
NORTHERN GREAT PLAINS NETWORK

INVENTORIES OF VASCULAR PLANTS AND VERTEBRATES



Black-tailed prairie dogs, Wind Cave National Park

**STUDY PLAN
FY2001-2004**

NATIONAL PARK SERVICE

April 1, 2002

FINAL

SIGNATURE PAGE

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Agate Fossil Beds National Monument

Date

Superintendent
Missouri National Recreational River

Date

Superintendent
Badlands National Park

Date

Superintendent
Mount Rushmore National Memorial

Date

Superintendent
Devils Tower National Monument

Date

Superintendent
Niobrara National Scenic River

Date

Superintendent
Fort Laramie National Historic Site

Date

Superintendent
Scotts Bluff National Monument

Date

Superintendent
Fort Union Trading Post National Historic Site

Date

Superintendent
Theodore Roosevelt National Park

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Jewel Cave National Monument

Date

Superintendent
Wind Cave National Park

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Knife River Indian Villages National Historic Site

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SECTION 1. INTRODUCTION AND BACKGROUND INFORMATION

The National Park Service's (NPS) enabling legislation directs the agency to “*conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations*” (16 U.S.C. 1). However, many park units lack the baseline ecological information necessary to make sound management decisions. As a result, the National Parks Omnibus Management Act of 1998 stated that the NPS “*shall undertake a program of inventory and monitoring of National Park System resources to establish baseline information and to provide information on long-term trends in the condition of the National Park System resources.*” Similarly, NPS policies direct the agency to “*define, assemble, and synthesize comprehensive baseline inventory data describing natural resources*” (National Park Service 2001:31).

This study plan describes in detail how the 13 parks in the Northern Great Plains (NGP) Network will conduct inventories of vertebrates and vascular plants on their lands. This plan adheres to NPS guidance for conducting biological inventories, including the guidance provided by the Washington Office (WASO) Inventory & Monitoring Program (National Park Service 1999, National Park Service 2001). This study plan is also consistent with the 1999 pre-proposal submitted by the Network. The tasks described in this plan will conclude by the end of fiscal year (FY) 2004.

