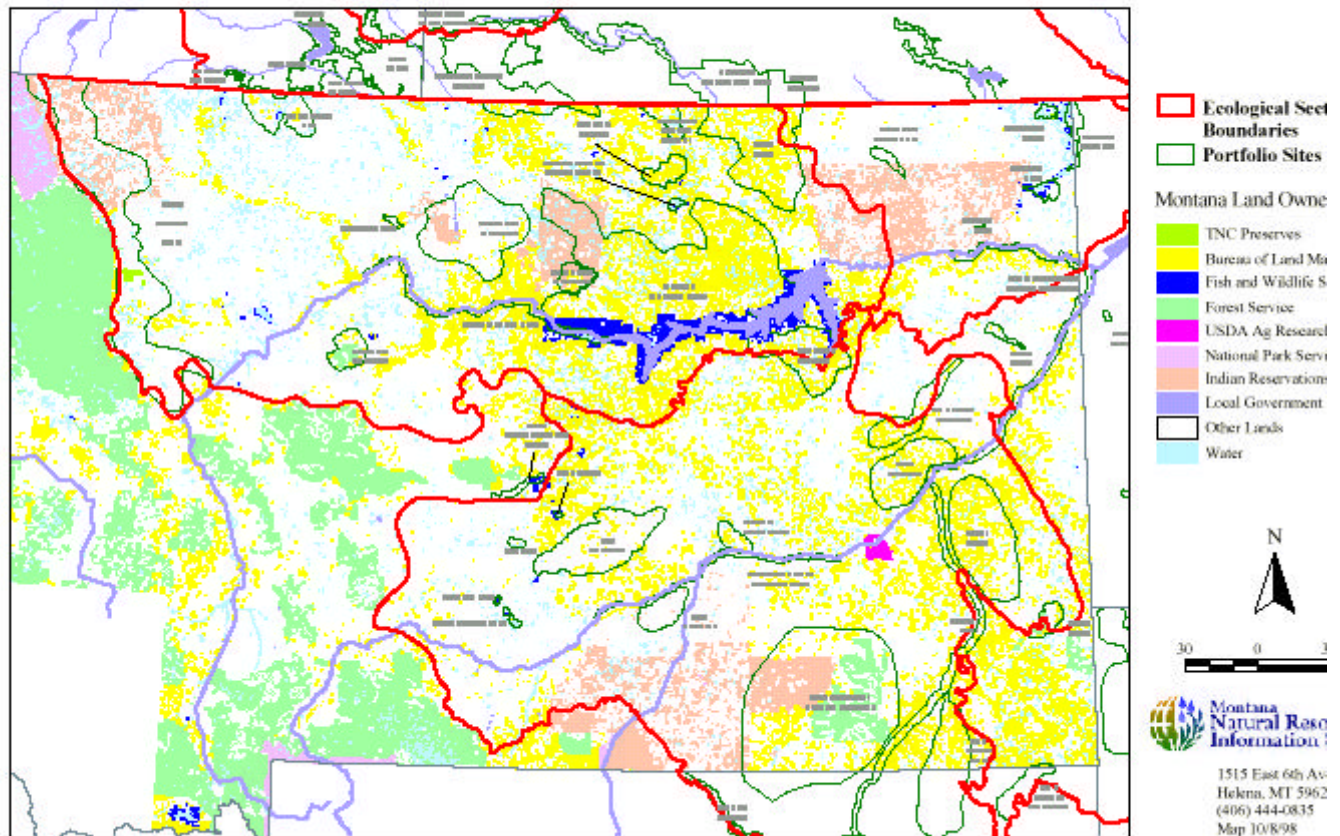


Figure 17
Portfolio Sites and Managed Areas in Wyoming

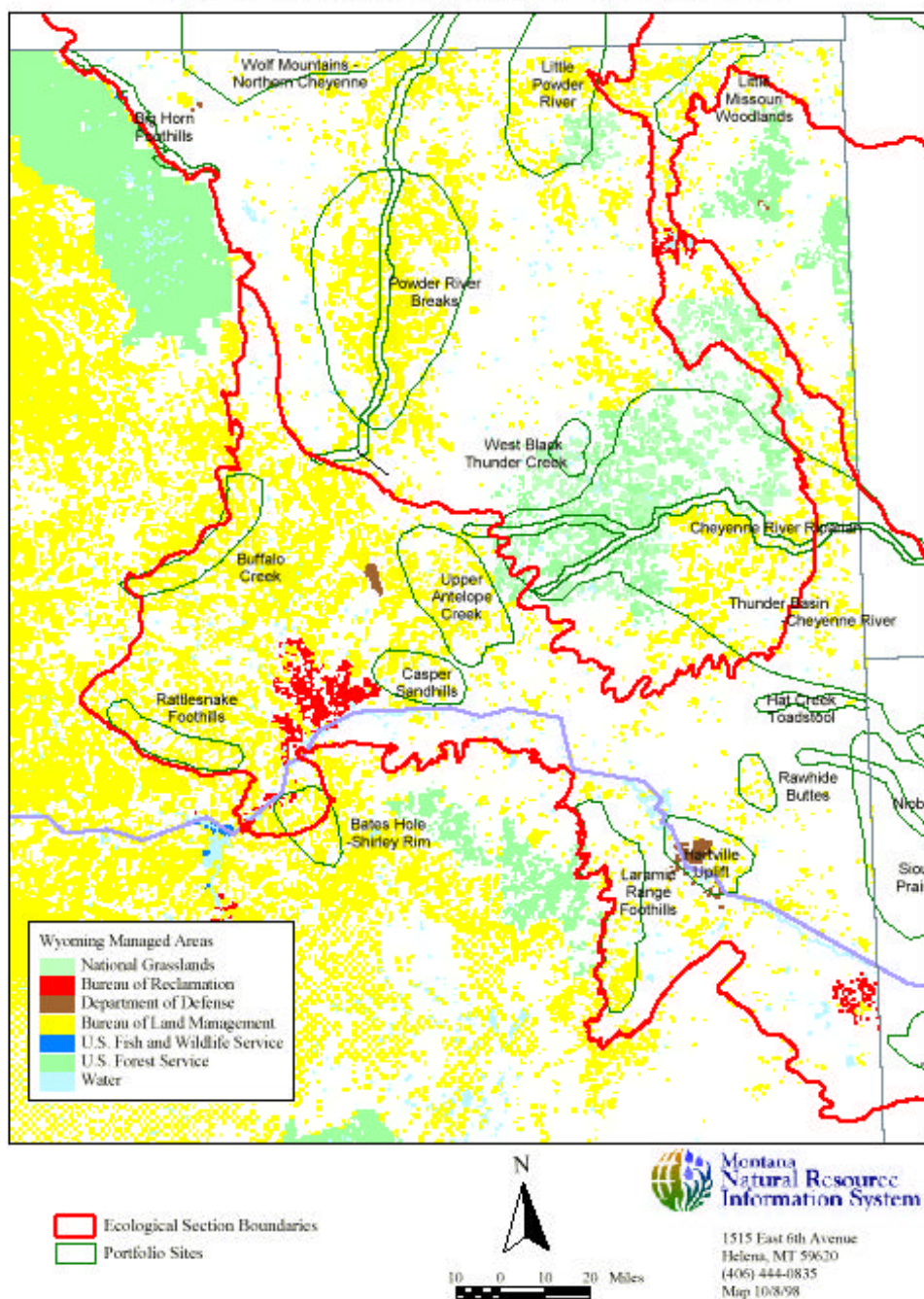


Figure 18
Portfolio Sites and Managed Areas in North and South Dakota

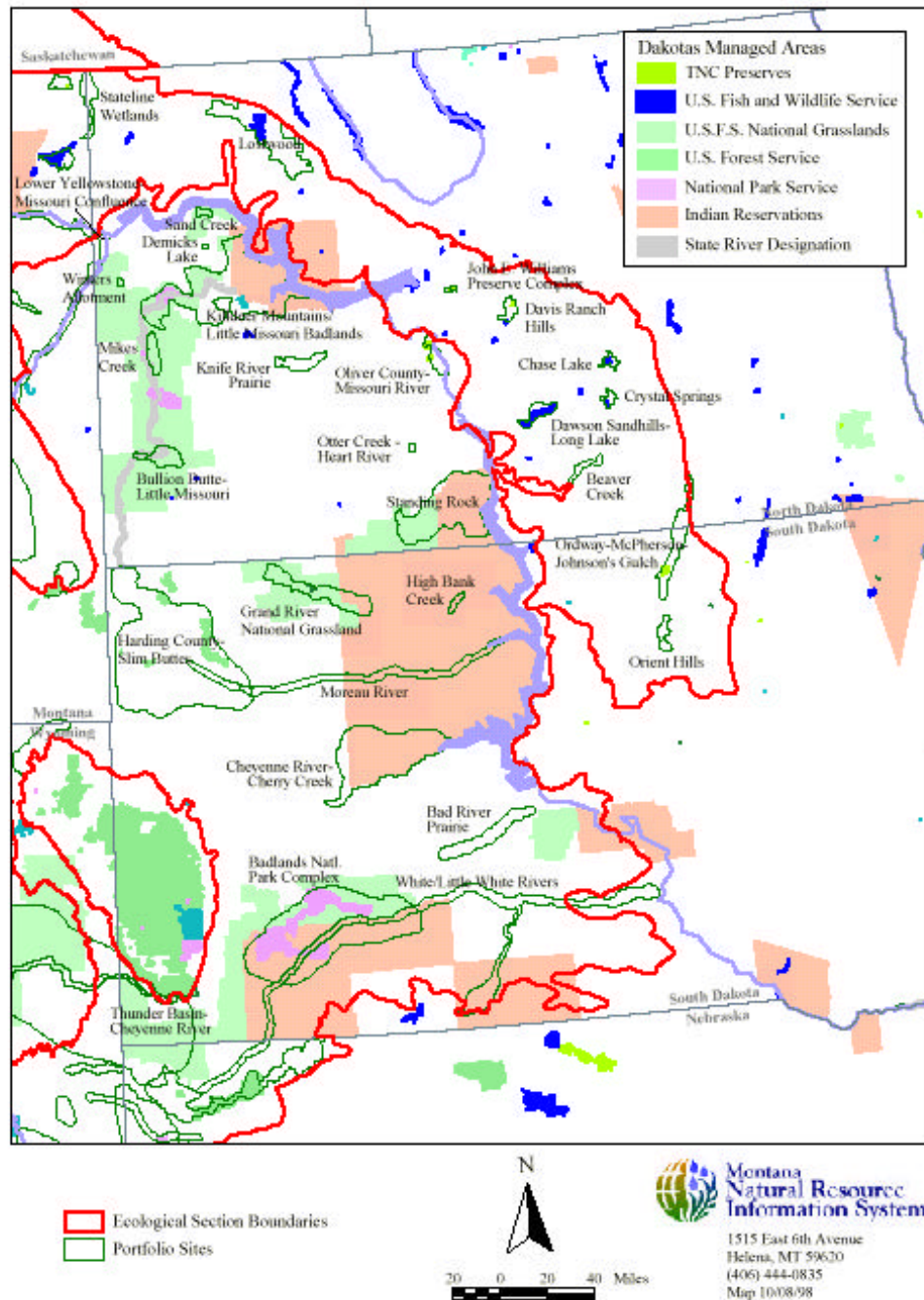
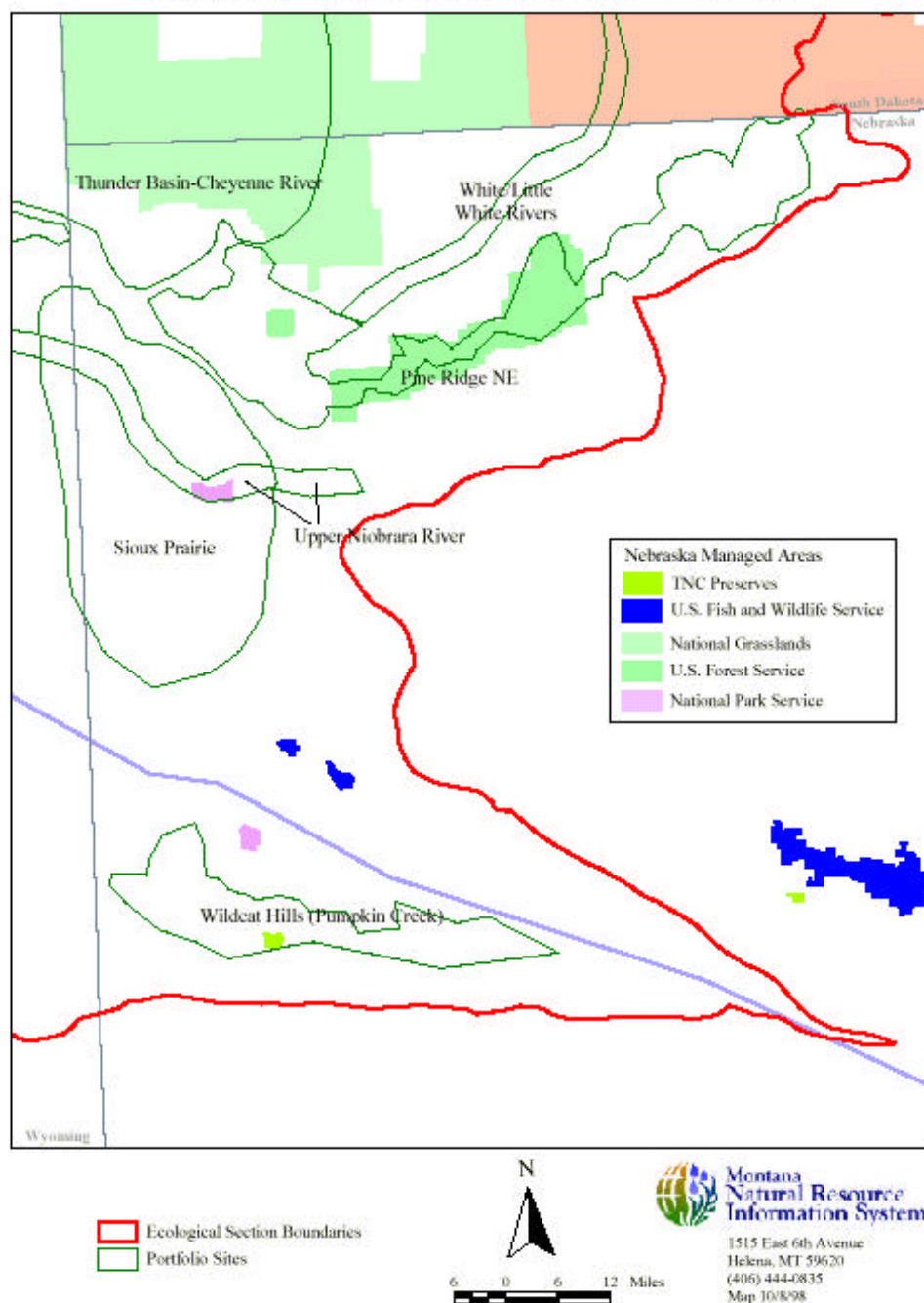


Figure 19
Portfolio Sites and Managed Areas in Nebraska



Chapter 5:

Conclusions and the Ecoregional Action Plan

5.1 Project Expenses

The final project expenses for ecoregional design in the Northern Great Plains Steppe approximate \$98,000 (Table 7). However, it should be noted that this is a projected estimate based on financial figures assessed in August 1998. Also, this expense figure did not include staff time for persons contributing from field offices and regional offices.

The resources to fund this effort were largely supplied by respective state and regional offices of The Nature Conservancy, along with considerable voluntary assistance by state/provincial Heritage/CDC programs. Additional funding for completion of rapid ecological assessments and analysis of TM satellite imagery was provided through cooperative agreements with the Natural Resource Conservation Service and the U.S. Forest Service, respectively.

Table 7. Northern Great Plains Steppe Expenses

Data Creation	
• Imagery Acquisition and Landscape Delineation	\$27,000
• Rapid Ecological Assessments	\$30,000
• Expert Workshops	\$ 7,000
GIS Product Development/Data Management	\$30,000
Misc. (Communications, Office Supplies)	\$ 4,000

5.2 Lessons Learned

As with all of the early ecoregional planning efforts, the learning curve was often steep, painful, and enlightening. Some of these lessons are captured below:

- ✎ The time required to complete this plan would have been greatly reduced if it would have been given continuous attention throughout the process. Without significant advances in human cloning, it is imperative that planning team leaders have portions of their traditional job duties temporarily reassigned to allow time to complete the ecoregional plan. This will be especially important in other ecoregions with few Conservancy staff.
- ✎ Rapid ecological assessments were extremely valuable for gaining information about the ecoregion's natural communities and threats. The first-hand knowledge gained through on the ground inventory was critical in weighting the importance and evaluating sites during portfolio assembly. This approach might well serve as a standard for ecoregions where target occurrence data is minimal.
- ✎ Expert workshops were an add-on to this planning effort in response to the success in other ecoregions. Despite the fact that these were rushed, we gained valuable insights and significant information for designing the portfolio. The lateness of the workshops in the planning process did not diminish their importance. Multi-location workshops did achieve the goal of increased participation; however, the time and energy required for the number of workshops reduced the overall quality of some of the later ones.

- ✎ This effort would have benefited from a more inclusive list of participants outside of the Conservancy and Heritage/CDC, especially non-governmental partners in Canada (i.e. Nature Conservancy Canada). Conversely, it requires a tremendous amount of effort to sustain a working group of Conservancy and Heritage/CDC staff; therefore, planning teams should be cautious about expending energy and time in the implementation realm of partnership cultivation, particularly where relationships are not well developed.
- ✎ The use of ecological complexes as surrogates for natural communities was one of the strengths of this planning effort. Surrogates allowed the Team to work with meaningful planning targets, natural communities as they are actually represented in landscapes. The surrogate approach allowed the Team to bridge significant data gaps for natural community occurrence information and aquatic communities while addressing most of the targets within the ecoregion. Clearly, many sites would not have been selected without this approach.
- ✎ The Team worked conceptually on a landscape-based approach, allowing for data collection and processing that could handle the extensive area of the ecoregion and some of the ambiguity built into the information. This landscape approach also facilitated portfolio design. One of the key concepts developed from this planning effort was the ecological backdrop and its significance in placing portfolio sites within an ecological context. Furthermore, the backdrop as a portfolio layer will play an important role in maintaining a focus on the larger whole and the many large-scale processes that shaped the ecoregion.
- ✎ This planning effort benefited greatly from the first round of ecoregional plans and the methodology/information sources developed, particularly in regard to expert workshops, threat assessment, and setting implementation priorities for sites. The template for the written plan was extensively borrowed from the Northern Tallgrass Prairie (in truth we copied as much as possible).

5.3 An Action Plan for the Northern Great Plains Steppe

An ecoregional plan is only complete when it has addressed all targets in a comprehensive manner. Due to inherent data gaps and other reasons, a comprehensive design has not been achieved for the Northern Great Plains Steppe ecoregion. Despite the prevalence of data gaps, a credible first iteration has been achieved.

On November 16-17, 1998, Divisional, State and Program Directors along with a host of other Conservancy staff with interest in the ecoregion attended an implementation meeting. The meeting was designed to establish a framework for coordinated implementation and to set measures to track success in meeting the Conservancy's conservation goal in the ecoregion.

5.3.1 Priorities for Conservation Action

Sites identified with very high or high conservation priorities (43 sites) were identified as the primary focus of conservation action over the next ten years. Due to their intrinsic biodiversity values, these sites were recognized as offering the greatest return on investment if threat level is reduced. For each of these sites, site conservation plans will be completed within these sites to better inform the site conservation planning process. Conservation action will be directed at reducing threats one category level (i.e. from high to medium) for each of the priority sites. It has been recognized that success within sites may

depend upon multi-site threat abatement strategies that will need to be employed across a larger area than the ecoregion.

Sites with a medium or low conservation priority rating will be considered for conservation action to a lesser extent over the next ten years; however, they remain as critical components of the ecoregional plan. Conservation action within these sites will be more opportunity-driven. Site conservation plans will need to be developed as opportunities emerge for these sites on an ad-hoc basis. Many of these sites also require additional inventory. For landscape scale sites it may be appropriate to direct inventory at quick, extensive surveys to confirm conservation target location and quality.

The Implementation Team recognized that opportunities would also arise outside of existing sites that may significantly contribute to conservation of biodiversity in the ecoregion. Three conservation-driven reasons were identified to consider opportunities outside of existing sites:

- ✎ First, not all of the conservation goals had been met for primary conservation targets or ecological complexes.
- ✎ Second, sites with low biodiversity ratings (i.e. frequently encompass one conservation target) may not represent the best or a better example (compared to a newly identified site) of an ecological complex or population of a conservation target, therefore, it may be possible to exchange one site for another.
- ✎ Finally, low-cost conservation action (i.e. donated conservation easements) opportunities may arise that offer opportunities to contribute to maintaining the integrity of the ecological backdrop.

5.3.2 Evaluating and Charting Progress

An ecoregional plan needs to be a living document that undergoes revision and improvement prior to the next iteration, which for this ecoregional plan will probably not occur sooner than 10 years from its publication. To ensure that the plan remains relevant a Northern Great Plains Steppe review meeting will be held every 18 months to evaluate progress and make revisions to the plan. Progress evaluation will be based on meeting the conservation priorities outlined above and other measures established for state and divisional programs. Revisions to the plan will be made as additional data becomes available on conservation targets. A decision tree will be developed in the near future regarding adding or dropping sites based on science driven criteria for the ecoregional plan, whereas decision making regarding conservation projects will follow existing structure (i.e. State Directors reporting to Divisional Directors). Participants at this meeting will include the Implementation Team, Heritage Program Directors, other staff as needed, and potentially, partners.