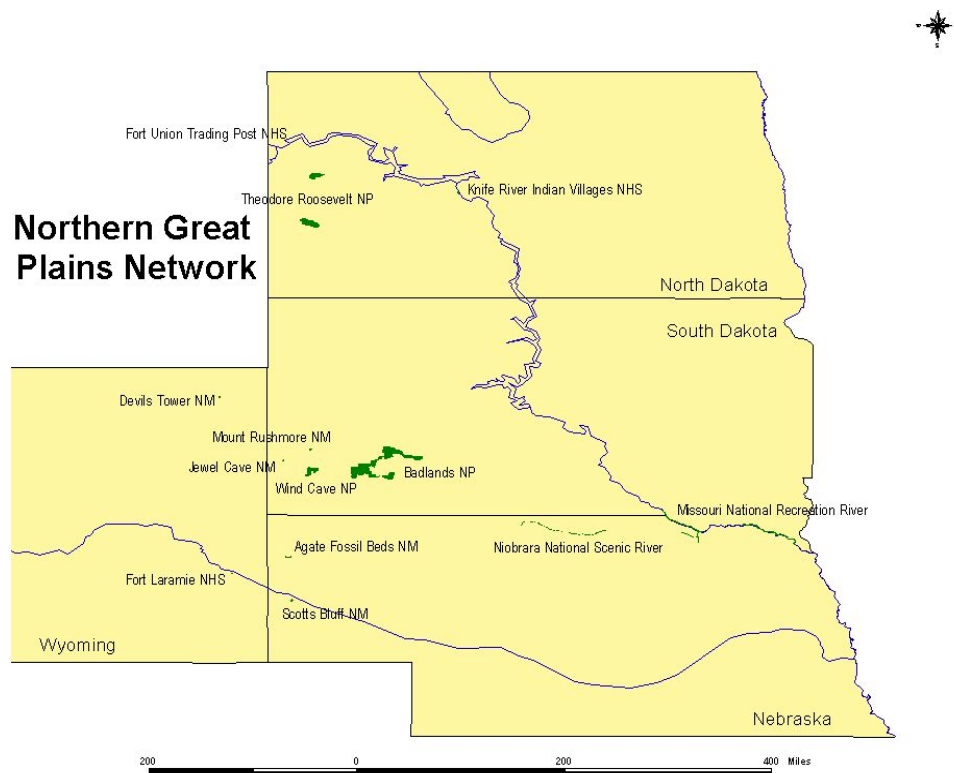


Figure 1. Map of the Northern Great Plains Network

Table 1. Sizes of parks in the Northern Great Plains Network

Parks	Acres	Hectares
Agate Fossil Beds National Monument (AGFO)	3,055	1,236
Badlands National Park (BADL)	244,300	98,868
Devils Tower National Monument (DETO)	1,360	550
Fort Laramie National Historic Site (FOLA)	833	336
Fort Union Trading Post National Historic Site (FOUS)	450	182
Jewel Cave National Monument (JECA)	1,355	548
Knife River Indian Villages National Historic Site (KNRI)	1,758	711
Missouri National Recreational River (MNRR)	33,839	13,695
Mount Rushmore National Memorial (MORU)	1,238	501
Niobrara National Scenic River (NIOB)	21,035	8,513
Scotts Bluff National Memorial (SCBL)	3,003	1,215
Theodore Roosevelt National Park (THRO)	70,446	28,509
Wind Cave National Park (WICA)	28,295	11,451

The primary objectives established by the WASO I&M Program for the vertebrate and vascular plant inventories (National Park Service 1999) are:

- To document through existing, verifiable data and targeted field investigations the occurrence of at least 90% of the species of vertebrates and vascular plants currently estimated to occur in the park
- To describe the distribution and relative abundance of species of special concern, such as threatened and endangered species, exotics and other species of special management interest occurring within park boundaries
- To provide baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resource issues

This study plan outlines the approach the NGP Network will take to meet these objectives. This study plan also summarizes the work completed to date, the agencies and personnel involved, the anticipated costs to conduct the necessary work, and other relevant issues.

OVERVIEW OF THE NORTHERN GREAT PLAINS NETWORK

The NGP Network encompasses North and South Dakota, the northern half of Nebraska, and eastern Wyoming. The region has a continental climate with hot summers and cold winters. Precipitation, which occurs in the form of rain and snow, is moderate and generally decreases from east to west. The sparsely populated rural landscape has experienced a decades-long loss of human population. Agriculture is the primary industry; mineral and oil development and tourism are important locally.

Most scholars and cartographers place the 13 parks in the NGP Network in three to five ecological biomes (Omernik 1985, Kuchler 1986, Bailey 1995). However, all the parks display characteristics of multiple biomes and/or ecosystems.

The Missouri National Recreational River occurs in the tallgrass biome, and is the easternmost park. Potential natural vegetation in the biome includes big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*). However, the park primarily occurs in

the Missouri River floodplain where the dominant natural vegetation is cottonwood (*Populus deltoides*) forest.

Further west, Badlands and Theodore Roosevelt National Parks (NP), Agate Fossil Beds and Scotts Bluff National Monuments (NM), Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites (NHS), and the Niobrara National Scenic River (NSR) occur in what is generally considered the mixed-grass or shortgrass biome. Species typically found in the region include wheatgrass (*Agropyron spp.*), grama (*Bouteloua spp.*) and buffalo grass (*Buchloe dactyloides*). Shrubs such as sagebrush (*Artemisia spp.*) and rabbit brush (*Ericameria nauseosa*) become increasingly common in the western part of the region. In addition to the upland habitats, Theodore Roosevelt NP, Scotts Bluff NM, Niobrara NSR, and Knife River Indian Villages and Fort Union Trading Post NHS all include significant floodplain areas where cottonwood and willow (*Salix spp.*) dominate. Niobrara NSR is well known for supporting a diversity of ecological communities representative of other biomes to the north, west, east, and south.