Information on conservation action occurring in the interim period between review meetings will be stored in a database by the lead state (initially Montana), which will provide updates every six months (beginning July 1, 1999). Conservancy Field Offices and its Canada Program will be responsible for providing information on their actions on a timely basis to the lead state.

5.4 The Next Iteration

Developing an ecoregional plan is a resource intensive process. Rather than setting a target date for completing a next iteration, program directors will need to evaluate the benefits and costs associated with developing the next iteration. Clearly, one of the primary factors should be a substantial increase in data that will allow for meaningful improvements over the current iteration. Future planners should also recognize that data will not be generated equally across the ecoregion, therefore, benefits may be realized by creating the next iteration based on ecoregion section.

5.4.1 Existing Data

Data compiled for the first iteration of the Northern Great Plains Steppe ecoregional plan has been stored at several locations. Element data is available through each of the Natural Heritage/CDC programs and a composite database is maintained by the Great Plains Program. Expert information has been stored as paper and electronic files at the Montana Field Office. All GIS projects and supporting information has been stored at the Montana Field Office.

5.4.2 Filling Data Gaps

A cursory description of data gaps for target species was identified in the previous chapter, whereas data gaps within sites are identified in Appendix 12. Data collection should be a priority within very high and high rated sites in the near future. Long-term inventory should focus on natural communities and species within lesser known portfolio sites, followed by natural community inventory of large intact landscapes. Prioritization between these landscapes should be possible based on REA data.

Meeting inventory priorities is a major challenge in this ecoregion. Many of the Heritage Programs in this ecoregion have limited staff with poor financial support, making substantial progress difficult. To fill these data gaps, the Conservancy will need to invest greater resources through direct contributions or assist (as needed) Heritage Programs engage federal, state/provincial, and tribal governments, institutions of higher learning, and other non-profits.

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Appendix 1:

Primary Target Species in the Northern Great Plains Steppe

Appendix 1: Primary Target Species in the Northern Great Plains Steppe.

Scientific Name	Common Name	Global Rank	USESA	Level of Edemism
BIRDS				
<i>Pelecanus erythrophynchos</i>	American White Pelican	G3		Mostly Within
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4	LTNL	Peripheral
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	G4T3	LE	Peripheral
<i>Grus americana</i>	Whooping Crane	G1	LE	Peripheral
<i>Charadrius melodus</i>	Piping Plover	G3	LELT	Mostly Within
<i>Charadrius montanus</i>	Mountain Plover	G3	C	Mostly Within
<i>Sterna antillarum athalassos</i>	Interior Least Tern	G4T2Q	LENL	Mostly Outside
FISH				
<i>Acipenser fulvescens</i>	Lake Sturgeon	G3		Peripheral
<i>Scaphirhynchus albus</i>	Pallid Sturgeon	G1G2	LE	Mostly Within
<i>Macrhybopsis gelida</i>	Sturgeon Chub	G2	C	Mostly Within
<i>Macrhybopsis meeki</i>	Sicklefin Chub	G3	C	Mostly Outside
<i>Cycleptus elongatus</i>	Blue Sucker	G3		Mostly Outside

MAMMALS

<i>Myotis thysanodes pahasapensis</i>	Fringe-Tailed Myotis	G5T2		Peripheral
<i>Vulpes velox</i>	Swift Fox	G3	C	Mostly Within
<i>Mustela nigripes</i>	Black-Footed Ferret	G1	LEXN	Mostly Within
<i>Cynomys ludovicianus</i>	Black-Tailed Prairie Dog	G4		Mostly Within
<i>Canis lupus</i>	Gray Wolf	G4	LELT	Peripheral
<i>Ursus actos horribilis</i>	Grizzly Bear	G4T3	LT	Peripheral

INSECTS

<i>Hesperia dacotae</i>	Dakota Skipper	G2G3		Peripheral
<i>Speyeria idalia</i>	Regal Fritillary	G3		Peripheral

DICOT PLANTS

<i>Erigeron radicans</i>	Taprooted Fleabane	G3		Mostly Outside
<i>Parthenium alpinum</i>	Alpine Fever-Few	G2		Mostly Within
<i>Lappula cenchrusoides</i>	Great Plains Stickseed	G2G3		Endemic
<i>Arabis fendleri</i> var <i>spatifolia</i>	A Fendler Rock-Cress	G5T3		Peripheral
<i>Halimolobos virgata</i>	Virgate Halimolobos	G2G3		Mostly Outside
<i>Lesquerella arenosa</i> var <i>arguilloa</i>	Secund Bladderpod	G5T3		Endemic
<i>Physaria didymocarpa</i> var <i>lanata</i>	Wooly Twinpod	G5T2		Mostly Outside
<i>Rorippa calycina</i>	Persistent-Sepal Yellow-Cress	G3		Peripheral

<i>Chenopodium subglabrum</i>	Smooth Goosefoot	G3		Mostly Within
<i>Astragalus barrii</i>	Barr Milk-vetch	G3		Mostly Within
<i>Astragalus simplicifolius</i>	Bun Milk-vetch	G3		Peripheral
<i>Dalea cylindriceps</i>	Andean Prairie-Clover	G3?		Mostly Outside
<i>Eriogonum visherii</i>	Dakota Wild-Buckwheat	G3		Endemic
<i>Polygonum polygaloides</i> ssp <i>confertiflorum</i>	Dense-Flower Knotweed	G4G5T3		Endemic
<i>Sullivantia hapemani</i> l	Purpus' Sullivantia	G3		Peripheral
<i>Cryptantha stricta</i>	Erect Cryptantha	G3		Peripheral
<i>Cuscuta plottensis</i>	Wyoming Dodder	G3		Mostly Within

MONOCOT PLANTS

<i>Spiranthes diluvialis</i>	Ute Ladies' Tresses	G2	LT	Peripheral
<i>Oryzopsis contracta</i>	An Indian Ricegrass	G3		Peripheral

PTERIDOPHYTE PLANTS

<i>Botrychium hesperium</i>	Western Moonwort	G3		Peripheral
<i>Botrychium pedunculosum</i>	Stalked Moonwort	G3?		Mostly Outside
<i>Botrychium campestre</i>	Prairie Dunewort	G2		Mostly Within

Appendix 2:

Secondary Target Species in the Northern Great Plains Steppe

Appendix 2: Secondary Target Species in the Northern Great Plains Steppe.

Scientific Name	Common Name	Global Rank	USESA	Level of Edemism
BIRDS				
<i>Larus pipixcan</i>	Franklin's Gull	G5		Mostly within
<i>Speotyto cunicularia</i>	Burrowing Owl	G4		Mostly within
<i>Anthus spragueii</i>	Sprague's Pipit	G4		Endemic
<i>Ammodramus bairdii</i>	Baird's Sparrow	G4		Mostly within
<i>Calcarius ornatus</i>	Chestnut Collared Longspur	G5		Mostly within
<i>Centrocercus urophasianus</i>	Sage Grouse	G5		Mostly outside
FISHES				
<i>Hybognathus placitus</i>	Plains Minnow	G5		Mostly outside
<i>Nocomis biguttatus</i>	Hornyhead Chub	G5		Mostly within
<i>Platygobio gracilis</i>	Flathead Chub	G5		Mostly within
<i>Polyodon spathula</i>	Paddlefish	G4		Mostly within
INVERTEBRATES				
<i>Hesperia ottoe</i>	Ottoe Skipper	G4		Mostly outside
<i>Phyciodes batesii</i>	Tawny Crescentspot	G3G4		Mostly outside

MAMMALS

<i>Felis concolor</i>	Mountain Lion	G5	Peripheral
<i>Lynx rufus</i>	Bobcat	G5	Peripheral
<i>Plecotus townsendii pallenscens</i>	Townsend's Big-Eared Bat	G4T4	Mostly outside

REPTILES

<i>Phrynosoma douglasii</i>	Short-Horned Lizard	G5	Mostly outside
<i>Trionyx spiniferus</i>	Spiny Softshell Turtle	G5	Mostly outside
<i>Coluber constrictor</i>	Yellow-bellied Racer	G5	Mostly outside

Appendix 3:

Natural Community Associations Captured Within Ecological Complexes

Appendix 3. Natural Community Associations Captured within Ecological Complexes.

Wetland

Prairie Pothole, Playa, and Lake

Calamagrostis stricta - Carex sartwellii - Carex praegracilis - Plantago eriopoda Saline Herbaceous Vegetation
Hordeum jubatum Herbaceous Vegetation
Pascopyrum smithii - Eleocharis spp. Herbaceous Vegetation
Pascopyrum smithii - Hordeum jubatum Herbaceous Vegetation
Calamagrostis canadensis Herbaceous Vegetation
Carex aquatilis Herbaceous Vegetation
Carex atherodes Herbaceous Vegetation
Carex nebrascensis Herbaceous Vegetation
Deschampsia cespitosa Herbaceous Vegetation
Deschampsia cespitosa - Carex spp. Herbaceous Vegetation
Equisetum fluviatile Herbaceous Vegetation
Polygonum amphibium Herbaceous Vegetation
Potamogeton spp. - Ceratophyllum demersum Great Plains Herbaceous Vegetation
Potamogeton pectinatus - Myriophyllum spicatum Herbaceous Vegetation
Potamogeton pectinatus - Ruppia maritima Herbaceous Vegetation
Potamogeton pectinatus - Zannichellia palustris Herbaceous Vegetation
Potamogeton richardsonii - Myriophyllum spicatum Herbaceous Vegetation
Ruppia maritima Great Plains Herbaceous Vegetation

Alkali/Saline

Distichlis spicata var. stricta Herbaceous Vegetation
D. spicata - H. jubatum - Puccinellia nuttalliana - Sueda calceoliformis Saline Herbaceous Vegetation
Distichlis spicata - Hordeum jubatum - Sporobolus airoides Saline Herbaceous Vegetation
Pascopyrum smithii - Distichlis spicata Herbaceous Vegetation
Spartina pectinata - Calamagrostis stricta - Carex spp. Great Plains Herbaceous Vegetation
Eleocharis palustris Herbaceous Vegetation
Juncus balticus Herbaceous Vegetation
Phalaris arundinacea Herbaceous Vegetation
Poa palustris Herbaceous Vegetation
Scolochloa festucacea Herbaceous Vegetation
Scirpus validus - Typha spp. - (Sparganium spp. - Juncus spp.) Herbaceous Vegetation
Glyceria borealis Herbaceous Vegetation
Phragmites australis Herbaceous Vegetation
Scirpus acutus Herbaceous Vegetation
Scirpus acutus - (Scirpus fluviatilis) Freshwater Herbaceous Vegetation
Scirpus maritimus Herbaceous Vegetation
Scirpus maritimus - Scirpus acutus - (Triglochin maritima) Herbaceous Vegetation
Scirpus pungens Herbaceous Vegetation
Scirpus spp. - Typha spp. Mixed Inland Great Plains Herbaceous Vegetation
Typha latifolia Herbaceous Vegetation
Typha spp. Inland Great Plains Herbaceous Vegetation
Deschampsia cespitosa - Caltha leptosepala Herbaceous Vegetation
Salicornia rubra Herbaceous Vegetation
Cobble/gravel beach

Fen

Carex buxbaumii Herbaceous Vegetation
Carex rostrata Herbaceous Vegetation
Carex interior - Eleocharis erythropoda - Thelypteris palustris Herbaceous Vegetation
Carex prairea - Scirpus americanus - Rhynchospora capillacea Herbaceous Vegetation
Carex spp. - Triglochin maritima - Eleocharis pauciflora Marl Fen Herbaceous Vegetation
Typha spp. - Equisetum hyemale - Carex spp. Seep Herbaceous Vegetation

Wooded Draw

Shrub Wooded Draw

Amelanchier alnifolia/Pseudoroegneria spicata Shrubland
Amelanchier alnifolia Shrubland
Betula occidentalis - Juniperus horizontalis/Calamovilfa longifolia Shrubland
Prunus virginiana Shrubland
Crataegus douglasii Shrubland
Crataegus chrysocarpa
Crataegus succulenta Shrubland
Rosa woodsii Shrubland
Shepherdia argentea Shrubland

Deciduous Wooded Draw

Fraxinus pennsylvanica - Ulmus americana/Ostrya virginiana Canyon Woodland
Fraxinus pennsylvanica - (Ulmus americana)/Prunus virginiana Woodland
Quercus macrocarpa/Carex inops ssp. heliophila Woodland
Quercus macrocarpa/Corylus americana - Amelanchier alnifolia Woodland
Quercus macrocarpa/Prunus virginiana Northern Ravine Woodland
Quercus macrocarpa Mixedgrass Till Wooded Mixedgrass Herbaceous Vegetation

Deciduous-Coniferous Wooded Draw

Juniperus scopulorum/Artemisia tridentata Woodland
Juniperus scopulorum/Oryzopsis micrantha Woodland
Juniperus scopulorum/Pseudoroegneria spicata Woodland

Riparian

Herbaceous Riparian

Sporobolus airoides Herbaceous Vegetation
Carex lanuginosa-Calamagrostis stricta Herbaceous Vegetation
Spartina pectinata - Carex spp. Herbaceous Vegetation
Spartina pectinata - Scirpus pungens Herbaceous Vegetation
Agrostis stolonifera Herbaceous Vegetation

Shrub Riparian

Artemisia cana/Pascopyrum smithii Shrub Herbaceous Vegetation
Acer glabrum (Drainage Bottom) Shrubland
Alnus incana Shrubland
Alnus incana/Calamagrostis canadensis Shrubland
Alnus viridis ssp. sinuata Shrubland
Cornus sericea Shrubland
Pentaphylloides floribunda/Carex spp. Shrubland
Pentaphylloides floribunda/Deschampsia cespitosa Shrubland
Salix bebbiana Shrubland
Salix drummondiana Shrubland
Salix exigua Shrubland
Salix exigua/Mesic Graminoid Shrubland
Salix geyeriana/Deschampsia cespitosa Shrubland

Salix lucida ssp. caudata Shrubland
Salix lutea/Calamagrostis canadensis Shrubland
Salix wolfii/Deschampsia cespitosa Shrubland
Symphoricarpos occidentalis Shrubland
Betula occidentalis Shrubland
Betula occidentalis - Pentaphylloides floribunda Shrubland
Salix lutea/Carex rostrata Wetland Shrubland

Riparian Forest/Woodland

Acer negundo/Prunus virginiana Forest
Fraxinus pennsylvanica/Prunus virginiana Forest
Fraxinus pennsylvanica - (Ulmus americana) - Acer negundo Forest
Juniperus scopulorum/Cornus sericea Woodland
Pinus ponderosa/Cornus sericea Wetland Woodland
Pseudotsuga menziesii/Cornus sericea Woodland
Salix amygdaloides Woodland

Cottonwood Riparian

Populus deltoides/Cornus sericea Forest
Populus deltoides - Fraxinus pennsylvanica Forest
Populus x jackii Forest
Populus angustifolia/Cornus sericea Woodland
Populus deltoides/Symphoricarpos occidentalis Floodplain Woodland

Sandhills

Sandhills

Andropogon hallii - Calamovilfa longifolia Herbaceous Vegetation
Andropogon hallii - Carex inops ssp. heliophila Herbaceous Vegetation
Andropogon hallii - Stipa comata Herbaceous Vegetation
Calamovilfa longifolia - Andropogon hallii Herbaceous Vegetation
Oryzopsis hymenoides - Psoraleum lanceolatum Herbaceous Vegetation
Sporobolus cryptandrus Shrub Herbaceous Vegetation

Badlands

Badlands

Artemisia filifolia/Andropogon hallii Shrubland
Artemisia filifolia/Calamovilfa longifolia Shrubland
Artemisia tridentata - Atriplex confertifolia Shrubland
Artemisia tridentata/Pseudoroegneria spicata Shrub Herbaceous Vegetation
Artemisia tridentata/Stipa comata Shrubland
Atriplex confertifolia Shrubland
Atriplex confertifolia/Chrysothamnus nauseosus Shrubland
Chrysothamnus nauseosus/Pseudoroegneria spicata Shrubland
Krascheninnikovia lanata/Phlox spp. Dwarf-Shrubland
Krascheninnikovia lanata/Stipa comata Dwarf-Shrubland
Yucca glauca/Calamovilfa longifolia Shrub Herbaceous Vegetation
Yucca glauca/Pseudoroegneria spicata Shrub Herbaceous Vegetation
Pinus ponderosa limestone cliff Sparse Vegetation
Sandstone Caprock Butte Sparse Vegetation
Great Plains Sandstone - Siltstone Talus Sparse Vegetation
Great Plains Limestone Talus Sparse Vegetation
Artemisia longifolia Badlands Sparse Vegetation
Artemisia longifolia Sparse Vegetation
Artemisia longifolia/Oryzopsis hymenoides Sparse Vegetation
Eroding Great Plains Badlands Sparse Vegetation

Forest/Woodland

Deciduous Forest

Quercus macrocarpa/Ostrya virginiana Forest
Betula papyrifera/Corylus cornuta Forest
Populus tremuloides/Carex geyeri Forest
Populus tremuloides/Symphoricarpos albus Forest
Populus tremuloides/Symphoricarpos oreophilus Forest
Populus tremuloides/Corylus cornuta Forest
Populus tremuloides/Cornus sericea Forest
Populus tremuloides - Populus balsamifera/Calamagrostis canadensis Wetland Forest
Populus tremuloides/Calamagrostis rubescens Forest
Betula papyrifera/Corylus cornuta Woodland

Low Elevation Coniferous Forest

Pinus ponderosa/Mahonia repens Forest
Pinus ponderosa/Prunus virginiana Forest
Pinus ponderosa/Symphoricarpos albus Forest
Pinus ponderosa/Symphoricarpos occidentalis Forest
Pseudotsuga menziesii/Cornus canadensis Forest
Populus tremuloides/Amelanchier alnifolia Forest
Populus tremuloides/Mahonia repens Forest
Populus tremuloides/Osmorhiza occidentalis Forest
Populus tremuloides/Prunus virginiana Forest
Populus tremuloides/Rosa woodsii Forest
Pinus flexilis - Populus tremuloides Forest
Pinus ponderosa - Populus tremuloides Forest
Pinus contorta/Juniperus communis Woodland
Pinus flexilis/Festuca idahoensis Woodland
Pinus flexilis/Festuca scabrella Woodland
Pinus flexilis/Juniperus communis Woodland
Pinus flexilis/Juniperus scopulorum Woodland
Pinus flexilis/Pseudoroegneria spicata Woodland
Pinus flexilis/Scree Woodland
Pinus ponderosa/Amelanchier alnifolia Woodland
Pinus ponderosa/Andropogon spp. Woodland
Pinus ponderosa/Arctostaphylos uva-ursi Woodland
Pinus ponderosa/Carex geyeri Woodland
Pinus ponderosa/Carex inops ssp. heliophila Woodland
Pinus ponderosa/Cercocarpus montanus Woodland
Pinus ponderosa/Festuca idahoensis Woodland
Pinus ponderosa/Festuca scabrella Woodland
Pinus ponderosa/Juniperus communis Woodland
Pinus ponderosa/Juniperus horizontalis Woodland
Pinus ponderosa/Juniperus scopulorum Woodland
Pinus ponderosa/Pascopyrum smithii Woodland
Pinus ponderosa/Pseudoroegneria spicata Woodland
Pinus ponderosa/Quercus macrocarpa Woodland
Pinus ponderosa/Schizachyrium scoparium Woodland
Pinus ponderosa/Scree Woodland
Pseudotsuga menziesii/Festuca idahoensis Woodland
Pseudotsuga menziesii/Festuca scabrella Woodland
Pseudotsuga menziesii/Juniperus scopulorum Woodland
Pseudotsuga menziesii/Muhlenbergia cuspidata Woodland
Pseudotsuga menziesii/Pseudoroegneria spicata Woodland
Pseudotsuga menziesii/Scree Woodland
Salix geyeriana/Calamagrostis canadensis Shrubland

Salix geyeriana/Carex rostrata Shrubland
 Andropogon gerardii/Calamovilfa longifolia Herbaceous Vegetation
 Andropogon gerardii/Festuca idahoensis Herbaceous Vegetation
 Pinus ponderosa/Schizachyrium scoparium Wooded Herbaceous Vegetation

High Elevation Coniferous Forest

Pinus contorta/Arctostaphylos uva-ursi Forest
 Pinus contorta/Arnica cordifolia Forest
 Pinus contorta/Calamagrostis rubescens Forest
 Pinus contorta/Linnaea borealis Forest
 Pinus contorta/Vaccinium cespitosum Forest
 Pinus contorta/Vaccinium scoparium Forest
 Picea engelmannii/Vaccinium scoparium Forest
 Picea x glauca/Juniperus communis Forest
 Picea x glauca/Linnaea borealis Forest
 Picea x glauca/Maianthemum stellatum Forest
 Picea x glauca/Vaccinium cespitosum Forest
 Pseudotsuga menziesii/Amelanchier alnifolia Forest
 Pseudotsuga menziesii/Arctostaphylos uva-ursi Forest
 Pseudotsuga menziesii/Arnica cordifolia Forest
 Pseudotsuga menziesii/Calamagrostis rubescens Forest
 Pseudotsuga menziesii/Carex geyeri Forest
 Pseudotsuga menziesii/Juniperus communis Forest
 Pseudotsuga menziesii/Linnaea borealis Forest
 Pseudotsuga menziesii/Mahonia repens Forest
 Pseudotsuga menziesii/Spiraea betulifolia Forest
 Pseudotsuga menziesii/Symphoricarpos albus Forest
 Pseudotsuga menziesii/Symphoricarpos occidentalis Forest
 Pseudotsuga menziesii/Vaccinium cespitosum Forest
 Pseudotsuga menziesii/Viola canadensis Forest
 Abies lasiocarpa/Actaea rubra Forest
 Abies lasiocarpa/Arnica cordifolia Forest
 Abies lasiocarpa/Calamagrostis rubescens Forest
 Abies lasiocarpa/Clematis columbiana var. columbiana Forest
 Abies lasiocarpa/Galium triflorum Forest
 Abies lasiocarpa/Linnaea borealis Forest
 Abies lasiocarpa/Symphoricarpos albus Forest
 Abies lasiocarpa/Vaccinium cespitosum Forest
 Abies lasiocarpa/Vaccinium globulare Forest
 Abies lasiocarpa/Alnus viridis ssp. sinuata Forest
 Picea x glauca/Cornus sericea Forest
 Picea x glauca/Galium triflorum Forest
 Abies lasiocarpa/Calamagrostis canadensis Forest
 Picea x glauca/Equisetum arvense Forest
 Picea x glauca/Senecio streptanthifolius Forest
 Pinus contorta - Populus tremuloides Forest
 Abies lasiocarpa/Juniperus communis Woodland
 Abies lasiocarpa/Scree Woodland
 Abies lasiocarpa - Pinus albicaulis/Vaccinium scoparium Woodland
 Acer glabrum (Avalanche Chute) Shrubland
 Alnus spp. (Avalanche Chute) Shrubland
 Salix wolfii/Carex aquatilis Wetland Shrubland

Shrubland

Big Sage Shrubland

Artemisia tridentata ssp. vaseyana/Pascopyrum smithii Shrubland
Artemisia tridentata ssp. wyomingensis/Bouteloua gracilis Shrubland
Artemisia tridentata ssp. wyomingensis/Carex filifolia Shrubland
Artemisia tridentata ssp. wyomingensis/Elymus lanceolatus ssp. albicans Shrubland
Artemisia tridentata ssp. wyomingensis/Pascopyrum smithii Shrubland
Artemisia tridentata ssp. wyomingensis/Poa secunda Shrubland
Artemisia tridentata/Festuca idahoensis Shrub Herbaceous Vegetation
Artemisia tridentata/Festuca scabrella Shrub Herbaceous Vegetation
Artemisia tridentata/Pascopyrum smithii Shrub Herbaceous Vegetation
Artemisia tridentata ssp. wyomingensis/Mixed Grass Shrub Herbaceous Vegetation
Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Shrub Herbaceous Vegetation
Artemisia tridentata ssp. wyomingensis/Buchloe dactyloides Shrub Herbaceous Vegetation

Basin Big Sage Shrubland

Artemisia tridentata ssp. tridentata/Festuca idahoensis Shrubland
Artemisia tridentata ssp. tridentata/Pseudoroegneria spicata Shrub Herbaceous Vegetation

Black Sagebrush Shrubland

Artemisia nova/Pseudoroegneria spicata Dwarf-Shrubland

Birdsfoot Sage Shrubland

Artemisia pedatifida/Pascopyrum smithii Dwarf-shrubland

Mountain Mahogany Shrubland

Cercocarpus montanus/Bouteloua curtipendula Shrubland
Cercocarpus montanus/Pseudoroegneria spicata Shrubland

Nuttall's Saltbrush Shrubland

Atriplex gardneri Dwarf-shrubland
Atriplex gardneri/Oryzopsis hymenoides Dwarf-shrubland
Atriplex gardneri/Pascopyrum smithii Dwarf-shrubland

Greasewood Shrubland

Artemisia cana ssp. cana - Sarcobatus vermiculatus - (Chrysothamnus nauseosus) Shrubland
Sarcobatus vermiculatus/Pseudoroegneria spicata Shrubland
Sarcobatus vermiculatus/Artemisia tridentata Shrubland
Sarcobatus vermiculatus/Atriplex gardneri Shrubland
Sarcobatus vermiculatus/Elymus lanceolatus Shrub Herbaceous Vegetation
Sarcobatus vermiculatus/Distichlis spicata - (Puccinellia nuttalliana) Saline Shrub Herbaceous Vegetation
Sarcobatus vermiculatus/Pascopyrum smithii Shrub Herbaceous Vegetation
Sarcobatus vermiculatus/Sporobolus airoides Sparse Vegetation

Silverberry Shrubland

Eleagnus commutata/Pascopyrum smithii Shrubland
Eleagnus commutata Wetland Shrubland

Creeping Juniper Shrubland

Juniperus horizontalis/Carex inops ssp. heliophila Dwarf-shrubland
Juniperus horizontalis/Schizachyrium scoparium Dwarf-shrubland

Tallgrass Prairie

Tallgrass Prairie

Andropogon gerardii - Schizachyrium scoparium (Western Great Plains) Herbaceous Vegetation

Mixed-grass Sod

Prairie Sandreed Grassland

Calamovilfa longifolia - Carex filifolia Herbaceous Vegetation
Calamovilfa longifolia - Carex inops ssp. heliophila Herbaceous Vegetation
Calamovilfa longifolia - Pascopyrum smithii Herbaceous Vegetation
Calamovilfa longifolia - Stipa comata Herbaceous Vegetation
Artemisia cana ssp. cana/Calamovilfa longifolia Shrub Herbaceous Vegetation
Rhus trilobata/Calamovilfa longifolia Shrub Herbaceous Vegetation

Western Wheatgrass Grassland

Leymus cinereus Herbaceous Vegetation
Leymus cinereus - Pascopyrum smithii Herbaceous Vegetation
Pascopyrum smithii Herbaceous Vegetation
Pascopyrum smithii - Bouteloua gracilis/Carex filifolia Herbaceous Vegetation
Pascopyrum smithii - (Elymus trachycaulus) Clay Pan Herbaceous Vegetation
Pascopyrum smithii - Stipa comata Central Mixedgrass Herbaceous Vegetation
Pascopyrum smithii - Nasella viridula Herbaceous Vegetation
Artemisia cana ssp. cana/Pascopyrum smithii Shrub Herbaceous Vegetation

Northern Wheatgrass Grassland

Elymus lanceolatus-Koeleria pyramidata Herbaceous Vegetation
Stipa curisetata - Elymus lanceolatus Herbaceous Vegetation

Needlegrass Grassland

Stipa comata - Carex inops ssp. heliophila Herbaceous Vegetation
Stipa comata - Bouteloua gracilis Herbaceous Vegetation
Stipa comata - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation
Stipa comata - Oryzopsis hymenoides Herbaceous Vegetation
Stipa comata - Yucca glauca Herbaceous Vegetation
Bouteloua gracilis (Shortgrass Prairie) Herbaceous Vegetation
Bouteloua gracilis - Buchloe dactyloides Herbaceous Vegetation
Bouteloua gracilis - Buchloe dactyloides Xeric Slope Herbaceous Vegetation
Bouteloua gracilis - Carex filifolia Herbaceous Vegetation
Artemisia cana/Carex inops ssp. heliophila Shrub Herbaceous Vegetation
Artemisia cana/Stipa comata Shrub Herbaceous Vegetation
Artemisia cana ssp. cana/Bouteloua gracilis Shrub Herbaceous Vegetation

Mixed-grass Bunch

Rough Fescue Grassland

Festuca scabrella Herbaceous Vegetation
Festuca scabrella - Festuca idahoensis Herbaceous Vegetation
Festuca scabrella - Pseudoroegneria spicata Herbaceous Vegetation
Festuca scabrella - (Stipa spp.) Herbaceous Vegetation
Pentaphylloides floribunda/Festuca scabrella Shrub Herbaceous Vegetation

Idaho Fescue Grassland

Leymus cinereus - Festuca idahoensis Herbaceous Vegetation
Festuca idahoensis - Carex filifolia Herbaceous Vegetation
Festuca idahoensis - Carex inops ssp. heliophila Herbaceous Vegetation
Festuca idahoensis - Elymus trachycaulus Herbaceous Vegetation
Festuca idahoensis - Pascopyrum smithii Herbaceous Vegetation

Festuca idahoensis - Pseudoroegneria spicata Herbaceous Vegetation
Festuca idahoensis - Carex scirpoidea Herbaceous Vegetation
Festuca idahoensis - Deschampsia cespitosa Herbaceous Vegetation
Artemisia cana/Festuca idahoensis Shrub Herbaceous Vegetation
Pentaphylloides floribunda/Festuca idahoensis Shrub Herbaceous Vegetation
Rhus trilobata/Festuca idahoensis Shrub Herbaceous Vegetation

Bluebunch Wheatgrass Grassland

Pseudoroegneria spicata - Bouteloua gracilis Herbaceous Vegetation
Pseudoroegneria spicata - Bouteloua curtipendula Herbaceous Vegetation
Pseudoroegneria spicata - Carex filifolia Herbaceous Vegetation
Pseudoroegneria spicata - Koeleria macrantha Herbaceous Vegetation
Pseudoroegneria spicata - Muhlenbergia cuspidata Herbaceous Vegetation
Pseudoroegneria spicata - Oryzopsis hymenoides Herbaceous Vegetation
Pseudoroegneria spicata - Pascopyrum smithii Herbaceous Vegetation
Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation
Pseudoroegneria spicata - Stipa comata Herbaceous Vegetation
Rhus trilobata/Pseudoroegneria spicata Shrub Herbaceous Vegetation
Rhus trilobata/Carex filifolia Shrub Herbaceous Vegetation

Little Bluestem Grassland

S. scoparium - Bouteloua spp. (curtipendula, gracilis)/Carex filifolia Herbaceous Vegetation
Schizachyrium scoparium - Carex inops ssp. heliophila Herbaceous Vegetation
Schizachyrium scoparium - Muhlenbergia cuspidata Herbaceous Vegetation
Rhus trilobata/Schizachyrium scoparium Shrub Herbaceous Vegetation

Appendix 4:

Target Selections by Portfolio Site in the Northern Great Plains Steppe

Appendix 4-A: Target Selections by Portfolio Site in the Northwestern Glaciated Plains Section.

Portfolio Site, State/Province	Data Source¹	Confidence Level²
Target		
Alkali Creek Moraine, AB		
Prairie pothole	L	H
Needlegrass grassland	L	H
Antelope Lake, SK		
Lake	E	M
Bear's Paw Mountains, MT		
Deciduous wooded draw	R	M
Deciduous forest/woodland	R	M
High elevation coniferous forest/woodland	R	M
Rough fescue grasslands	R	M
Bluebunch wheatgrass grasslands	R	M
Bitter Creek, MT		
Deciduous wooded draw	R	M
Herbaceous riparian	R	M
Badlands	R	H
Creeping juniper shrubland	R	H
Prairie sandreed grassland	R	H
Western wheatgrass grassland	R	H
Thickspike wheatgrass grassland	R	H
Needlegrass grassland	R	H
Bowdoin National Wildlife Refuge, MT		
American white pelican	H	H
Burstall Sandhills, SK		
Sandhills	E	H
Smooth goosefoot	H	H
Cabri Sandhills, SK		
Sandhills	E	H
Prairie sandreed grasslands	E	M
Smooth goosefoot	H	H

¹ Represents the data source for a conservation target. R = rapid ecological assessment, H = Heritage Network, E = expert or expert workshop, L = published literature.

² Level of confidence assigned to the presence and quality of a conservation target. H = high, M = medium.

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Chappice-Sam-Lakes, AB		
Alkali/saline wetland	L	H
Piping plover	L	H
Dinosaur Provincial Park, AB		
Shrub riparian	L	H
Cottonwood riparian	L	H
Badlands	L	H
Frenchman Valley, SK		
Shrub wooded draw	E	H
Deciduous wooded draw	E	H
Taprooted fleabane	H	H
Grasslands National Park West, SK		
Needlegrass grassland	R	H
Mountain plover	E	H
Swift fox	H	H
Black-tailed prairie dog	H	H
Taprooted fleabane	H	H
Dense-flower knotweed	H	H
Great Sandhills, SK		
Sandhills	H	H
Prairie sandreed grassland	E	M
Smooth goosefoot	H	H
Prairie dunewort	H	H
Highwood Mountains, MT		
Deciduous wooded draw	R	M
Deciduous forest/woodland	R	M
High elevation coniferous forest/woodland	R	M
Jenner Moraine, AB		
Pothole wetland	L	H
Needlegrass grassland	L	H
Killdeer Badlands, SK		
Badlands	E	H
Swift fox	H	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Little Rocky Mountains, MT		
Deciduous forest/woodland	R	M
High elevation coniferous forest/woodland	R	M
Idaho fescue grassland	H	H
Bluebunch wheatgrass grassland	H	H
Lonesome Lake, MT		
Pothole wetland	E	H
Lower Bow Dunes, AB		
Sandhills	L	H
Many Island Lake, AB		
Alkali/saline wetland	L	H
Greasewood shrubland	L	H
Mannyberries Badlands, AB		
Shrub riparian	L	H
Badlands	L	H
Creeping juniper shrubland	L	H
Middle Sandhills, AB		
Sandhills	L	H
Needlegrass grasslands	L	H
Smooth goosefoot	L	H
Milk River, AB		
Pothole wetland	L	H
Deciduous wooded draw	L	H
Herbaceous riparian`	L	H
Shrub riparian	L	H
Cottonwood riparian	L	H
Badlands	L	H
Needlegrass grasslands	L	H
Swift fox	L	H
Milk River Benches, MT		
Thickspike wheatgrass grassland	R	H
Swift fox	H	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Montana Glaciated Plains, MT		
Low elevation coniferous forest/woodland	R/H/L	H
Big sage shrubland	R/E	H
Greasewood shrubland	R	M
Prairie sandreed grassland	R	M
Western wheatgrass grassland	R	M
Bluebunch wheatgrass grassland	R	M
Mountain plover	H	H
Swift fox	E	H
Black-footed ferret	H	H
Black-tailed prairie dog	H/L	H
Old Man on His Back Plateau, SK		
Western wheatgrass grassland	R	M
Oldman River, AB		
Shrub riparian	L	H
Cottonwood riparian	L	H
Pakowki Lake, AB		
Lake	L	H
Purple Springs Sandhills, AB		
Sandhills	L	H
Red Deer River, AB		
Shrub riparian	L	H
Cottonwood riparian	L	H
Red Deer-South Saskatchewan, AB/SK		
Shrub wooded draw	H	H
Deciduous wooded draw	L/H	H
Shrub riparian	L/H	H
Cottonwood riparian	L/H	H
Sandhills	L	H
Aquatic communities	E	M
Piping plover	H	H
Lake sturgeon	L	H
Virgate halimoloba	H	H
Reed Lake, SK		
Alkali/saline wetland	E	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Rocky Mountain Front, MT		
Pothole wetland	R/H	H
Alkali/saline wetland	R/H	H
Fen	H	H
Shrub riparian	R/H	H
Deciduous forest/woodland	R/H	H
Rough fescue grassland	R/H	H
Bluebunch wheatgrass grassland	R/H	H
Grizzly bear	H	H
Gray wolf	H	H
Western moonwort	H	H
Sage Creek-Southwest Pasture Complex, AB-SK-MT		
Alkali/saline wetland	L	H
Shrub riparian	L	H
Western wheatgrass grassland	L/R	H
Swift fox	H/E	H
Dense flower knotweed	H	H
South Snowy Mountains, MT		
Mountain plover	L	H
Sweetgrass Hills, MT		
High elevation coniferous forest/woodland	R	M
Western wheatgrass grassland	R	H
Needlegrass grassland	R	M
Rough fescue grassland	R	M
Swift Current Creek, SK		
Aquatic communities	E	M
Tunstall Sandhills, SK		
Alkali/saline wetland	E	H
Sandhills	E	H
Smooth goosefoot	H	H
Turin Dunes, AB		
Sandhills	L	H
Smooth goosefoot	H	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Upper Missouri River, MT		
Shrub riparian	R	H
Cottonwood riparian	R	H
Aquatic communities	E	M
Bald eagle	H	H
Pallid sturgeon	L/H	H
Sicklefin chub	H	H
Sturgeon chub	H	H
Blue sucker	E/L	H
Whitewater Wetlands Complex, MT		
Pothole wetland	R	M
Swift fox	E	H
Wolf Island Dunes, AB		
Sandhills	L	H
Writing on Stone, AB		
Deciduous wooded draw	L	H
Shrub riparian	L	H
Cottonwood riparian	L	H

Appendix 4-B: Target Selections by Portfolio Site in the Northern Glaciated Plains Section.

Portfolio Site, State/Province	Data Source¹	Confidence Level²
Beaver Creek, ND		
Herbaceous riparian	E	M
Chaplin Lake, SK		
Alkali/saline wetland	E	H
Piping plover	H	H
Chase Lake, ND		
Pothole wetland	H	H
Alkali/saline wetland	H	H
Fen	H	H
Tallgrass prairie	R	M
Little bluestem grassland	R	M
American Pelican	E	H
Comertown Prairie, MT		
Pothole wetland	H	H
Thickspike wheatgrass grassland	H	H
Crystal Springs, ND		
Tallgrass prairie	R	M
Needlegrass grassland	R	M
Little bluestem grassland	R	M
Davis Ranch Hills, ND		
Pothole wetland	R	M
Silverberry shrubland	R	M
Western wheatgrass grassland	R	M
Needlegrass grassland	R	M
Dawson Sandhills/Long Lake, ND		
Lake	H	H
Sandhills	H	H
John E. Williams Preserve Complex, ND		
Alkali wetland	H	H
Piping plover	H	H

¹ Represents the data source for a conservation target. R = rapid ecological assessment, H = Heritage Network, E = expert or expert workshop, L = published literature.

² Level of confidence assigned to the presence and quality of a conservation target. H = high, M = medium.

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Lake of the Rivers, SK		
Alkali/saline wetland	E	H
Piping Plover	E, H	H
Lostwood, ND		
Pothole wetland	H	H
Lake	H	H
Alkali/saline wetland	H	H
Fen	H	H
Deciduous wooded draw	E	M
Deciduous forest/woodland	E	M
Tallgrass prairie	E	M
Western wheatgrass grassland	H	H
Needlegrass grassland	H	H
Piping plover	H	H
Dakota skipper	E	H
Manning Lake, MT		
Alkali/saline wetland	R	M
Medicine Lake, MT		
Pothole wetland	L	H
Lake	L	H
Sandhills	L	H
American Pelican	H	H
Piping Plover	H	H
Muddy Creek Badlands, SK		
Alkali/saline wetland	E	H
Shrub riparian	E	M
Needlegrass grassland	R	M
Piping plover	H	H
Old Wives Lake, SK		
Alkali/saline wetland	E	H
Piping plover	H	H
American pelican	H	H
Orient Hills, SD		
Needlegrass grassland	E	M

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Ordway/McPherson/Johnson's Gulch, ND/SD		
Pothole wetland	H	H
Fen	H	H
Deciduous wooded draw	H	H
Tallgrass prairie	H	H
Needlegrass grassland	H	H
Little bluestem grassland	H	H
Dakota skipper	H	H
Regal fritillary	H	H
Stateline Wetlands, MT/ND		
Alkali/saline wetland	E	H
Piping plover	H	H
West Fork Poplar River, MT		
Deciduous wooded draw	R	M
Shrub riparian	R	M
Willow Bunch Lake, SK		
Alkali/saline wetland	E	H
Piping plover	H	H

Appendix 4-C: Target Selections by Portfolio Site in the Northwestern Great Plains Section.

Portfolio Site, State/Province Target	Data Source ¹	Confidence Level ²
Badlands National Park Complex, SD		
Deciduous wooded draw	R	M
Badlands	R	H
Western wheatgrass grassland	E	M
Fringe-tailed myotis	H	H
Swift fox	H	H
Black-footed ferret	H	H
Black-tailed prairie dog	E	H
Barr's milkvetch	H	H
Dakota buckwheat	H	H
Bad River Prairie, SD		
Tallgrass prairie	R	M
Bates Hole/Shirley Rim, WY		
Badlands	R	M
High elevation coniferous forest/woodland	R	M
Basin big sage shrubland	R	M
Nuttall's saltbush shrubland	R	M
Smooth goosefoot	H	H
Oryzopsis contracta	H	H
Buffalo Creek, WY		
Bluebunch wheatgrass grassland	R	M
Bullion Butte/Little Missouri, ND		
Shrub riparian	L	H
Cottonwood riparian	L	H
Dakota buckwheat	H	H
Burns Creek, MT		
Deciduous wooded draw	L	H
Casper Sandhills, WY		
Alkali wetland	R	H
Herbaceous riparian	R	H
Sandhills	R	H

¹ Represents the data source for a conservation target. R = rapid ecological assessment, H = Heritage Network, E = expert or expert workshop, L = published literature.

² Level of confidence assigned to the presence and quality of a conservation target. H = high, M = medium.

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Chalk Buttes, MT		
Deciduous wooded draw	R	M
Cheyenne River/Cherry Creek, SD		
Deciduous wooded draw	R	M
Mixed deciduous-coniferous wooded draw	R	M
Low elevation coniferous forest/woodland	R	M
Western wheatgrass grassland	R	M
Little bluestem grassland	R	M
Interior least tern	H	H
Dakota buckwheat	H	H
Cheyenne River Riparian, SD & WY		
Cottonwood riparian	R	M
Demick's Lake, ND		
Lake	E	M
Grand River National Grassland, SD		
Black-tailed prairie dog	E	M
Dakota buckwheat	H	H
Harding County/Slim Buttes, SD		
Needlegrass grassland	R	M
Swift fox	H	H
Dakota buckwheat	H	H
Smooth goosefoot	H	H
Hartville Uplift, WY		
Mountain mahogany shrubland	R	M
Little bluestem grassland	R	M
Parthenium alpinum	H	H
Hat Creek/Toadstool, WY		
Badlands	R	H
Low elevation coniferous forest/woodland	R	M
Alpine fever-few	H	H
High Bank Creek, SD		
Mixed deciduous riparian	R	M
Black-tailed prairie dog	R	M

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Killdeer Mountains/Little Missouri Badlands, ND		
Deciduous wooded draw	H	H
Mixed deciduous-coniferous wooded draw	H	H
Shrub riparian	E	H
Cottonwood riparian	E	H
Badlands	R	M
Deciduous forest/woodland	H	H
Low elevation coniferous forest/woodland	L	H
Little bluestem grassland	R	H
Dakota skipper butterfly	L	H
Knife River, ND		
Little bluestem grassland	R	M
Laramie Range Foothills, WY		
Black sage shrubland	R	M
Mountain mahogany shrubland	R	M
Needlegrass grassland	R	M
Alpine fever-few	H	H
Little Missouri Woodlands, WY		
Deciduous forest/woodland,	H/R	H
Lower Yellowstone-Missouri Confluence, MT/ND		
Aquatic communities	E	M
Interior least tern	H	H
Pallid sturgeon	E	H
Sicklefin chub	H	H
Sturgeon chub	H	H
Blue sucker	E	H
Mike's Creek, ND		
Mixed deciduous-coniferous wooded draw	L	H
Low elevation coniferous forest/woodland	L	H
Moreau River, SD		
Herbaceous riparian	R	M

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Oliver County/Missouri River, ND		
Deciduous wooded draw	E	H
Little bluestem grassland	E	M
Interior least tern	H	H
Piping plover	H	H
Otter Creek/Heart River, ND		
Tallgrass prairie	E	M
Pine Ridge, NE		
Deciduous wooded draw	H	H
Mixed deciduous-coniferous wooded draw	H	H
Low elevation coniferous forest/woodland	H	H
Fringe-tailed myotis	E	H
Rattlesnake Foothills, WY		
Big sage shrubland	R	M
Black sage shrubland	R	M
Rawhide Buttes, WY		
Little bluestem grassland	R	M
Sand Creek, ND		
Needlegrass grassland	R	M
Sioux Prairie, NE/WY		
Herbaceous riparian	H	H
Sandhills	R	M
Needlegrass grassland	R	M
Swift fox	H	H
Secund bladderpod	H	H
Smooth goosefoot	E	H
Ute's ladies' tressess	H	H
Standing Rock, ND		
Badlands	R	M
Western wheatgrass grassland	R	M
Needlegrass grassland	R	M
Dakota buckwheat	H	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Upper Niobrara River, NE/WY		
Herbaceous riparian	H	H
Ute's ladies' tressess	E	H
White/Little White Rivers, NE/SD		
Mixed deciduous-coniferous wooded draw	R	M
Cottonwood riparian	R	M
Badlands	R	M
Low elevation coniferous forest/woodland	R	M
Aquatic communities	E	M
Sturgeon chub	H	H
Sicklefin chub	L	M
Swift fox	H	H
Black-tailed prairie dog	E	H
Wildcat Hills (Pumpkin Creek), NE		
Deciduous wooded draw	H	H
Herbaceous riparian	H	H
Mixed deciduous-coniferous wooded draw	H	H
Low elevation coniferous forest/woodland	H	H
Mountain mahogany	H	H
Winter's Allotment, ND		
Dakota buckwheat	H	H

Appendix 4-D: Target Selections by Portfolio Site in the Powder River Section.

Portfolio Site, State/Province Target	Data Source ¹	Confidence Level ²
Big Horn Foothills, WY		
Shrub wooded draw	R	H
Wooly twinpod	H	H
Purpus' sullivantia	H	H
Bull Mountains, MT		
Herbaceous riparian	R	M
Low elevation coniferous forest/woodland	R	M
Bluebunch wheatgrass grassland	R	M
Cedar Creek, MT		
Low elevation coniferous forest/woodland	R	M
Prairie sandreed grassland	R	M
Dry Lake Basin, MT		
Lake	R	H
Needlegrass grassland	R	M
Froze-to-Death Creek, MT		
Big sage shrubland	R	M
Nuttall's saltbush shrubland	R	M
Hailstone Lake, MT		
Lake	E	M
Half-breed/Big Lake, MT		
Lake	E	M
Hell Creek Badlands, MT		
Badlands	R	M
Lake Mason, MT		
Lake	E	M

¹ Represent the data source for a conservation target. R = rapid ecological assessment, H = Heritage Network, E = expert or expert workshop, L = published literature.

² Level of confidence assigned to the presence and quality of a conservation target. H = high, M = medium.

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Little Powder River, MT/WY		
Shrub wooded draw	R	M
Deciduous wooded draw	R	M
Herbaceous riparian	R	M
Cottonwood riparian	R	M
Low elevation coniferous forest/woodland	R	H
Big sage shrubland	R	H
Western wheatgrass grassland	R	M
Bluebunch wheatgrass grassland	R	M/L
Little bluestem grassland	R	M
Barr's milkvetch	H	H
Little Sheep Mountains, MT		
Deciduous wooded draw	R	M
Bluebunch wheatgrass grassland	R	M
Pine Ridge, MT		
Low elevation coniferous forest/woodland	R	H
Powder River, MT/WY		
Cottonwood riparian	R	H
Aquatic communities	E	M
Sturgeon chub	H	H
Powder River Breaks, WY		
Badlands	R	M
Big sage shrubland	R	H
Prairie sandreed grassland	R	M
Western wheatgrass grassland	R	M
Needlegrass grassland	R	M
Bluebunch wheatgrass grassland	E	H
Little bluestem grassland	R	M
Black-tailed prairie dog	E	H
Barr's milkvetch	H	H
Terry Badlands, MT		
Badlands	H	H
Black-tailed prairie dog	L	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Thunder Basin/Cheyenne River, NE/SD/WY		
Badlands	R	H
Low elevation coniferous forest/woodland	R	H
Birdsfoot sage shrubland	R	M
Prairie sandreed grassland	R	M
Western wheatgrass grassland	R	M
Needlegrass grassland	R	M
Bluebunch wheatgrass grassland	R	H
Little bluestem grassland	R	M
Mountain plover	E	H
Swift fox	E	H
Black-tailed prairie dog	E	H
Barr's milkvetch	H	H
Secund bladderpod	H	H
Upper Antelope Creek, WY		
Herbaceous riparian	R	M
Prairie sandreed grassland	R	M
Needlegrass grassland	R	M
West Black Thunder Creek, WY		
Playa wetland	R	H
Wolf Mountains/Northern Cheyenne, MT/WY		
Shrub wooded draw	R	M
Deciduous wooded draw	R	M
Mixed deciduous-coniferous wooded draw	R	M
Shrub riparian	R	M
Low elevation coniferous forest/woodland	H	H
Western wheatgrass grassland	R	M
Idaho fescue grassland	R	M
Bluebunch wheatgrass grassland	R	M
Little bluestem grassland	R	M
Black-tailed prairie dog	E/L	H
Yellowstone River (Pompey's Pillar), MT		
Cottonwood riparian	E	M
Aquatic communities	E	M
Bald eagle	H	H

Portfolio Site, State/Province		
Target	Data Source	Confidence Level
Yellow Water Triangle, MT		
Western wheatgrass grassland	R	M
Needlegrass grassland	R	M

Appendix 5:

Northern Great Plains Steppe Conservation Goal Status: Target Species

Appendix 5. Northern Great Plains Steppe Conservation Goal Status: Target Species.

Target Species Sites Supporting Species	Ecoregion Conservation Goal
American White Pelican Bowdoin National Wildlife Refuge, MT Chase Lake, ND Medicine Lake, MT Old Wives Lake, SK Pakowki Lake, AB	5
Bald Eagle Upper Missouri River, MT Yellowstone River (Pompay's Pillar), MT	1
American Peregrine Falcon No sites selected	1
Whooping Crane No sites selected	0
Piping Plover Chappice-Sam-Lakes, AB South Saskatchewan River, SK Chaplin Lake, SK John E. Williams Preserve Complex, ND Lake of the Rivers, SK Lostwood, ND Medicine Lake, MT Muddy Creek Badlands, SK Old Wives Lake, SK Stateline Wetlands, MT/ND Willow Bunch Lake, SK Oliver County/Missouri River, ND	Not Established
Mountain Plover Grasslands National Park West, SK Montana Glaciated Plains, MT South Snowy Mountains, MT Thunder Basin/Cheyenne River, WY	5
Interior Least Tern Cheyenne River/Cherry Creek, SD Lower Yellowstone-Missouri Confluence, MT/ND Oliver County/Missouri River, ND	4
Pallid Sturgeon Upper Missouri River, MT Lower Yellowstone-Missouri Confluence, MT/ND	2

Lake Sturgeon	1
South Saskatchewan River, AB/SK	
Sturgeon Chub	6
Upper Missouri River, MT	
Lower Yellowstone-Missouri Confluence, MT/ND	
White/Little White Rivers, NE/SD	
Powder River, MT/WY	
Sicklefin Chub	6
Upper Missouri River, MT	
Lower Yellowstone-Missouri Confluence, MT/ND	
White/Little White Rivers, NE/SD	
Blue Sucker	3
Upper Missouri River, MT	
Lower Yellowstone-Missouri Confluence, MT/ND	
Fringe-Tailed Myotis	2
Badlands National Park Complex, SD	
Pine Ridge, NE	
Swift Fox	5
Grasslands National Park West, SK	
Milk River Benches, MT	
Sage Creek-Southwest Pasture Complex, AB/MT/SK	
Badlands National Park Complex, SD	
Harding County/Slim Buttes, SD	
Thunder Basin/Cheyenne River, WY	
Black-footed Ferret	4
Montana Glaciated Plains, MT	
Badlands National Park Complex, SD	
Black-tailed Prairie Dog	10
Grasslands National Park West, SK	
Montana Glaciated Plains, MT	
Badlands National Park Complex, SD	
Grand River National Grassland, SD	
High Bank Creek, SD	
White/Little White Rivers, NE/SD	
Powder River Breaks, WY	
Terry Badlands, MT	
Thunder Basin/Cheyenne River, WY	
Wolf Mountains/Northern Cheyenne, MT/WY	
Gray Wolf	1
Rocky Mountain Front, MT	
Grizzly Bear	1
Rocky Mountain Front, MT	

Dakota Skipper	3
Lostwood, ND	
Ordway/McPherson/Johnson's Gulch, ND/SD	
Killdeer Mountains/Little Missouri Badlands, ND	
Regal Fritillary	2
Ordway/McPherson/Johnson's Gulch, ND/SD	
Taprooted Fleabane	3
Frenchman Valley, SK	
Grassland National Park West, SK	
Alpine Fever-Few	6
Hartville Uplift, WY	
Hat Creek/Toadstool, WY	
Laramie Range Foothills, WY	
Great Plains Stickseed	10
No sites selected	
A Fendler Rock-Cress	1
No sites selected	
Virgate Halimolobos	3
South Saskatchewan River	
Secund Bladderpod	10
Sioux Prairie, NE/WY	
Thunder Basin/Cheyenne River, WY	
Wooly Twinpod	3
Bighorn Foothills, WY	
Persistent-Sepal Yellow-Cress	1
No sites selected	
Smooth Goosefoot	6
Burstall Sandhills, SK	
Cabri Sandhills, SK	
Great Sandhills, SK	
Turin Dunes, AB	
Bates Hole/Shirley Rim	
Harding County/Slim Buttes, SD	
Sioux Prairie, NE/WY	
Barr's Milk-vetch	6
Badlands National Park Complex	
Little Powder River, MT/WY	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, WY	

Andean Prairie Clover	3
No sites selected	
Dakota Wild-Buckwheat	10
Badlands National Park Complex	
Bullion Butte/Little Missouri, ND	
Cheyenne River/Cherry Creek, SD	
Grand River National Grassland, SD	
Harding County/Slim Buttes, SD	
Standing Rock, ND	
Winter's Allotment, ND	
Dense-Flower Knotweed	10
Grassland National Park West, SK	
Sage Creek-Southwest Pasture Complex, AB/MT/SK	
Purpus' Sullivantia	1
Bighorn Foothills, WY	
Erect Cryptantha	1
No sites selected	
Wyoming Dodder	6
No sites selected	
Ute Ladies' Tresses	2
Sioux Prairie, NE/WY	
Upper Niobrara River, NE/WY	
An Indian Ricegrass	3
Bates Hole/Shirley Rim, WY	
Western Moonwort	1
Rocky Mountain Front, MT	
Stalked Moonwort	1
No sites selected	
Prairie Dunewort	1
Great Sandhills, SK	

Appendix 6

Northern Great Plains Steppe Conservation Goal Status: Ecological Complexes

Appendix 6-A: Northern Great Plains Steppe Conservation Goal Status: Ecological Complexes in the Northwestern Glaciated Plains Section.

Ecological Complex Sites Supporting Ecological Complex	Section Conservation Goal
Pothole Wetland	7
Alkali Creek Moraine, AB	
Jenner Moraine, AB	
Lonesome Lake, MT	
Milk River, AB	
Rocky Mountain Front, MT	
Whitewater Wetlands Complex, MT	
Lake	5
Antelope Lake, SK	
Pakowki Lake, AB	
Alkali/Saline	6
Chappice-Sam-Lakes, AB	
Many Island Lake, AB	
Reed Lake, SK	
Rocky Mountain Front, MT	
Sage Creek-Southwest Pasture Complex, AB/MT/SK	
Tunstall Sandhills, SK	
Fen	3
Rocky Mountain Front, MT	
Shrub wooded draw	5
Frenchman Valley, SK	
Red Deer-South Saskatchewan River, AB/SK	
Deciduous wooded draw	8
Bear's Paw Mountains, MT	
Bitter Creek, MT	
Frenchman Valley, SK	
Highwood Mountains, MT	
Milk River, AB	
Red Deer River, AB	
Red Deer-South Saskatchewan River, AB/SK	
Writing on Stone, AB	
Herbaceous Riparian	6
Bitter Creek, MT	
Milk River, AB	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Shrub Riparian	10
Dinosaur Provincial Park, AB	
Mannyberries, AB	
Milk River, AB	
Oldman River, AB	
Red Deer River, AB	
Rocky Mountain Front, MT	
Sage Creek-Southwest Pasture Complex, AB/MT/SK	
Red Deer -South Saskatchewan River, AB/SK	
Upper Missouri River, MT	
Writing on Stone, AB	
Cottonwood Riparian	7
Dinosaur Provincial Park, AB	
Milk River, AB	
Oldman River, AB	
Red Deer River, AB	
Red Deer-South Saskatchewan River, AB/SK	
Upper Missouri River, MT	
Writing on Stone, AB	
Sandhills	9
Burstall Sandhills, SK	
Cabri Sandhills, SK	
Great Sandhills, SK	
Lower Bow Dunes, AB	
Middle Sandhills, AB	
Purple Springs Sandhills, AB	
Red Deer-South Saskatchewan River, AB/SK	
Tunstall Sandhills, SK	
Turin Dunes, AB	
Badlands	4
Bitter Creek, MT	
Dinosaur Provincial Park, AB	
Killdeer Badlands, SK	
Milk River, AB	
Deciduous forest/woodland	4
Bear's Paw Mountains, MT	
Highwood Mountains, MT	
Little Rocky Mountains, MT	
Rocky Mountain Front, MT	
Low elevation coniferous forest/woodland	1
Montana Glaciated Plains, MT	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
High elevation coniferous forest/woodland	4
Bear's Paw Mountains	
Highwood Mountains, MT	
Little Rocky Mountains, MT	
Sweetgrass Hills, MT	
Big sage shrubland	1
Montana Glaciated Plains, MT	
Greasewood shrubland	2
Many Island Lake, AB	
Montana Glaciated Plains, MT	
Creeping juniper shrubland	2
Bitter Creek, MT	
Mannyberries Badlands, AB	
Prairie sandreed grassland	5
Bitter Creek, MT	
Cabri Sandhills, SK	
Great Sandhills, SK	
Montana Glaciated Plains, MT	
Western wheatgrass grassland	6
Bitter Creek, MT	
Montana Glaciated Plains, MT	
Old Man on His Back Plateau, SK	
Sage Creek-Southwest Pasture Complex, AB/MT/SK	
Sweetgrass Hills, MT	
Thickspike wheatgrass grassland	4
Bitter Creek, MT	
Milk River Benches, MT	
Needlegrass grassland	7
Alkali Creek Moraine, AB	
Bitter Creek, MT	
Grasslands National Park West, SK	
Jenner Moraine, AB	
Middle Sandhills, AB	
Milk River, AB	
Sweetgrass Hills, MT	
Idaho fescue grassland	1
Little Rocky Mountains, MT	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Rough fescue grassland	3
Bear's Paw Mountains, MT	
Rocky Mountain Front, MT	
Sweetgrass Hills, MT	
Bluebunch wheatgrass grassland	4
Bear's Paw Mountains, MT	
Little Rocky Mountains, MT	
Montana Glaciated Plains, MT	
Rocky Mountain Front, MT	

Appendix 6-B: Northern Great Plains Steppe Conservation Goal Status Report: Ecological Complexes in the Northern Glaciated Plains Section.

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Pothole Wetland	8
Chase Lake, ND	
Comertown Prairie, MT	
Davis Ranch Hills, ND	
Lostwood, ND	
Medicine Lake, MT	
Ordway/McPherson/Johnson's Gulch, ND/SD	
Lake	7
Dawson Sandhills, ND	
Lake of the Rivers, SK	
Lostwood, ND	
Medicine Lake, MT	
Alkali/Saline	9
Chaplin Lake, SK	
Chase Lake, ND	
John E. Williams Preserve Complex, ND	
Lostwood, ND	
Manning Lake, MT	
Muddy Creek Badlands, SK	
Old Wives Lake, SK	
Stateline Wetlands, MT/ND	
Willow Bunch Lake, SK	
Fen	4
Chase Lake, ND	
Lostwood, ND	
Ordway/McPherson/Johnson's Gulch, ND/SD	
Shrub wooded draw	2
Deciduous wooded draw	7
Lostwood, ND	
Ordway/McPherson/Johnson's Gulch, ND/SD	
West Fork Poplar River, MT	
Deciduous-coniferous wooded draw	2
Herbaceous Riparian	2
Beaver Creek, ND	
Shrub Riparian	4
Muddy Creek Badlands, SK	
West Fork Poplar River, MT	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Cottonwood Riparian	1
Deciduous-Coniferous Riparian	2
Sandhills	3
Dawson Sandhills, ND	
Medicine Lake, MT	
Deciduous forest/woodland	1
Lostwood, ND	
Silverberry shrubland	2
Davis Ranch Hills, ND	
Tallgrass Prairie	6
Chase Lake, ND	
Crystal Springs, ND	
Lostwood, ND	
Ordway/McPherson/Johnson's Gulch, ND/SD	
Prairie sandreed grassland	2
Western wheatgrass grassland	6
Davis Ranch Hills, ND	
Lostwood, ND	
Thickspike wheatgrass grassland	2
Comertown Prairie	
Needlegrass grassland	10
Crystal Springs, ND	
Davis Ranch Hills, ND	
Lostwood, ND	
Muddy Creek Badlands, SK	
Orient Hills, SD	
Ordway/McPherson/Johnson's Gulch, ND/SD	
Little bluestem grassland	6
Chase Lake, ND	
Crystal Springs, ND	
Ordway/McPherson/Johnson's Gulch, ND/SD	

Appendix 6-C: Northern Great Plains Steppe Conservation Goal Status Report: Ecological Complexes in the Northwestern Great Plains Section.

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Lake	2
Demick's Lake	
Alkali/Saline	1
Casper Sandhills, WY	
Deciduous wooded draw	10
Badlands National Park Complex, SD	
Burns Creek, MT	
Chalk Buttes, MT	
Cheyenne River/Cherry Creek, SD	
Killdeer Mountains/Little Missouri Woodlands, ND	
Oliver County/Missouri River, ND	
Pine Ridge, NE	
Wildcat Hills (Pumpkin Creek), NE	
Deciduous-coniferous wooded draw	8
Cheyenne River/Cherry Creek, SD	
Killdeer Mountains/Little Missouri Woodlands, ND	
Mike's Creek, ND	
Pine Ridge, NE	
White/Little White Rivers, NE/SD	
Wildcat Hills (Pumpkin Creek), NE	
Herbaceous Riparian	8
Casper Sandhills, WY	
Moreau River, SD	
Sioux Prairie, NE/WY	
Upper Niobrara River, NE/WY	
Wildcat Hills (Pumpkin Creek), NE	
Shrub Riparian	3
Bullion Butte/Little Missouri, ND	
Killdeer Mountains/Little Missouri Woodlands, ND	
Cottonwood Riparian	4
Bullion Butte/Little Missouri, ND	
Cheyenne River Riparian, WY	
Killdeer Mountains/Little Missouri Woodlands, ND	
White/Little White Rivers, NE/SD	
Deciduous-Coniferous Riparian	4
High Bank Creek, SD	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Sandhills	3
Casper Sandhills, WY	
Sioux Prairie, NE/WY	
Badlands	6
Badlands National Park Complex, SD	
Bates Hole/Shirley Rim, WY	
Hat Creek/Toadstool, WY	
Killdeer Mountains/Little Missouri Woodlands, ND	
Standing Rock, ND	
White/Little White Rivers, NE/SD	
Deciduous forest/woodland	2
Killdeer Mountains/Little Missouri Woodlands, ND	
Little Missouri Woodlands, WY	
Low elevation coniferous forest/woodland	7
Cheyenne River/Cherry Creek, SD	
Hat Creek/Toadstool, WY	
Killdeer Mountains/Little Missouri Woodlands, ND	
Mike's Creek, ND	
Pine Ridge, NE	
White/Little White Rivers, NE/SD	
Wildcat Hills (Pumpkin Creek), NE	
High elevation coniferous forest/woodland	1
Bates Hole/Shirley Rim, WY	
Big sage shrubland	2
Rattlesnake Foothills, WY	
Basin big sage shrubland	1
Bates Hole/Shirley Rim, WY	
Black sage shrubland	2
Laramie Range Foothills, WY	
Rattlesnake Foothills, WY	
Mountain mahogany shrubland	4
Hartville Uplift, WY	
Laramie Range Foothills, WY	
Wildcat Hills (Pumpkin Creek), NE	
Nuttall's saltbush shrubland	2
Bates Hole/Shirley Rim, WY	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Tallgrass Prairie	5
Bad River Prairie, SD	
Otter Creek/Heart River, ND	
Prairie sandreed grassland	4
Western wheatgrass grassland	6
Badlands National Park Complex, SD	
Cheyenne River/Cherry Creek, SD	
Standing Rock, ND	
Needlegrass grassland	6
Harding County/Slim Buttes, SD	
Laramie Range Foothills, WY	
Sand Creek, ND	
Sioux Prairie, NE/WY	
Standing Rock, ND	
Bluebunch wheatgrass grassland	2
Buffalo Creek, WY	
Little bluestem grassland	6
Cheyenne River/Cherry Creek, SD	
Hartville Uplift, WY	
Killdeer Mountains/Little Missouri Woodlands, ND	
Knife River, ND	
Oliver County/Missouri River, ND	
Rawhide Buttes, WY	

Appendix 6-D: Northern Great Plains Steppe Conservation Goal Status Report: Ecological Complexes in the Powder River Section.

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Lake	4
Dry Lake Basin, MT	
Hailstone Lake, MT	
Half-breed/Big Lake, MT	
Lake Mason, MT	
Playa	1
West Black Thunder Creek, WY	
Shrub wooded draw	6
Big Horn Foothills, WY	
Little Powder River, MT/WY	
Wolf Mountains/Northern Cheyenne, MT/WY	
Deciduous wooded draw	6
Little Powder River, MT/WY	
Little Sheep Mountains, MT	
Wolf Mountains/Northern Cheyenne, MT/WY	
Deciduous-coniferous wooded draw	2
Wolf Mountains/Northern Cheyenne, MT/WY	
Herbaceous Riparian	6
Bull Mountains, MT	
Little Powder River, MT/WY	
Upper Antelope Creek, WY	
Shrub Riparian	5
Wolf Mountains/Northern Cheyenne, MT/WY	
Cottonwood Riparian	5
Little Powder River, MT/WY	
Powder River, MT/WY	
Yellowstone River (Pompey's Pillar), MT	
Deciduous-Coniferous Riparian	2
Badlands	4
Hell Creek Badlands, MT	
Powder River Breaks, WY	
Terry Badlands, MT	
Thunder Basin/Cheyenne River, NE/SD/WY	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Low elevation coniferous forest/woodland	7
Bull Mountains, MT	
Cedar Creek, MT	
Little Powder River, MT/WY	
Pine Ridge, MT	
Thunder Basin/Cheyenne River, NE/SD/WY	
Wolf Mountains/Northern Cheyenne, MT/WY	
Big sage shrubland	5
Froze to Death Creek, MT	
Little Powder River, MT/WY	
Powder River Breaks, WY	
Bird's foot sage shrubland	1
Thunder Basin/Cheyenne River, NE/SD/WY	
Nuttall's saltbush shrubland	3
Froze to Death Creek, MT	
Prairie sandreed grassland	4
Cedar Creek, MT	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, NE/SD/WY	
Upper Antelope Creek, WY	
Western wheatgrass grassland	7
Little Powder River, MT/WY	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, NE/SD/WY	
Wolf Mountains/Northern Cheyenne, MT/WY	
Yellow Water Triangle, MT	
Needlegrass grassland	7
Dry Lake Basin, MT	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, NE/SD/WY	
Upper Antelope Creek, WY	
Yellow Water Triangle, MT	
Idaho fescue grassland	1
Wolf Mountains/Northern Cheyenne, MT/WY	

Ecological Complex	Section Conservation Goal
Sites Supporting Ecological Complex	
Bluebunch wheatgrass grassland	6
Bull Mountains, MT	
Little Powder River, MT/WY	
Little Sheep Mountains, MT	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, NE/SD/WY	
Wolf Mountains/Northern Cheyenne, MT/WY	
Little bluestem grassland	4
Little Powder River, MT/WY	
Powder River Breaks, WY	
Thunder Basin/Cheyenne River, NE/SD/WY	
Wolf Mountains/Northern Cheyenne, MT/WY	

Appendix 7:

Description of Threats

Appendix 7: General Description of Threats.

Habitat Conversion: Agriculture: Conversion of natural vegetation to either annual cropland or tame hayland.

Habitat Conversion: Strip Mining: Destruction of natural vegetation as the result of surface mining. This threat is primarily the result of large-scale operations (i.e., coal, bentonite), rather than removal for gravel.

Habitat Conversion: Oil and Gas: Conversion of natural vegetation associated with oil or gas development. Impacts include drill pads, roads, storage facilities, and pipelines.

Habitat Conversion: Logging: Logging practices that eliminates historic stand structure (i.e., high-grading or clear-cut of some community types). Sustainable logging practices may remove large or old growth trees but retain structure.

Exotic Species: The presence and spread of non-native species capable of invading undisturbed habitats and altering species composition and potentially processes (i.e. increased fire frequency associated with cheatgrass). Includes both plants and animals.

Poor Grazing Management: Management practices that cause natural communities to deteriorate. This may include continuous over-utilization or under-utilization. While occurring on many scales, this threat was identified in this planning process for landscapes or large areas. Patches comprised of various grazing intensities were considered beneficial for maintaining biodiversity.

Loss of Fire Regime: Exclusion of fire. Loss of this disturbance may promote expansion of woody species, stabilization of sandhills, and altered ecological composition.

Hydrologic Alteration: Daming or dewatering of streams or tributaries.

Recreational Use: Activities that displace species, promote spread of exotic species, or destroys natural communities (i.e., off-road vehicle recreation).

Pesticide Drift/Application: Misapplication of pesticides, especially around sensitive species, or application for large-scale nonselective control of pests (i.e., aerial application for grasshopper control).

Wetland Drainage/Filling: Degradation of wetland hydrology through manipulation of basins.

Elevated Predator Populations: Increased or altered predator populations which generally predate ground nesting birds. Generally the result of other habitat modification, such as habitat conversion and planting shelterbelts.

Prairie Dog/Ground Squirrel Control: Human eradication of these burrowing mammals and elimination of colonies, primarily through poisoning or shooting.

Commercial Use: Uses associated with industrial production.

Residential Development: Rural subdivision which may include primary or second homes. Density of homes is often low.

Railroad Construction: Construction of new railroad lines. Habitat destruction and associated impacts as the result of construction and other increased human activities. Greater opportunities for industrial contamination associated with spills.

Appendix 8:

Threats to Biodiversity at Sites

Appendix 8-A. Threats to Biodiversity at Conservation Sites in the Northwestern Glaciated Plains.

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Recreational Use	Pesticide Drift/Application	Wetland Drainage/Filling	Elevated Predator Populations	Prairie Dog/G. Squirrel Control	Commercial Use	Residential Development	Railroad Construction
Alkali Creek Moraine	L		M		L	M	M	L					M			
Antelope Lake								L								
Bear's Paw Mountains				L	M	M	L		L						L	
Bitter Creek	M				M	L	L		L							
Bowdoin National Wildlife Refuge												L				
Burstall Sandhills			M		L	M	H									
Cabri Sandhills			M		L	M	H									
Chappice-Sam-Lakes	M		M		L	M	M	M					M			
Dinosaur Provincial Park			L		L	M	M	M	L				L			
Frenchman Valley	L		L		L	M	H					L	M			
Grassland National Park West					L		M		L							
Great Sandhills			M		L	M	H									
Highwood Mountains				L	L	M	M		L							
Jenner Moraine	M		M		L	M	M									
Killdeer Badlands					L		M		M							
Little Rocky Mountains		H		L	L		M		L							
Lonesome Lake					L	L		L								
Lower Bow Dunes	L		H		L	M	M						M			
Many Island Lake	L		M		M	M		H					L			
Mannyberries	L		H		L	M	M						M			
Middle Sandhills	L		H		M	M	M	L					M			
Milk River	L		M		L	M	M	L					M			
Milk River Benches	M		M		L	M										
Old Man on His Back Plateau	M		L		L	M	H			L	L		L			
Montana Glaciated Plains	H	L		L	L	M	L		L				H			
Oldman River			L		M	M	L	M					L			
Pakowki Lake	L		M		L	M	M	L					L			
Purple Springs Sandhills	M		H		M	M	M						M			
Red Deer River	M		L		M	M	L	M					L		M	
Red Deer-South Saskatchewan	M		M		L	M	H	M	L							
Reed Lake	H							L		L						
Rocky Mountain Front	M				H	L	M		M		L				H	

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Recreational Use	Pesticide Drift/Application	Wetland Drainage/Filling	Elevated Predator Populations	Prairie Dog/G. Squirrel Control	Commercial Use	Residential Development	Railroad Construction
Sage Creek-SW Pasture Complex	M		L		L	M	M	M					M			
South Snowy Mountains	H				L							L				
Sweetgrass Hills	L	M			H		L		L							
Swift Current Creek	L					M		M								
Tunstall Sandhills			M		L	M	H									
Turin Dunes	L		M		M	M	H		L				M			
Upper Missouri River					M	H	M	M	L							
Whitewater Wetlands Complex	H		M			M					L					
Writing on Stone	M		L		M	M	H	L	L				M			

Appendix 8-B. Threats to Biodiversity at Conservation Sites in the Northern Glaciated Plains.

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Recreational Use	Pesticide Drift/Application	Wetland Drainage/Filling	Elevated Predator Populations	Prairie Dog/G. Squirrel Control	Commercial Use	Residential Development	Railroad Construction
Beaver Creek	L				M	M		L								
Chaplin Lake		L			L			M		L				M		
Chase Lake	L				M	L					L	M				
Comertown Prairie	H		H		L	M					M					
Crystal Springs	M				M	M	L				L	L				
Davis Ranch Hills	L				M	M	L				L					
Dawson Sandhills/Long Lake	H				M	M	L	L			L					
John E. Williams Preserve Complex	L				M	L	M	L		L	L	H				
Lake of the Rivers			L		L	M	H	L		L		L				
Lostwood	M		L		M	L	L				L	H				
Manning Lake	L				L	L		L			L					
Medicine Lake					M							M				
Muddy Creek Badlands			L		L	M	H	L				L	L			
Old Wives Lake					L			L		L						
Orient Hills	M				M	M	L					L				
Ordway/McPherson/ Johnson's Gulch	M				M	L	L				L	L				
Stateline Wetlands	H		M		L					M		H				
West Fork Poplar River	L		L			M										
Willow Bunch Lake			L		L	M	H	L		L		L				

Appendix 8-C. Threats to Biodiversity at Conservation Sites in the Northwestern Great Plains.

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Recreational Use	Pesticide Drift/Application	Wetland Drainage/Filling	Elevated Predator Populations	Prairie Dog/G. Squirrel Control	Commercial Use	Residential Development	Railroad Construction
Badlands National Park Complex					L	L			L				L			
Bad River Prairie	L				L	M	L									
Bates Hole/Shirley Rim			L			M										
Buffalo Creek	L														M	
Bullion Butte/Little Missouri			H		L	L	L									
Burns Creek			M			M										
Casper Sandhills			L			L										
Chalk Buttes				L	M	M	M								L	
Cheyenne River/Cherry Creek	L				M	H	L	M					M			
Cheyenne River Riparian			L		M											H
Demick's Lake								L			L					
Grand River National Grassland	L				H	H	H									
Harding County/Slim Buttes			H		M	M	L				L					
Hartville Uplift	M	M		M			H									
Hat Creek/Toadstool							M									
High Bank Creek	H				M	M										
Killdeer Mountains/Little Missouri Badlands		L	H			L	L								L	
Knife River	L				L	L										
Laramie Range Foothills							H								M	
Little Missouri Woodlands	M		M		M											
Lower Yellowstone-Missouri Confluence					M			H								
Mike's Creek			M		L											
Moreau River			H		L	M		M			L					
Oliver County/Missouri River	M				M	M	L	H	M			H			M	
Otter Creek/Heart River	H				M	M	L									
Pine Ridge				M	M	M	M		M		M				H	
Rattlesnake Foothills			L			L										
Rawhide Buttes	M						M									
Sand Creek					M	M										
Sioux County	M				M	M	M		M				M			
Standing Rock	H				M	M										
Upper Niobrara River	H				H	L		H		L	L					

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Recreational Use	Pesticide Drift/Application	Wetland Drainage/Filling	Elevated Predator Populations	Prairie Dog/G. Squirrel Control	Commercial Use	Residential Development	Railroad Construction
White/Little White Rivers	L	M				M	L	L		L			M			
Wildcat Hills (Pumpkin Creek)	H				M	M	L		L	M					H	
Winter's Allotment			M		M	M	L									

Appendix 8-D. Threats to Biodiversity at Conservation Sites in the Powder River Basin.

	Habitat Conversion: Agriculture	Habitat Conversion: Strip Mining	Habitat Conversion: Oil and Gas	Habitat Conversion: Logging	Exotic Species	Poor Grazing Management	Loss of Fire Regime	Hydrologic Alteration	Wetland Drainage/Filling	Prairie Dog/G. Squirrel Control	Residential Development	Railroad Construction
Big Horn Foothills	H				H						H	
Bull Mountains		H			M	M	M				H	
Cedar Creek	M		H		M	L						
Dry Lake Basin	M				L	L		L				
Froze-to-Death Creek	M				M	L	L					
Half-breed/Big Lake								L				
Hailstone Lake								L				
Hell Creek Badlands	L				M							
Lake Mason								L				
Little Powder River	M				M			L				
Little Sheep Mountains					L	L						
Pine Ridge				M	M		M				L	
Powder River	M				M			L				
Powder River Breaks			M		M		L			M		
Terry Badlands			L		L					H		
Thunder Basin/Cheyenne River	L		M		M					M		H
Upper Antelope Creek			L									
West Black Thunder Creek		L						H				H
Wolf Mountains/Northern Cheyenne		M	L		M	M	M					
Yellowstone River (Pompay's Pillar)	H				M			M	M		M	
Yellow Water Triangle	M				M	M	H					

Appendix 9:

Threats Assessment by Ecoregional Section

Appendix 9-A: Northwestern Glaciated Plains Section Portfolio Threat Analysis.

Threat	Score	Frequency	Mean	Index
Exotic species	50	36	1.39	1.22
Loss of fire regime	115	32	3.59	2.80
Poor grazing management	95	32	2.97	2.32
Habitat conversion: agriculture	64	26	2.46	1.56
Habitat conversion: oil and gas	72	27	2.67	1.76
Prairie dog/ground squirrel control	48	20	2.40	1.17
Hydrologic alteration	34	16	2.12	0.83
Recreational use	17	13	1.31	0.41
Habitat conversion: strip mining	9	3	3.00	0.22
Residential development	9	3	3.00	0.22
Habitat conversion: poor logging practices	4	4	1.00	0.10
Wetland drainage/filing	4	4	1.00	0.10
Elevated predator populations	3	3	1.00	0.07
Pesticide drift/application	2	2	1.00	0.05

Appendix 9-B: Northern Glaciated Plains Section Portfolio Threat Analysis.

Threat	Score	Frequency	Mean	Index
Exotic species	38	18	2.11	2.00
Poor grazing management	35	15	2.33	1.84
Habitat conversion: agriculture	33	13	2.54	1.73
Elevated predator populations	27	11	2.45	1.21
Loss of fire regime	24	10	2.40	1.26
Habitat conversion: oil and gas	13	7	1.86	0.68
Hydrologic alteration	11	9	1.22	0.58
Wetland drainage/filing	11	9	1.22	0.58
Pesticide drift/application	8	6	1.33	0.42
Commercial uses	3	1	3.00	0.16
Habitat conversion: mining	1	1	1.00	0.05
Prairie dog/ground squirrel control	1	1	1.00	0.05

Appendix 9-C: Northwestern Great Plains Section Portfolio Threat Analysis.

Threat	Score	Frequency	Mean	Index
Poor grazing management	65	25	2.60	1.86
Exotic species	61	23	2.65	1.74
Habitat conversion: agriculture	46	16	2.87	1.31
Loss of fire regime	40	18	2.22	1.14
Habitat conversion: oil and gas	36	12	3.00	1.03
Hydrologic alteration	23	7	3.29	0.66
Residential development	21	7	3.00	0.60
Recreational use	11	5	2.20	0.31
Prairie dog/ground squirrel control	10	4	2.50	0.29
Habitat conversion: strip mining	10	3	3.33	0.29
Wetland drainage/filing	7	5	1.40	0.20
Habitat conversion: poor logging practices	7	3	2.33	0.20
Pesticide drift/application	5	3	1.67	0.14
Elevated predator populations	5	1	5.00	0.14
Rail line construction	5	1	5.00	0.14

Appendix 9-D: Powder River Section Portfolio Threat Analysis.

Threat	Score	Frequency	Mean	Index
Exotic Species	44	16	2.75	2.10
Habitat conversion: agriculture	30	10	3.00	1.43
Loss of fire regime	16	6	2.67	0.76
Habitat conversion: oil and gas	14	6	2.33	0.67
Hydrologic alteration	14	8	1.75	0.67
Residential development	14	4	3.50	0.67
Poor grazing management	13	7	1.86	0.62
Prairie dog/ground squirrel control	11	3	3.67	0.53
Rail line construction	10	2	5.00	0.48
Habitat conversion: strip mining	9	3	3.00	0.43
Habitat conversion: poor logging practices	3	1	3.00	0.14
Wetland drainage/filing	3	1	3.00	0.14

Appendix 10:

Prioritization of Portfolio Sites

Appendix 10: Prioritization of Portfolio Sites

Very High

Northwestern Glaciated Plains

- Bitter Creek
- Chappice-Sam-Lakes
- Great Sandhills
- Milk River
- Montana Glaciated Plains
- Rocky Mountain Front
- Sage Creek/Southwest Pasture Complex

Northern Glaciated Plains

- Comertown Prairie
- Lostwood
- John E. Williams Preserve Complex

Northwestern Great Plains

- Cheyenne River Riparian
- Lower Yellowstone-Missouri Confluence
- Upper Niobrara River
- White/Little White Rivers
- Wildcat Hills (Pumpkin Creek)

Powder River

- Big Horn Foothills
- Powder River
- Thunder Basin/Cheyenne River

High

- Dinosaur Provincial Park
- Frenchman Valley
- Grasslands National Park West
- Manyberries Badlands
- Pakowki Lake
- Red Deer River
- Red Deer-South Saskatchewan River
- South Snowy Mountains
- Writing on Stone

- Davis Ranch Hills
- Muddy Creek Badlands
- Ordway/McPherson/Johnson's Gulch
- Stateline Wetlands

- Badlands National Park Complex
- Cheyenne River/Cherry Creek
- Harding County/Slim Buttes
- High Bank Creek
- Killdeer Mountains/Little Missouri Badlands
- Little Missouri Woodlands
- Oliver County/Missouri River
- Sioux Prairie
- Standing Rock

- Bull Mountains
- Little Powder River
- Wolf Mountains/Northern Cheyenne
- Yellowstone River (Pompey's Pillar)

Medium

Northwestern Glaciated Plains

- Bear's Paw Mountains
- Burstall Sandhills
- Capri Sandhills
- Jenner Moraine
- Killdeer Badlands
- Little Rocky Mountains
- Lower Bow Dunes
- Many Island Lake
- Middle Sandhills
- Milk River Benches
- Old Man on His Back Plateau
- Oldman River
- Purple Springs Sandhills
- Sweetgrass Hills
- Swift Current Creek
- Turin Dunes
- Lower Missouri River
- Whitewater Wetland Complex

Northern Glaciated Plains

- Chaplin Lake
- Chase Lake
- Crystal Springs
- Dawson Sandhills/Long Lake
- Medicine Lake
- Old Wives Lake

Northwestern Great Plains

- Bad River Prairie
- Bates Hole/Shirley Rim
- Bullion Butte/Little Missouri
- Burns Creek
- Chalk Buttes
- Hartville Uplift
- Laramie Range Foothills
- Pine Ridge, NE

Powder River

- Cedar Creek
- Pine Ridge, MT
- Powder River Breaks
- Terry Badlands
- West Black Thunder Creek
- Yellow Water Triangle

Low

Northwestern Glaciated Plains

- Alkali Creek Moraine
- Antelope Lake
- Bowdoin National Wildlife Refuge
- Highwood Mountains
- Lonesome Lake
- Reed Lake
- Tunstall Sandhills

Northern Glaciated Plains

- Beaver Creek
- Lake of the Rivers
- Manning Lake
- Orient Hills
- West Fork Poplar River
- Willow Bunch Lake

Northwestern Great Plains

- Buffalo Creek
- Casper Sandhills
- Demick's Lake
- Grand River National Grassland
- Hat Creek/Toadstool
- Knife River
- Mike's Creek
- Moreau River
- Otter Creek/Heart River
- Rattlesnake Foothills
- Rawhide Buttes
- Sand Creek
- Winter's Allotment

Powder River

- Dry Lake Basin
- Froze-to-Death Creek
- Hailstone Lake
- Half-breed/Big Lake
- Hell Creek Badlands
- Lake Mason
- Little Sheep Mountains
- Upper Antelope Creek

Appendix 11:

Managed Areas Within Portfolio Sites

Appendix 11-A. Managed Areas within Montana Sites.

<u>Site</u>	<u>Manager</u>	<u>Managed Acres</u>	<u>Percent of Site</u>	<u>Site Acres</u>
Bear's Paw Mountains				728024
	BLM	7326	1.0	
	LOC	8925	1.2	
	NPS	204	0	
Big Horn Foothills				335
Bitter Creek				715311
	BLM	194276	59.6	
Bowdoin National Wildlife Refuge				14336
	BLM	413	2.9	
	USFWS	7671	53.5	
Bull Mountains				548816
	BLM	6970	2.7	
Burns Creek				29367
	BLM	123	0.4	
Cedar Creek				276397
	BLM	45908	57.1	
Chalk Buttes				75093
	BLM	3952	5.8	
	USFS	18354	24.4	
Comertown Prairie				25499
	TNC	945	3.7	
	USFWS	114	0.5	
Froze to Death Creek				9265
	BLM	5328	57.5	
Hailstone Lake				3947
	USFWS	1497	37.9	
Half-Breed-Big Lake				16179
	BLM	24		
	USFWS	2573	15.9	

Site	<u>Manager</u>	<u>Managed Acres</u>	<u>Percent of Site</u>	<u>Site Acres</u>
Hell Creek Badlands				425247
	BLM	186389	43.8	
	USFWS	43725	10.3	
Highwood Mountains				121094
	BLM	3042	2.5	
	USFS	42437	35	
Lake Mason				6185
	USFWS	2584	41.8	
Little Missouri Woodlands				6902
	BLM	439	6.3	
Little Powder River				61825
	BLM	46989	76	
Little Rocky Mountains				84375
	BLM	28009	33.2	
Little Sheep Mountains				208740
	BLM	6681	29.8	
Lonesome Lake				11477
	BLM	8409	73.3	
Lower Yellowstone-Missouri Confluence				243452
	BLM	11105	6.8	
Manning Lake		3604		4513
Medicine Lake				37127
	USFWS	12045	32.4	
Milk River Benches				93214
	BLM	34193	46.9	
Montana Glaciated Plains				2545985
	BLM	911650	43.4	
	USFWS	307700	12.1	
Pine Ridge MT				138791
Powder River				120830
	BLM	27636	24.8	
	USFS	53		

<u>Site</u>	<u>Manager</u>	<u>Managed Acres</u>	<u>Percent of Site</u>	<u>Site Acres</u>
Rocky Mountain Front				1203933
	BLM	8751	0.7	
	TNC	11461	1.0	
	USFS	1320	0.1	
South Snowy Mountains Prairie				37053
	BLM	22		
	USFWS	2228	6.0	
Southwest Pasture Complex				122157
	BLM	17163	45.5	
Stateline Wetlands				22677
	BLM	9		
	USFWS	3259	14.4	
Sweet Grass Hills				234002
	BLM	8210	3.5	
	USFWS	1629	0.7	
Terry Badlands				384085
	BLM	59761	37.9	
Upper Missouri River				143144
	BLM	51075	36.8	
	USFWS	32683	22.8	
West Fork Poplar River				36314
Whitewater Wetland Complex				43755
	BLM	11839	39.2	
Wolf Mountains-Northern Cheyenne				1408631
	BLM	129412	9.2	
	USFS	432694	30.7	
Yellowstone River (Pompey' Pillar)				110163
	BLM	2360	3.0	

Appendix 11-B. Managed Areas within Wyoming Sites.

<u>Site</u>	<u>Manager</u>	<u>Managed Acres</u>	<u>Percent of Site</u>	<u>Site Acres</u>
Bates Hole-Shirley Rim				109786
	BLM	47361	43.1	
Big Horn Foothills				62699
	BLM	223	0.3	
	USFWS	228	0.3	
	USFS	4655	7.4	
Buffalo Creek				153808
	BLM	77276	50.2	
Casper Sandhills				119483
	BLM	22931	19.1	
Cheyenne River Riparian				161586
	BLM	2974	1.8	
	USFSNG	19554	12.1	
Hartville Uplift				141263
	BLM	7359	5.2	
Hat Creek/Toadstool				46489
	BLM	250	0.5	
Laramie Range Foothills				238344
	BLM	27717	11.6	
	USFS	1472	0.6	
Little Missouri Woodlands				119647
	BLM	12148	10.1	
Little Powder River				321797
	BLM	40485	12.6	
	USFSNG	24866	7.7	

<u>Site</u>	<u>Manager</u>	<u>Managed Acres</u>	<u>Percent of Site</u>	<u>Site Acres</u>
Powder River Breaks				862346
	BLM	262831	30.5	
Powder River				67125
	BLM	11601		
Rattlesnake Foothills				121279
	BLM	65438	54.0	
Rawhide Buttes				48603
	BLM	3066	6.3	
Sioux County				63696
	BLM	441	0.7	
Thunder Basin-Cheyenne River				1575632
	USFSNG	171415	10.9	
	BLM	122598	7.8	
	USFS	153915	9.8	
Upper Antelope Creek				293541
	BLM	43759	14.9	
West Black Thunder Creek				48666
	USFSNG	11733	24.1	
Wolf Mountains-Northern Cheyenne				182889
	BLM	3982	2.1	

Appendix 12:

Summary Information for Portfolio Sites

Appendix 12-A: Summary Information for Sites within the Northwestern Glaciated Plains Section.

Alkali Creek Moraine, AB

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, ground squirrel control.

Description:

Rolling terrain blanketed by needlegrass grasslands and a variety of pothole wetlands. Declining species in uplands include Baird's sparrow. This area is recognized as provincially significant by the Alberta CDC.

Inventory Rating: Low

Inventory Needs: Natural communities and rare species.

Antelope Lake, SK

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – hydrologic alteration.

Description:

Internally drained basin important as a spring and fall staging area for shorebirds and waterfowl. Historic nesting site for a small breeding population of piping plover.

Inventory Rating: Low

Inventory Needs: Natural communities and rare species.

Bear's Paw Mountains, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – exotic species, poor grazing management, loss of fire regime.

Description:

A large volcanic island mountain chain with elevations reaching nearly 7,000 feet. Higher peaks are covered by coniferous forest/woodland communities. Grassland communities are comprised mostly of bluebunch wheatgrass communities located on steep slopes and rough fescue grasslands in mesic sites. Deciduous wooded draws are located in ravines and deciduous forest/woodland communities are common in mesic upland sites.

Inventory Rating: Low

Inventory Needs: Inventory and description of forested communities has been completed, however, extensive inventory is needed for other natural communities and species.

Bitter Creek, MT

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium -- exotic species, conversion for cropland, loss of fire regime.

Description:

This area encompasses two primary landscape features, badlands and rolling to moderately dissected plains. The badlands vary from barren shale slopes to well vegetated creeping juniper shrubland and prairie sandreed grassland on dune-like topography. Western wheatgrass, thickspike wheatgrass and needlegrass grassland natural communities occupy portions of the badlands and the adjoining upland communities. Hardwood draws are found in ravines with ephemeral streams, while permanent streams support herbaceous riparian vegetation. This and adjoining areas in Saskatchewan represents one of the largest glaciated grasslands landscapes in North America.

Inventory Rating: Low

Inventory Needs: Limited inventory of badland portions of site. Needs additional natural community and species inventory.

Bowdoin National Wildlife Refuge, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – elevated predator populations.

Description:

A brackish lake supporting one of five breeding populations of American white pelican in the ecoregion and occasionally a small piping plover population. Nearly all of the lake and adjoining shoreline is contained within Bowdoin National Wildlife Refuge. Grassland communities around the lake support breeding populations of Sprague's pipit and Baird's sparrow, both declining grassland birds.

Inventory Rating: High

Inventory Needs: Rare bird species have been well inventoried by the USWFS. Terrestrial communities need documentation.

Burstall Sandhills, SK

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – loss of fire regime, oil and gas habitat conversion, poor grazing management.

Description:

Sandhills complex comprised of stabilized dunes, depressions supporting *Populus tremuloides* clones, and some open dunes. Provincially rare plant species include *Psoraleidum larceolatum*, *Oryzopsis asperifolia*, *Rumex venosus*.

Inventory Rating: Low (annual wildlife surveys)

Inventory Needs: Natural communities and rare species.

Cabri Sandhills, SK

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium -- loss of fire regime, oil and gas habitat conversion, poor grazing management.

Description:

Sandhills complex comprised of stabilized dunes, depressions supporting *Populus tremuloides* clones, and some open dunes. Provincially rare plant species include *Psoraleidum larceolatum*, *Oryzopsis asperifolia*, *Rumex venosus*.

Inventory Rating: Low (annual wildlife surveys)

Inventory Needs: Natural communities and rare species.

Chappice-Sam-Lakes, AB

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, hydrologic alteration, poor grazing management.

Description:

A large alkali lake complex supporting a breeding piping plover populations, it has been recognized as an internationally significant area by the Alberta CDC. This is also a significant staging area for shorebirds and waterfowl. Surrounding grasslands support Baird's sparrow, a declining grassland bird. Ground squirrels, a significant food source for raptors, are also abundant.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventory.

Dinosaur Provincial Park, AB

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – Oil and gas habitat conversion, poor grazing management, hydrologic alteration.

Description:

An area of extensive badlands surrounding the Red Deer River. The Red Deer also supports well developed cottonwood and shrub riparian vegetation. This area has been recognized as internationally significant by the Alberta CDC. Dinosaur Provincial Park, a World Heritage Site, is located within this area.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventory.

Frenchman Valley, SK

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – loss of fire regime, poor grazing management, ground squirrel control.

Site Description:

The Frenchman Valley is characterized by eroded and dissected terrain. Shrub and deciduous wooded draw communities are located in ravines and depressions. The rare plant taprooted fleabane occurs on sparsely vegetated slopes. Surrounding uplands are dominated by mixed-grass prairie. Frenchman Creek supports a relatively intact fish assemblage, including mountain sucker in the Cypress Upland (outside of ecoregion). Secondary targets include bobcat

Inventory Rating: Low

Inventory Needs: Some inventory has been completed in Grasslands National Park, but little throughout the rest of the valley. Inventory needed for rare species and natural communities.

Grasslands National Park, SK

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Low – loss of fire regime, exotic species, recreational use.

Description:

Rolling to moderately dissected glaciated landscape blanketed by needlegrass grasslands. Approximately half of this area is contained within Grasslands National Park and community provincial pastures. Grasslands National Park hosts the only population of black-tailed prairie dog in Canada, as well as several rare species, including mountain plover, swift fox, taprooted fleabane, and prairie dunewort. Declining species include sage grouse, bobcat, short-horned lizard, and yellow-bellied racer. This area also supports numerous invertebrate species at the northern edge of their range that are considered rare in Canada (Ron Hooper pers. com.). Among these are a wind scorpion in a new genus (*Solpugid*) currently being described (Keith Roney pers. com.)

Inventory Rating: Medium

Inventory Needs: Additional inventories are required for natural communities.

Great Sandhills, SK

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, loss of fire regime, poor grazing management.

Description:

This area encompasses an extensive sandhills system (second largest in the Great Plains) and a rich diversity of sandhills associated natural communities. It also provides habitat for prairie dunewort and smooth goosefoot, rare plant species.

Inventory Rating: Low

Inventory Needs: Limited rare plant and Ord's kangaroo rat surveys have been completed. Additional plant community and rare species inventories are needed, including verification of the presence of a potential endemic and rare tiger beetle.

Highwood Mountains, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Low – poor grazing management, loss of fire regime, exotic species.

Description:

An island mountain chain reaching elevations greater than 7,000 feet, the Highwoods support high elevation coniferous forest, deciduous wooded draws, and deciduous woodlands. Nearly all of the montane portions of this area are within the Lewis and Clark National Forest.

Inventory Rating: Low

Inventory Needs: Natural communities need additional inventory.

Jenner Moraine, AB

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – agricultural conversion, oil and gas habitat conversion, poor grazing management.

Description:

Rolling to hummocky glacial moraine covered by needlegrass grasslands. Alkali wetlands are imbedded in these grassland communities. This extensive grassland area has been recognized as provincially significant by the Alberta CDC. Burrowing owl, a declining species, utilizes grasslands where burrows are available.

Inventory Rating: Low

Inventory Needs: Natural community inventory.

Killdeer Badlands, SK

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – loss of fire regime, recreational use, exotic species.

Description:

This area is captured entirely within Grasslands National Park (East) and contains the best example of badlands found in Saskatchewan. These badlands provide habitat for swift fox and short-horned lizard, a declining species. Numerous invertebrate species are also found here that occur at the northern edge of their range and are considered rare in Canada (Ron Hooper pers. com.).

Inventory Rating: Medium

Inventory Needs: Systematic inventory of natural communities and rare species.

Little Rocky Mountains, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – strip mining, loss of fire regime, exotic species.

Description:

An island mountain range, the Little Rockies support a diverse assemblage of natural communities, including deciduous woodlands, high elevation coniferous forest, and Idaho fescue and bluebunch wheatgrass grasslands. Caves contained within the mountains are significant bat hibernacula. This is also an important area for raptors, especially golden eagles.

Inventory Rating: Medium

Inventory Needs: Inventory completed for some natural communities and bats. Requires further vegetation and species inventory.

Lonesome Lake, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – exotic species, poor grazing management, hydrologic alteration.

Description:

An intact prairie pothole and grassland system in one of the most disturbed portions of the Great Plains in Montana. Burrowing owl, Baird's sparrow and Sprague's pipit are found in the uplands. This area is almost entirely managed by the BLM.

Inventory Rating: Medium

Inventory Needs: Additional wetland and natural community inventories needed.

Lower Bow Dunes, AB

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, loss of fire regime.

Description:

Native mixed grassland and sagebrush on sand dune terrain with active blowouts. This area has been recognized as nationally significant by the Alberta CDC.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Many Island Lake, AB

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – hydrologic alteration, poor grazing management, oil and gas habitat conversion.

Description:

An extensive area of saline wetlands and surrounding vegetation, including greasewood shrublands. This area has been recognized as nationally significant by the Alberta CDC.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Mannyberries, AB

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, loss of fire regime, poor grazing management.

Description:

Badlands topography that supports creeping juniper shrublands on sandier soils and extensive riparian shrub habitats. This area has been recognized as nationally significant by the Alberta CDC. Sage grouse and short-horned lizard, declining species, utilize this area.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Middle Sandhills, AB

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, exotic species, poor grazing management.

Description:

A diverse sand plain dominated by needlegrass grasslands and sandhills vegetation that ranges from aspen woodlands to active blowouts. This area has been recognized as provincially significant by the Alberta CDC and is considered one of the most diverse sand dune habitats in the province. Baird's sparrow, a declining grassland bird, utilizes the grassland communities.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Milk River, AB

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium -- oil and gas habitat conversion, poor grazing management, loss of fire regime.

Description:

A remote wilderness setting surrounding the Milk River, this area has been recognized as nationally significant by the Alberta CDC. Natural communities along the Milk River include shrub and cottonwood riparian communities. Rugged badlands support a variety of natural communities, including deciduous wooded draws in ravines. Surrounding uplands contain pothole wetland complexes. Declining species include Baird's sparrow and short-horned lizard. This area also hosts bobcat and an abundance of provincially rare plant species.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Milk River Benches, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – agricultural conversion, oil and gas conversion, poor grazing management.

Description:

Level to rolling tablelands dissected by the Milk River and smaller streams. Natural vegetation is dominated by thickspike wheatgrass grasslands, which provide habitat for Baird's sparrow, Sprague's pipit, and chestnut collared longspur, declining grassland birds. The Bureau of Land Management administers much of this area as multiple-use lands.

Inventory Rating: Low

Inventory Needs: Inventory of natural communities and species is needed.

Montana Glaciated Plains, MT

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: High – agricultural conversion, prairie dog control, poor grazing management.

Description:

One of the largest intact landscapes in the Great Plains, this area is characterized by level to rolling plains in the north trending to deeply dissected and rugged topography near the Missouri River in the south. Western wheatgrass grasslands and big sage shrublands dominate the level to rolling plains. Greasewood shrublands are located on soils with concentrated salts in uplands and in claypans. Breaks along the Missouri are dominated by bluebunch wheatgrass grasslands and low elevation coniferous forest/woodlands. Prairie sandreed grasslands are found in the Larb Hills, a sandstone ridge located in the eastern portion of the landscape. This area supports the largest population of mountain plover and black-tailed prairie dog in Montana, as well as two black-footed ferret reintroduction sites. Secondary target species utilizing the site include Baird's sparrow, Sprague's pipit, chestnut collared longspur, sage grouse, burrowing owl, mountain lion, and bobcat. The U.S. Fish and Wildlife Service (Charles M. Russell NWR) and Bureau of Land Management administer a significant portion of the Glaciated Plains, which also includes portions of the Fort Belknap Reservation.

Inventory Rating: Medium

Inventory Needs: Rare animals have been well inventoried on public lands, however, additional inventory is needed for private lands. Natural community information is needed for all lands.

Old Man on His Back Plateau, SK

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – agricultural conversion, loss of fire regime, poor grazing management.

Site Description:

Western wheatgrass grasslands on moderately rolling to hilly terrain. Secondary targets include burrowing owl, Sprague's pipit, Baird's sparrow, chestnut collared longspur, sage grouse, and bobcat. This area includes The Old Man on His Back Shortgrass Prairie and Heritage Preserve (13,100 acres), established with the assistance of The Nature Conservancy of Canada.

Inventory Rating: Low

Inventory Needs: Inventory for natural communities and rare species.

Oldman River, AB

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – exotic species, poor grazing management, hydrologic alteration.

Description:

This area supports shrub and cottonwood riparian communities along the Oldman River. Mostly outside of the ecoregion, this area may gain in significance when evaluated by the adjoining ecoregion. This area is recognized as internationally significant by the Alberta CDC.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Pakowki Lake, AB

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, loss of fire regime.

Description:

An extensive lake with adjoining sand dunes and native prairie. This area has been recognized as internationally significant by the Alberta CDC. A major shorebird/waterfowl staging area, as well as significant breeding area for colonial birds, including American white pelican. Declining species utilizing this area include sage grouse and Franklin's gull. Smooth goosefoot is found on sand dunes adjoining the lake.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Purple Springs Sandhills, AB

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, oil and gas habitat conversion, exotic species.

Description:

Mixed grassland on stabilized sand dune terrain with some active blowouts. This area is recognized as provincially significant by the Alberta CDC. The rare plant smooth goosefoot is found in the active portions of the sandhills.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Red Deer River, AB

Biodiversity Rating: High

Threat Urgency Rating -Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

Adjoining the Red Deer River, this nationally significant area hosts the most extensive and diverse plains cottonwood system in Canada. Shrub riparian communities also occur along the river.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Red Deer-South Saskatchewan, AB/SK

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, hydrologic alteration, poor grazing management.

Description:

This area encompasses canyon portions of the South Saskatchewan River in Alberta (recognized as nationally significant by the Alberta CDC) and Saskatchewan and portions of the Red Deer River in Alberta (identified as provincially significant by the Alberta CDC). The Alberta portion of the South Saskatchewan has been identified as one of the premiere wild river sections in the Grassland Region of Canada. Cottonwood and shrub riparian communities are found along the rivers, while extensive shrub and deciduous wooded draw communities are located in ravines in the adjoining uplands. The rivers support high quality aquatic communities and include lake sturgeon, a rare species. The rare plant Virgate halimoloba is also found in this area, as are the secondary targets short-horned lizard and bobcat. Also, this area delineates the most northern limits of the prairie rattlesnake in Canada.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Reed Lake, SK

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, hydrologic alteration, pesticide drift.

Description:

Shallow saline lake internally drained. Important migratory staging area for shorebirds and waterfowl.

Inventory Rating: Medium

Inventory Needs: Birds are well inventoried. Limited need for other features.

Rocky Mountain Front, MT

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: High – subdivision, exotic species, agricultural conversion.

Description:

Where the Great Plains meet the Rocky Mountains, this extensive area encompasses a variety of natural communities, including the largest fen in the western United States. Small streams supporting shrub riparian vegetation dissects gently rolling grasslands dominated by bluebunch wheatgrass and rough fescue communities. Pothole and alkali wetlands are also imbedded in portions of the grasslands. Deciduous forest and woodlands (aspen dominated) occur locally, primarily along the interface of mountains and plains. Conservation lands include Pine Butte Swamp and Blackleaf preserves, several conservation easements, and MT wildlife management areas. The Front is home to the only Great Plains grizzly bear and gray wolf populations, and also supports several other large carnivores (mountain lion and bobcat). The rare plant western moonwort is also found here.

Inventory Rating: Medium

Inventory Needs: Good information is available for some rare species (grizzly bear, gray wolf) and natural communities associated with the Pine Butte area and portions of the Blackfeet Reservation. Additional community information is needed across extensive portions of the Front.

Sage Creek-Southwest Pasture Complex, AB, MT, SK

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – agricultural conversion, poor grazing management, ground squirrel control.

Description:

Encompassing one of the largest mixed-grass prairie complexes in Canada, this area is generally characterized by rolling topography with numerous alkali wetland basins. Small streams supporting shrub riparian communities bisect the uplands dominated by western wheatgrass grasslands. Supporting one of the most complete assemblages of Great Plains species in Canada, this area supports swift fox and a small population of mountain plover (less than 25 pairs). It also hosts a number of declining species, including burrowing owl, Sprague's pipit, Baird's sparrow, chestnut collared longspur, and sage grouse. Numerous plant species, rare in Canada, are found here, as is dense-flower knotweed, a rare Great Plains subspecies. In Alberta, Sage Creek has been recognized as nationally significant by the Alberta CDC.

Inventory Rating: Medium

Inventory Needs: Additional community information is needed.

South Snowy Mountains, MT

Biodiversity Rating: Medium

Threat Urgency Rating – Threats: High – agricultural conversion, exotic species, elevated predator populations.

Description:

Located at the base of the Snowy Mountains, this area is characterized by level to rolling grasslands. Technically outside of the ecoregion, it captures common Great Plains habitat and species and was therefore included in the portfolio. The second largest mountain plover population in Montana is located in this area.

Inventory Rating: High

Inventory Needs: Mountain plovers have been well documented.

Sweetgrass Hills, MT

Biodiversity Rating: Medium

Threat Urgency Rating – Threats: Medium – exotic species, strip mining, loss of fire regime.

Description:

A small island mountain range surrounded by cropland and tame grassland. The Sweet Grass Hills support high elevation coniferous forest/woodland communities in upper elevations. Lower slopes support three primary grassland types, western wheatgrass, needlegrass, and rough fescue. Future inventory efforts may indicate the need to consider the Alberta portion of this area, which is known to support a number of provincially rare plants. Baird's sparrow and Sprague's pipit, declining grassland birds, utilize grassland communities at the lower elevations.

Inventory Rating: Medium

Inventory Needs: Botanical and limited communities have been completed. Additional natural community inventory is needed.

Swift Current Creek, SK

Biodiversity Rating: Medium

Threat Urgency Rating – Threats: Medium – poor grazing management, hydrologic alteration, agricultural conversion.

Description:

Swift Current Creek supports high quality aquatic communities, including an intact fish assemblage (Ron Jensen pers.com.). Secondary targets include bobcat and mountain lion, which utilize rugged creek slopes and breaks of the South Saskatchewan River.

Inventory Rating: Low

Inventory Needs: Natural communities and rare species.

Tunstall Sandhills, SK

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Low – oil and gas habitat conversion, poor grazing management, loss of fire regime.

Description:

Sandhills complex comprised of stabilized dunes, depressions supporting *Populus tremuloides* clones, and some open dunes. Provincially rare plant species include *Psoraleidum larceolatum*, *Oryzopsis asperifolia*, *Rumex venosus*.

Inventory Rating: Low

Inventory Needs: Limited rare plant surveys have been completed in the past. Additional inventories are needed for rare species and natural communities.

Turin Dunes, AB

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, loss of fire regime.

Description:

Native mixed grassland and sagebrush on sand dune terrain with active blowouts. This area is recognized as nationally significant by the Alberta CDC.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventories are needed.

Upper Missouri River, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – poor grazing management, exotic species, hydrologic alteration.

Description:

The only remaining example of a relatively free-flowing segment of the Missouri River in the Great Plains, this stretch retains enough hydrologic integrity to continue flood cycles required to sustain riparian communities and rare river species. Cottonwood and shrub riparian communities occur along the river. Breeding and migratory bald eagles utilize the cottonwood communities. The river supports representative examples of aquatic communities and four rare fish species, pallid sturgeon, sicklefin chub, sturgeon chub, and blue sucker. Much of this area has been designated as a Wild and Scenic River. A portion is also contained within the Charles M. Russell National Wildlife Refuge.

Inventory Rating: Medium

Inventory Needs: Need for additional fisheries information and documentation of natural communities.

Whitewater Wetlands Complex, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – agricultural conversion, oil and gas habitat conversion, poor grazing management.

Description:

This area is characterized by rolling topography with numerous interspersed wetland basins. Pothole wetlands represented in this area are generally shallow and have only limited species diversity. Uplands are utilized by Baird's sparrow and Sprague's pipit, declining grassland birds. The BLM and USFWS maintain administration of portions of this site, although lands are very intermingled.

Inventory Rating: Low

Inventory Needs: Vegetation and species inventory.

Writing on Stone, AB

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – loss of fire regime, agricultural conversion, exotic species.

Description:

Rugged terrain surrounding the Milk River. Diverse and productive plains cottonwood and shrub riparian vegetation adjoins the river. Ravines host deciduous wooded draw communities. This area is recognized as internationally significant by the Alberta CDC and contains “some of the most diverse habitats and landscapes in the mixed grasslands of North America”. Declining or wide-ranging species include bobcat and short-horned lizard. Also, this area supports a rich diversity and abundance of raptors, rare butterflies, and numerous provincially rare plants. A portion of this area is captured within Writing on Stone Provincial Park.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventory needed.

Appendix 12-A: Summary Information for Sites within the Northern Glaciated Plains Section.

Beaver Creek, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low -- Exotic species, agricultural conversion, poor grazing management.

Description:

Small stream system supporting high quality herbaceous riparian communities. Beaver Creek flows through uplands in mixed grassland and cropland.

Inventory Rating: Low

Inventory Needs: Baseline vegetation and species information.

Chaplin Lake, SK

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – hydrologic alteration, commercial uses, exotic species.

Site Description:

Shallow saline lake that provides breeding habitat for piping plover.

Inventory Rating: Medium

Inventory Needs: Shorebirds and waterfowl have been well inventoried. Additional inventory of natural communities is required.

Chase Lake, ND

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – Exotic species, elevated predator populations, agricultural conversion.

Site:

Part of the Missouri Coteau, this area is characterized by rolling terrain with numerous wetland basins. Little bluestem grasslands are associated with shallow, calcareous soils, generally along hillsides while mixed-grass communities occur on other upland sites. Tallgrass prairie is found in small patches on mesic sites. Pothole wetlands vary in both water quality and permanency. Chase Lake, a large alkali wetland, supports the largest American white pelican colony in North America, a small piping plover population, and is a significant shorebird/waterfowl staging area. Declining bird species associated with wetlands and uplands, include Franklin's gull, burrowing owl, Baird's sparrow, Sprague's pipit, and Chestnut collared longspur. A portion of this site is captured within the Chase Lake National Wildlife Refuge. The U.S. Fish and Wildlife Service, Ducks Unlimited, and N.D. Game and Fish have been actively working with private landowners in this area through the North American Wetlands Management Plan.

Inventory Rating: Medium

Inventory Needs: Avian species are well documented. Additional inventory is needed for invertebrates and natural communities.

Comertown Prairie, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: High – Agricultural conversion, oil and gas conversion, poor grazing management.

Description:

Part of the Missouri Coteau, this area is characterized by rolling terrain with numerous wetland basins. Pothole wetlands vary in both water quality and permanency. This area is the only example of thickspike wheatgrass communities captured on the Missouri Coteau in the ecoregion. These types have been extensively converted to cropland elsewhere. This is also the largest remaining grassland-pothole complex remaining on the Missouri Coteau in Montana. A portion of this site is contained within the Comertown Prairie Pothole Preserve and Lonetree Lake Conservation Easement (1,400 acres).

Inventory Rating: High

Inventory Needs: Good inventory of plants and natural communities. Inventory needed for invertebrates.

Crystal Springs, ND

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – Agricultural conversion, exotic species, poor grazing management.

Description:

Part of the Missouri Coteau, this area is characterized by level to rolling terrain with wetland basins. Little bluestem grasslands are associated with shallow, calcareous soils, generally along hillsides while needlegrass communities occur on coarse textured upland soils. Tallgrass prairie is found in small patches on mesic sites. Declining grassland birds in this area include Baird's sparrow (some of the highest concentrations of this species across its range) and Sprague's pipit.

Inventory Rating: Low

Inventory Needs: Baseline natural community and species inventory.

Davis Ranch Hills, ND

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – Exotic species, poor grazing management, agricultural conversion.

Description:

Part of the Missouri Coteau, this area is characterized by level to rolling terrain with numerous wetland basins. Pothole wetlands vary in both water quality and permanency. Needlegrass communities occur on coarse textured upland soils while western wheatgrass communities are found on finer textured soils. Uplands and depressions host the silverberry shrubland communities identified in the ecoregion. Baird's sparrow and Sprague's pipit, declining grassland birds, utilize upland grassland communities. The Davis Ranch Preserve (7,000+ acres) and several Waterfowl Production Areas are located in this area.

Inventory Rating: Medium

Inventory Needs: Some inventory of butterflies, plants, and natural communities at Davis Ranch. Requires additional inventories of all of these for the remainder of the area.

Dawson Sandhills/Long Lake, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: High – Agricultural conversion, exotic species, poor grazing management.

Description:

A large brackish lake and small sandhills system. The lake represents a significant shorebird/waterfowl staging area and is occasionally utilized by piping plovers. The sandhills are mostly stabilized dunes and are of diminished quality due to leafy spurge; however, they are significantly threatened by conversion for center pivot agriculture. Much of the lake is captured within Long Lake National Wildlife Refuge.

Inventory Rating: Medium

Inventory Needs: Long Lake species values are well documented. Inventory of sandhills natural communities needs additional work.

John E. Williams Preserve Complex, ND

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – Elevated predator populations, loss of fire regime, exotic species.

Description:

A series of 7 major alkali wetlands that frequently hosts 10% or more of the piping plover population on the Missouri Coteau. This area is almost entirely captured within John E. Williams Preserve and adjoining public lands (Bur. Of Rec., State School, USFWS). Primary threats are related to predation of piping plovers that can be abated through expanded and intensified management to protect nests and chicks.

Inventory Rating: High

Inventory Needs: Site has been extensively inventoried. Additional research relating to landscape effects on plover productivity may be important.

Lake of the Rivers, SK

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – loss of fire regime, poor grazing management, elevated predator populations.

Site Description:

Shallow lake located in a glacial spillway. Surrounding uplands are highly dissected and relatively steep sloped. Small breeding population of piping plovers occasionally utilizes the lake.

Inventory Rating: Low

Inventory Needs: Inventories have been completed for piping plovers. Further inventory of rare species and natural communities are needed.

Lostwood, ND

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – Elevated predator populations, agricultural conversion, exotic species.

Description:

The largest intact landscape remaining on the Missouri Coteau, it is characterized by level to gently rolling terrain with numerous wetland basins. This area supports the greatest natural community diversity on the Missouri Coteau. Wetlands range from fresh to brackish potholes, fens, and several alkali/saline wetlands/lakes. Drier uplands support western wheatgrass and needlegrass grasslands, while mesic sites contain tallgrass prairie. Deciduous woodlands (primarily aspen) occur in depressions. Deciduous wooded draws are located in ravines associated with steeper topography. Rare species include piping plover and Dakota skipper, while Franklin's gull, burrowing owl (limited), Sprague's pipit, Baird's sparrow, chestnut collared longspur are declining birds found in the area. Lostwood National Wildlife Refuge is contained within this area.

Inventory Rating: Medium

Inventory Needs: Plover sites well inventoried as are many of the declining birds. There is a need for butterfly inventories on private lands. Natural community inventory is needed for both public and private lands.

Manning Lake, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – Hydrologic alteration, poor grazing management, exotic species.

Description:

A saline wetland associated with a flat expanse of saline affected grasslands. Provides habitat for Franklin's gull.

Inventory Rating: Low

Inventory Needs: Natural community and species inventory.

Medicine Lake, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – Exotic species, elevated predator populations.

Description:

Level to rolling grasslands around Medicine Lake and a sandhills system. Prairie potholes are imbedded within the grassland communities (many of which are infested with crested wheatgrass). Sandhills contain some small blowouts but are mostly stabilized grassland and shrub sandhill types. Grasslands support Baird's sparrow, Sprague's pipit, and Chestnut collared longspur. Medicine Lake supports a piping plover population that varies according to lake drawdown. A large American white pelican population utilizes the lake. Medicine Lake National Wildlife Refuge encompasses all of Medicine Lake and a significant component of the sandhills.

Inventory Rating: High

Inventory Needs: Well inventoried for most biological features.

Muddy Creek Badlands, SK

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – loss of fire regime, poor grazing management, exotic species.

Site Description:

Rolling to dissected topography. Needlegrass grasslands dominate uplands, while shrub riparian communities are located along Muddy Creek. Alkali/saline wetlands located in the uplands support breeding populations of piping plover. Secondary targets include burrowing owl, Sprague's pipit, Baird's sparrow, mountain lion, and yellow-bellied racer. This area also hosts a number of raptors, including golden eagle, ferruginous hawk, and prairie falcon.

Inventory Rating: Low

Inventory Needs: Natural community and rare species.

Old Wives Lake, SK

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – exotic species, hydrologic alteration, pesticide drift.

Site Description:

A shallow saline lake that provides breeding habitat for piping plover and American white pelican, and is a significant shorebird/waterfowl staging area. This area is almost entirely contained within a Migratory Bird Sanctuary.

Inventory Rating: Medium

Inventory Needs: Bird species have been well inventoried. Need additional surveys for rare species and natural communities.

Orient Hills, SD

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

Rolling topography supporting needlegrass grassland communities.

Inventory Rating: Low

Inventory Needs: Need extensive natural community and species inventory.

Ordway/McPherson/Johnson's Gulch, ND/SD

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium/Low – Agricultural conversion, exotic species, loss of fire regime.

Description:

Part of the Missouri Coteau, this area is characterized by level to rolling terrain with numerous wetland basins. Pothole wetlands vary in both water quality and permanency. Needlegrass communities occur on coarse textured upland soils. Little bluestem grasslands are located on hillsides with shallow soils, whereas tallgrass prairie is located in depressions. Three rare butterflies utilize the grassland communities, Dakota skipper, regal fritillary, and Ottoe skipper. Baird's sparrow and Sprague's pipit, declining grassland birds, utilize upland grassland communities. A diverse, extensive, and high quality deciduous wooded draw is associated with Johnson's Gulch WMA in ND. Other conservation lands include Samuel Ordway Prairie Preserve (7,800 acres) and numerous areas conserved for waterfowl by the USFWS and SD Game, Fish and Parks. Extensive areas of private land are under USFWS grassland easement in SD.

Inventory Rating: Medium

Inventory Needs: Natural communities and species, especially butterflies, on private and public lands.

Stateline Wetlands, MT/ND

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion and fragmentation, elevated predator populations, oil and gas habitat conversion.

Description:

Level to gently rolling terrain with numerous alkali wetlands and lakes. This landscape has been largely fragmented as the result of conversion to cropland; however, significant populations of piping plovers utilize the numerous alkali wetlands and lakes.

Inventory Rating: High

Inventory Needs: No significant needs.

West Fork Poplar River, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – Agricultural conversion, poor grazing management, oil and gas habitat conversion.

Description:

A relatively broad valley associated with the West Fork Poplar River. Deciduous wooded draw communities occur in ravines located in valley walls above the river.

Inventory Rating: Low

Inventory Needs: Natural community, species, and aquatic inventory.

Willow Bunch Lake, SK

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – loss of fire regime, poor grazing management, exotic species.

Site Description:

A shallow saline lake that provides habitat for a small population of piping plovers.

Inventory Rating: Low

Inventory Needs: This area has been inventoried for piping plovers, however, additional inventory is needed for rare species and natural communities.

Appendix 12-C: Summary Information for Sites within the Northwestern Great Plains Section.

Badlands National Park Complex, SD

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Low – Exotic species, recreational use, prairie dog control.

Description:

An extensive complex of badlands and grasslands frequently occurring on soils derived from marine shales. Western wheatgrass communities are prevalent in rolling uplands. Deciduous wooded draws are associated with ravines in broken topography. This area hosts a number of rare or declining species, including black-footed ferret, swift fox, fringe-tailed myotis, Barr's milkvetch, and Dakota buckwheat. It also supports significant black-tailed prairie dog colonies, which are utilized by burrowing owl. A large portion of this area is contained within Badlands National Park, and part of Buffalo Gap National Grassland and Pine Ridge Reservation.

Inventory Rating: Medium

Inventory Needs:

Inventories have been completed for many of the rare species and natural communities within the park. Additional vegetation inventory is required.

Bad River Prairie, SD

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – poor grazing management, agricultural conversion, exotic species.

Description:

This area supports an outstanding example of tallgrass prairie (big bluestem-little bluestem) occurring on mesic soils.

Inventory Rating: Low

Inventory Needs: Needs extensive natural community and species inventory.

Bates Hole/Shirley Rim, WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – poor grazing management, oil and gas habitat conversion.

Description:

Gently rolling hills and broad valleys in shale bedrock with sandstone outcrops. High elevation coniferous forest/woodland are associated with higher elevations of the Shirley Rim. Basin big sage (the only representation of these communities in the ecoregion) shrublands occur along stream valleys. Gentle slopes and flats support Nuttall's saltbush shrublands. Two rare plants occur in this area, smooth goosefoot and a ricegrass. This area may extend into a larger landscape centered in the Wyoming Basins ecoregion.

Inventory Rating: Medium

Inventory Needs: Rare plants have been well inventoried, however additional description of natural communities is needed.

Buffalo Creek, WY

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – residential development/subdivision, agricultural conversion.

Description:

Located along the foot of the southern end of the Bighorn Mountains, Buffalo Creek is characterized by a series of parallel sandstone and limestone ridges and shale strike valleys. Sidehills and shallow soils support bluebunch wheatgrass communities.

Inventory Rating: Low

Inventory Needs: Baseline inventory of natural communities and species.

Bullion Butte/Little Missouri, ND

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – oil and gas habitat conversion, exotic species, poor grazing management.

Description:

This area contains an intact portion of Little Missouri riparian vegetation and one of the most prominent buttes in the Little Missouri Badlands. Riparian communities include cottonwood and shrub types. The surrounding landscape is characterized by rolling to dissected topography dominated by mixed-grass prairie. This area is within the largest roadless area in the Little Missouri National Grasslands and is one of the least impacted by oil development in the Little Missouri Badlands.

Inventory Rating: High

Inventory Needs: Vegetation of the butte, riparian corridor, and state rare species have been well documented.

Burns Creek, MT

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low – poor grazing management.

Description:

Dissected topography associated with Burns Creek. Ephemeral streams in ravines support high quality deciduous hardwood draw communities, perhaps the best examples found in Montana and among the best in the ecoregion.

Inventory Rating: Medium

Inventory Needs: Hardwood draw communities relatively well described, however, grassland communities and species, especially birds, require further inventory.

Casper Sandhills, WY

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Low – poor grazing management, oil and gas habitat conversion

Description:

Primarily stabilized dunes with some active dune movement. Sandhills are deposited on mixed sedimentary parent material. Supports a variety of sandhills natural communities.

Inventory Rating: Low

Inventory Needs: Baseline vegetation inventory for natural communities and species.

Chalk Buttes, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – exotic species, poor grazing management, loss of fire regime.

Description:

A low elevation limestone escarpment surrounded by mixed sedimentary parent materials. Eroded topography of the buttes and adjoining landscape supports deciduous wooded draw communities in ravines.

Inventory Rating: Medium

Inventory Needs: Additional inventory of natural communities.

Cheyenne River/Cherry Creek, SD

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – poor grazing management, exotic species, hydrologic alteration.

Description:

This area encompasses the broken to rolling uplands and riparian corridor surrounding the Cheyenne River. Rolling uplands support western wheatgrass and little bluestem grasslands. Eroded clay slopes support the rare plant Dakota buckwheat. Ravines leading to the river host deciduous and mixed deciduous-coniferous wooded draw communities. Interior least tern utilizes sandbars with limited vegetative cover in the Cheyenne River. Most of this area is located within the Cheyenne River Reservation.

Inventory Rating: Medium

Inventory Needs: Rare species are relatively well documented. Extensive work is required for natural vegetation.

Cheyenne River Riparian, SD/WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: High – habitat conversion/fragmentation by railroad construction, exotic species, oil and gas habitat conversion.

Description:

The Cheyenne River riparian corridor above the Angostura Reservoir. This area supports high quality and extensive cottonwood riparian communities.

Inventory Rating: Medium/Low

Inventory Needs: Natural communities have been inventoried in Wyoming but not in South Dakota. Additional inventory is needed in both states.

Demick's Lake, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – hydrologic alteration, basin drainage/filling.

Description:

A relatively large lake located in the uplands adjoining the Little Missouri Badlands.

Inventory Rating: Low

Inventory Needs: Inventories are required for natural communities and species.

Grand River National Grassland, SD

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – exotic species, poor grazing management.

Description:

Rolling uplands interrupted by small streams and occasional exposed outcrops of parent material. Dakota buckwheat, a rare plant, is found on barren clay outcrops. Rolling grasslands support black-tailed prairie dog colonies. Extensive portions of the Grand River National Grasslands had been cropped and were seeded to crested wheatgrass. Portions of the uplands are utilized by four declining bird species, burrowing owl, chestnut collared longspur, Sprague's pipit, and Baird's sparrow.

Inventory Rating: Medium

Inventory Needs: Rare species are relatively well known. Limited natural community has been completed.

Harding County/Slim Buttes, SD

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, exotic species, poor grazing management.

Description:

An expansive area of gently rolling plains interrupted by sandstone and volcanic ash escarpments (Slim Buttes, Cave Hills). Needlegrass grasslands are prevalent in the uplands. Rare species include swift fox, Dakota buckwheat, and smooth goosefoot. Declining species include sage grouse.

Inventory Rating: Low

Inventory Needs: Intensive surveys have been completed in limited portions of Harding County/Slim Buttes, however, overall this area has seen limited inventory for species or natural communities.

Hartville Uplift, WY

Biodiversity Rating: Medium

Threat Urgency Rating – Threats: Medium – habitat conversion from mining, and oil and gas, loss of fire regime.

Description:

A rugged limestone uplift with numerous canyons, valleys, and limestone plateaus. Slopes with shallow soils support mountain mahogany shrublands and little bluestem grasslands. Alpine feverfew, a rare plant, grows on open stony slopes and ridges.

Inventory Rating: Medium

Inventory Needs: Additional inventory is needed for natural communities. Plant inventories have been relatively intensively completed.

Hat Creek/Toadstool, WY

Biodiversity Rating: Medium

Threat Urgency Rating – Threats: Low – loss of fire regime.

Description:

This area encompasses a north facing escarpment (a continuation of the Pine Ridge in Nebraska) and striking badlands. Low elevation coniferous forest/woodland communities occur on the escarpment, as does the rare plant alpine fever-few. The Toadstool Badlands support a number of natural communities associated with badlands topography. A portion of this area is captured within Toadstool State Park.

Inventory Rating: Low

Inventory Needs: Additional inventory is needed for natural communities and species.

High Bank Creek, SD

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

This area includes the rolling uplands and floodplain adjoining High Bank Creek. Mixed deciduous riparian communities include bur oak dominated types (unusual in this ecoregion). Uplands adjoining the creek support an extensive black-tailed prairie dog colony. This area is entirely within the Cheyenne River Reservation.

Inventory Rating: Low

Inventory Needs: Requires additional natural community (especially the oak types) and species inventory.

Killdeer Mountains/Little Missouri Badlands, ND

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Low – agricultural conversion, oil and gas habitat conversion, poor grazing management.

Description:

This area spans a wide variety of terrain, including the most rugged portion of the Little Missouri Badlands, a stream reach of the Little Missouri River, rolling uplands, and the Killdeer Mountains. A tremendous amount of natural community diversity is captured within this site as a result, including deciduous and mixed deciduous wooded draws, shrub and cottonwood riparian, badlands, deciduous forest/woodland, low elevation coniferous forest/woodland, and little bluestem grassland. The rare species, Dakota skipper butterfly has been found in little bluestem grasslands in this area. Small black-tailed prairie dog towns provide habitat for burrowing owl. In addition to private lands, this site has lands administered by the BLM, NPS, ND Parks, and USFS. It also includes a portion of the Fort Berthold Reservation.

Inventory Rating: Medium

Inventory Needs: Inventories have been completed within Theodore Roosevelt National Park and portions of USFS lands. Also private lands in the Killdeer Mountains have been intensively surveyed. Need for additional inventory of natural communities and species outside of the areas noted above, especially butterfly inventory in little bluestem grasslands.

Knife River, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – agricultural conversion, exotic species, poor grazing management.

Description:

Little bluestem grasslands located on dissected topography and thin soils along the valley walls of the Knife River.

Inventory Rating: Low

Inventory Needs: Inventory of natural communities and species.

Laramie Range Foothills, WY

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – loss of fire regime and residential development.

Description:

Located along the eastward slopes off of the Laramie Range, this area is characterized by broad surfaces dominated by needlegrass grasslands and mountain mahogany shrubland on steep slopes with shallow soils.

Inventory Rating: Low

Inventory Needs: Inventory of natural communities and species.

Little Missouri Woodlands, WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, strip mining, exotic species.

Description:

Rolling to moderately dissected terrain sloping northward off of the Wyoming Black Hills. This area hosts patches and stringers of deciduous woodland/forest (oak dominated) in ravines and mesic upland sites. Surrounding uplands are comprised of various grassland communities.

Inventory Rating: Low

Inventory Needs: Limited inventory has been completed in the oak communities. Additional inventory is needed for natural communities and species.

Lower Yellowstone-Missouri Confluence, MT/ND

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – hydrologic alteration, exotic species, elevated predator populations.

Description:

These river stretches provide habitat for several rare fish species associated with the Upper Missouri drainage. Although the Missouri River is highly controlled by Fort Peck Dam, flood events associated with the Yellowstone provide habitat for species in both rivers. Rare fish include pallid sturgeon, sicklefin chub, sturgeon chub, and blue sucker. This area also hosts a large paddlefish population. Interior least terns utilize the Yellowstone River while a small population of piping plovers utilize sandbar habitat in the Missouri. However, the population of the later is probably not viable due to the lack of river dynamics and maintenance of sandbar habitat. A small population of bald eagles also utilizes the area. The adjoining riparian corridor may support significant cottonwood communities.

Inventory Rating: Medium

Inventory Needs: Relatively good information is available for rare species. Natural community inventory is needed especially along the lower Yellowstone.

Mike's Creek, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – oil and gas habitat conversion, exotic species.

Description:

This area encompasses moderately to deeply dissected terrain of the Little Missouri Badlands. Mixed deciduous-coniferous wooded draw communities are present in ravines. Low elevation coniferous forest/woodland communities are associated with mesic sites and ridges. This area is located primarily within the Little Missouri National Grasslands.

Inventory Rating: High

Inventory Needs: Communities have been well inventoried.

Moreau River, SD

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, hydrologic alteration.

Description:

The Moreau River is a significant drainage in western South Dakota. Extensive herbaceous riparian communities occur along its banks. Much of the surrounding uplands are comprised of native grassland communities.

Inventory Rating: Low

Inventory Needs: Species and natural communities require additional inventory.

Oliver County/Missouri River, ND

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – hydrologic alteration, elevated predator populations, exotic species.

Description:

Uplands and riparian areas associated with the Missouri River. Uplands are fragmented by farming but contain relatively large and viable examples of wooded draws in ravines and little bluestem grasslands on steeper hillsides. Interior least terns and piping plovers utilize sandbar habitat, which is currently being maintained (minimally) by river management associated with dam operations. Upland grasslands support three declining species, Sprague's pipit, Baird's sparrow, and Ottoe skipper. Also, small populations of Dakota skipper and regal fritillary butterflies have been located at Cross Ranch Preserve (6,000 acres).

Inventory Rating: High

Inventory Needs:

Rare species are well inventoried (with the exception of rare butterflies), as are the natural communities at Cross Ranch Preserve. Upland communities and butterflies require additional inventory.

Otter Creek/Heart River, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

Tallgrass prairie communities are located in mesic locations (i.e. ravines) and are relatively small and linear. Overall, this area is characterized by dissected valley sidehills along the Heart River.

Inventory Rating: Low

Inventory Needs: Additional species and natural community inventory is needed.

Pine Ridge, NE

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – Residential development, loss of fire regime, exotic species.

Description:

A prominent east-west trending escarpment, the Pine Ridge supports a mosaic of woodland and grassland communities. Low elevation coniferous forest communities (primarily ponderosa pine) occur on various aspects and sites. Deciduous and mixed deciduous-coniferous wooded draw communities are associated with ravines and mesic upland sites. Fringe-tailed myotis, a rare bat, is found within this area. A significant portion of the Pine Ridge is contained within the Nebraska National Forest.

Inventory Rating: Medium

Inventory Needs: Additional inventory is needed for natural communities.

Rattlesnake Foothills, WY

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – oil and gas habitat conversion and poor grazing management.

Description:

Located north and east of the Rattlesnake Mountains, this area is comprised of broad flats vegetated primarily by natural communities dominated by big and black sagebrush.

Inventory Rating: Low

Inventory Needs: Additional inventory is needed for species and natural communities.

Rawhide Buttes, WY

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – Loss of fire regime.

Description:

An area of low mountains, the Rawhide Buttes are vegetated by a mosaic of ponderosa pine communities and little bluestem grasslands.

Inventory Rating: Low

Inventory Needs: Baseline inventory of natural communities and species.

Sand Creek, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – exotic species, poor grazing management.

Description:

Rolling uplands adjoining the breaks of the Missouri River. Upland communities are dominated by needlegrass grasslands. Much of this area is within the Little Missouri National Grasslands.

Inventory Rating: Medium

Inventory Needs: Inventories have been completed for some of the natural communities. Additional work is needed for communities and species.

Sioux Prairie, NE

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

This area encompasses rolling to broken topography dominated by needlegrass grasslands and a large sandhills system (disjunct from the sandhills of central Nebraska). Herbaceous riparian communities are well represented along small streams. Rare species in this area include swift fox, secund bladderpod, smooth goosefoot, and Ute's ladies' tresses.

Inventory Rating: Low

Inventory Needs: Natural community and species inventory is required. Efforts should initially concentrate in the sandhill communities, many of which may be unique and undescribed types.

Standing Rock, ND

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

Rolling to moderately dissected plains supporting western wheatgrass and green needlegrass grasslands. Localized badlands formations support diverse assemblages of communities. Clay outcrops in badlands support the rare plant Dakota buckwheat. Small prairie dog towns support burrowing owl, a secondary species. This area is almost entirely contained within the borders of the Standing Rock Reservation.

Inventory Rating: Low

Inventory Needs: Past inventory efforts have been focused on locating populations of Dakota buckwheat. Little information is available on natural communities or other rare species.

Upper Niobrara River, NE/WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: High – agricultural conversion, exotic species, hydrologic alteration.

Description:

A major drainage of northwestern Nebraska, this stretch of the Niobrara River is bordered by high quality herbaceous riparian communities. The rare plant Ute's ladies' tresses occurs in these communities.

Inventory Rating: Medium

Inventory Needs: Inventory has been completed for Ute's ladies' tresses and some natural communities.

White/Little White Rivers, NE/SD

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – strip mining, poor grazing management, prairie dog control.

Site Description:

An extensive and intact river system draining portions of northwestern Nebraska and southwestern South Dakota. These rivers flow through rugged terrain, including the Badlands of South Dakota. Biologically significant features of the uplands include deciduous and mixed deciduous-coniferous wooded draws in ravines, low elevation coniferous woodlands along valley walls, and natural communities associated with badlands. These uplands also support swift fox and black-tailed prairie dog colonies, which are utilized by burrowing owls (a secondary target). Cottonwood riparian communities are located along the rivers, which host an intact assemblage of native fishes, including the globally rare sturgeon chub and sickfin chub.

Inventory Rating: Medium

Inventory Needs: This area has been recently inventoried for rare fish species. Additional inventory is needed for natural communities and species.

Wildcat Hills (Pumpkin Creek), NE

Biodiversity Rating: High

Threat Urgency Rating - Threats: High – agricultural conversion, residential development, exotic species.

Description:

A limestone and sandstone escarpment supporting low elevation coniferous forest/woodlands and grasslands. Shallow soils host mountain mahogany shrublands. Ravines support deciduous and mixed deciduous wooded draw communities, while herbaceous riparian communities are located along Pumpkin Creek, just south of the Wildcat Hills.

Inventory Rating: High

Inventory Needs: Additional natural community inventory.

Winter's Allotment, ND

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, poor grazing management, exotic species.

Description:

Rolling to moderately dissected plains. Eroded barren clay outcrops support populations of the rare plant, Dakota buckwheat. This area is predominantly contained within the Little Missouri National Grasslands.

Inventory Rating: High

Inventory Needs: Dakota buckwheat populations have been well inventoried. Additional inventory is needed for natural communities and species.

Appendix 12-D: Summary Information for Sites within the Powder River Section.

Big Horn Foothills, WY

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: High – agricultural conversion, exotic species, residential development

Description:

The Big Horn Foothills encompasses the eastern slopes of the Bighorn Mountains, which are characterized by a mosaic of grasslands bisected by numerous small streams and ravines. Shrub wooded draw communities are located in ravines and mesic sites in the uplands. Two rare plants are located in this area, woolly twinpod (occurs on sparsely vegetated slopes in bunchgrass grasslands) and purpus' sullivantia (occurs in canyons at edge of the mountains on damp or wet limestone).

Inventory Rating: High

Inventory Needs: Extensive inventories have been completed for rare plants and natural communities.

Bull Mountains, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: High – strip mining, residential development, loss of fire regime.

Description:

An uplift of Fort Union Formation sandstones and localized areas of shale deposits. The Bull Mountains support an extensive mosaic of low elevation coniferous forest/woodland and bluebunch wheatgrass grasslands. Herbaceous riparian communities are located along small streams.

Inventory Rating: Low

Inventory Needs: Natural community and species inventory.

Cedar Creek, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – oil and gas habitat conversion, agricultural conversion, exotic species.

Description:

Gently rolling plains with widely-scattered escarpments. Low elevation coniferous forest/woodland communities occur along the ridges and sides of escarpments with prairie sandreed grassland communities interspersed on sandstone ridges.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

Dry Lake Basin, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, hydrologic alteration, exotic species.

Description:

A relatively large and flat basin supporting green needlegrass grasslands. A relatively large lake (Dry Lake) occurs in the basin.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

Froze-to-Death Creek, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, poor grazing management.

Description:

Rolling terrain surrounding Froze-to-Death Creek. This area supports big sagebrush and Nuttall's saltbrush shrublands.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

Hailstone Lake, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – hydrologic alteration.

Description:

A relatively permanent and large prairie lake. This area attracts a diverse assemblage of migrating and breeding wetland birds. This area is entirely contained within Hailstone Lake National Wildlife Refuge.

Inventory Rating: High

Inventory Needs: Bird use well documented, needs description of adjoining natural communities.

Half-breed/Big Lake, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – hydrologic alteration

Description:

A prairie lake complex including Halfbreed Lake, Big Lake, and 2 smaller lakes. Halfbreed is a relatively permanent lake contained within the Halfbreed Lake National Wildlife Refuge. Big Lake is larger and shallower. This complex attracts a diverse assemblage of migrating and breeding wetland birds. Burrowing owls utilize small prairie dog town.

Inventory Rating: High

Inventory Needs: Bird use well documented, needs description of adjoining natural communities.

Hell Creek Badlands, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – exotic species, agricultural conversion.

Description:

An area of extensive and rugged badlands interspersed with grasslands. A number of natural communities are captured within this badlands complex. A significant portion of this area is located in the Charles M. Russell National Wildlife Refuge or administered by the BLM.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

Lake Mason, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Low – hydrologic alteration

Description:

A relatively shallow and large prairie lake. This area attracts a diverse assemblage of migrating and breeding wetland birds. Mountain plovers occasionally use a small prairie dog town. This area is entirely contained within Lake Mason National Wildlife Refuge.

Inventory Rating: High

Inventory Needs: Natural communities and birds have been well inventoried.

Little Powder River, MT/WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, hydrologic alteration.

Description:

This topographically diverse area contains plateaus of sandstone and shale (capped with scoria) that are dissected by streams that form narrow to broad valleys with steep, rocky slopes. Western wheatgrass grasslands and big sage shrublands cover the gently rolling tops of the plateaus, while hillsides support bluebunch wheatgrass and little bluestem grasslands. These upland sites host the rare plant Barr's milkvetch. Low elevation ponderosa pine forests and woodlands are common on sandstone and scoria hillsides. Ravines leading to the Little Powder River support shrub and deciduous wooded draws. The banks of the Little Powder River support herbaceous and cottonwood riparian vegetation.

Inventory Rating: Low

Inventory Needs: This area has been minimally inventoried and requires additional description of natural communities and rare species.

Little Sheep Mountains, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Low – exotic species, poor grazing management.

Description:

This low elevation escarpment in eastern Montana supports examples of bluebunch wheatgrass grasslands on hillsides. Ravines support deciduous hardwood draws.

Inventory Rating: Low

Inventory Needs: Almost no information exists for this area. Extensive surveys are needed for natural communities and rare species.

Pine Ridge, MT

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – logging habitat conversion, exotic species, loss of fire regime.

Description:

The Pine Ridge rises 700-800 feet above the surrounding plains. This area supports extensive stands of low elevation coniferous forest/woodland.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

Powder River, MT/WY

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, hydrologic alteration.

Description:

In an inventory of all streams in the Great Plains of Wyoming, the Powder River was found to support the most intact assemblage of fish species. Notable among these is the sturgeon chub, a globally rare species. Preliminary surveys have identified the presence of significant cottonwood riparian communities along the Powder, perhaps the best in Wyoming.

Inventory Rating: Medium

Inventory Needs: Good fisheries information exists for Wyoming, additional inventory is needed for Montana. Very limited information is available regarding riparian communities.

Powder River Breaks, WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: Low (may be increasing) – oil and gas habitat conversion, exotic species, prairie dog control.

Description:

This area is comprised of rolling hills which trend to steep hills and deep draws feeding towards the Powder River. Big sage shrubland, western wheatgrass and needlegrass grasslands occur on gentle slopes, whereas bluebunch wheatgrass and little bluestem grasslands occur on steep slopes. The most rugged portions of this area support badlands natural communities that often have limited vegetative cover. Uplands provide habitat for Barr's milkvetch, a rare plant, and black-tailed prairie dog colonies.

Inventory Rating: Medium

Inventory Needs: Additional inventory is needed for natural communities.

Terry Badlands, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – prairie dog control, oil and gas habitat conversion, exotic species.

Site Description:

Badlands topography varying from broken to rolling. Uplands support the second largest area of black-tailed prairie dog colonies in Montana.

Inventory Rating: Medium

Inventory Needs: Additional natural community inventory is needed.

Thunder Basin/Cheyenne River, NE/SD/WY

Biodiversity Rating: Very High

Threat Urgency Rating - Threats: Medium – railroad construction (habitat fragmentation), oil and gas habitat conversion, prairie dog control.

Description:

One of the largest intact landscapes in the northern Great Plains, the Thunder Basin encompasses a heterogeneous mix of topography and substrates. Five major grassland types have been identified, including prairie sandreed, western wheatgrass, needlegrass, bluebunch wheatgrass, and little bluestem. The uplands also host the only example of birdsfoot sage shrubland in the ecoregion. Ponderosa pine woodlands are common on sandstone and scoria ridges. Primary target species within this area include mountain plover, swift fox, blacktailed prairie dog, Barr's milkvetch, and second bladderpod. Secondary species include sage grouse.

Inventory Rating: High

Inventory Needs:

Inventories have been completed for some of the rare species (mountain plover, Barr's milkvetch) and natural communities. Additional inventory is needed for natural communities.

Upper Antelope Creek, WY

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Low – oil and gas habitat conversion.

Description:

Rolling uplands of sedimentary rock surrounding Upper Antelope Creek. Uplands are generally sandy and support needlegrass and prairie sandreed grasslands. Herbaceous riparian communities are located along the creek.

Inventory Rating: Low

Inventory Needs: Natural communities and species.

West Black Thunder Creek, WY

Biodiversity Rating: Low

Threat Urgency Rating - Threats: Medium – Hydrologic alteration, railroad construction, strip mining.

Description:

Gently rolling to nearly level divide with flat lying sediments. This area contains numerous scattered playa wetlands formerly in matrix of western wheatgrass and big sage (much of this community has been converted to crested wheatgrass).

Inventory Rating: Medium

Inventory Needs: Wetlands have been relatively well sampled.

Wolf Mountains/Northern Cheyenne, MT/WY

Biodiversity Rating: High

Threat Urgency Rating - Threats: Medium – Strip mining, exotic species, poor grazing management.

Description:

An extensive landscape that includes the Wolf Mountains, surrounding foothills and plains, and breaks associated with the Tongue River. The Wolf Mountains are blanketed by low elevation coniferous forest/woodland (ponderosa pine forests and woodlands) with openings supporting Idaho fescue, bluebunch, and little bluestem grasslands. Ravines of the mountains and foothills support deciduous and mixed deciduous-coniferous wooded draws, while small streams give rise to shrub riparian natural communities. Surrounding plains are frequently covered by western wheatgrass grasslands. The plains also support black-tailed prairie dog colonies, which are utilized by burrowing owls. This area encompasses much of the Northern Cheyenne Reservation and a small portion of the Crow Reservation. It also includes most of the U.S. Forest Service Ashland District.

Inventory Rating: Low

Inventory Needs: The U.S. Forest Service Ashland District has been inventoried for rare plants and to a lesser extent natural communities. Additional inventory for natural communities and species is needed.

Yellowstone River (Pompey's River), MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: High – Residential development, exotic species, hydrologic alteration.

Description:

This area encompasses a segment of the Yellowstone River corridor. This area supports extensive cottonwood communities, which are utilized by breeding bald eagles. As with much of the Yellowstone River, this segment includes excellent examples of aquatic communities.

Inventory Rating: Medium

Inventory Needs: Bald eagle use is well documented, however, there is a need to better describe cottonwood communities and associated uplands. Additional aquatic information is also needed.

Yellow Water Triangle, MT

Biodiversity Rating: Medium

Threat Urgency Rating - Threats: Medium – agricultural conversion, exotic species, loss of fire regime.

Description:

Gently rolling plains blanketed by western wheatgrass and needlegrass grasslands.

Inventory Rating: Medium

Inventory Needs: Initial community inventory has been conducted, additional inventory for communities and species is needed.