The remaining parks, Wind Cave NP, Mount Rushmore National Memorial (NMEM), and Jewel Cave and Devils Tower NM occur in the Black Hills biome. The Black Hills are a low mountain range (5,000-7,000ft.) that receive more precipitation than the surrounding plains and consequently support coniferous forests. White spruce (*Picea glauca*) is common at higher elevations while ponderosa pine (*Pinus ponderosa*) dominates the lower areas. Aspen (*Populus spp.*), ash (*Fraxinus spp.*), hackberry (*Celtis occidentalis*), elm (*Ulmus spp.*), and bur oak (*Quercus macrocarpa*) are found. Granite outcroppings and grassy openings often interrupt the forests.

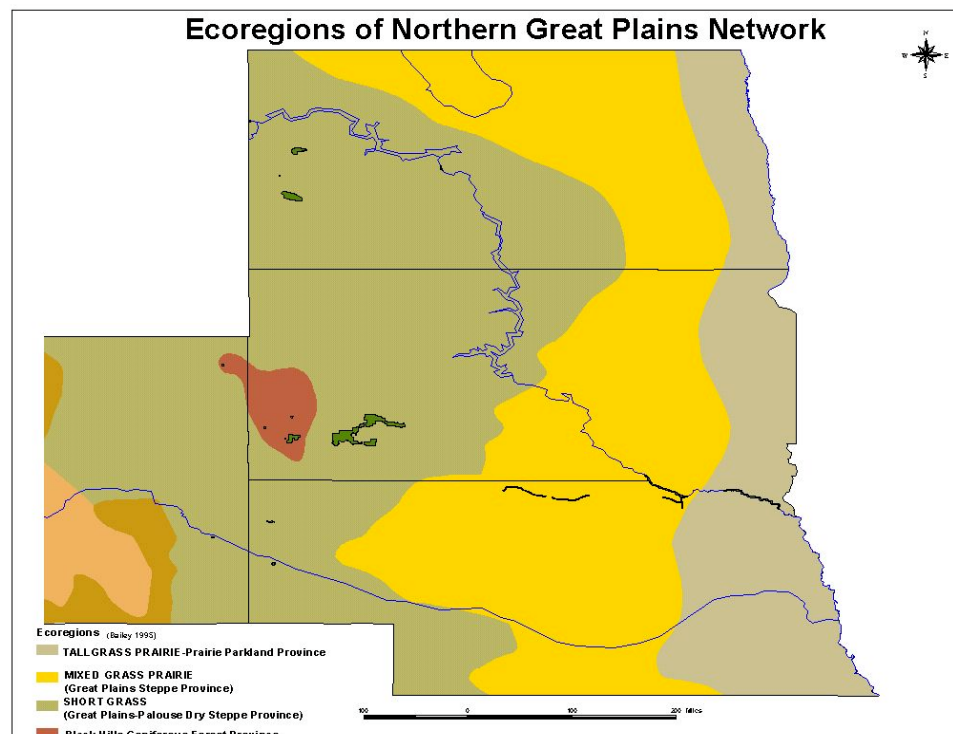


Figure 2. Ecoregions of the Northern Great Plains Network

PARK DESCRIPTION AND ISSUES

Agate Fossil Beds National Monument

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Located on the Niobrara River in northwestern Nebraska, the Agate Fossil Beds are preserved in the 3,055-acre Agate Fossil Beds National Monument (however, only 2,270 acres are federal fee land). The park was authorized in 1965. The fossil beds—once part of “Captain” James H. Cook’s Agate Springs Ranch—are an important source for 19.2 million year-old Miocene epoch mammal fossils. Cook’s ranch also became a gathering place for Chief Red Cloud and other Oglala Lakota (Sioux) Indian people. The Monument’s Cook Collection of American Indian artifacts reflects years of gifts brought by the Indians during visits to the ranch from the 1880’s through the early 1900’s.

DESCRIPTION OF NATURAL RESOURCES:

The Monument is dissected by the Niobrara River which creates a riparian corridor where bulrush (*Scirpus spp.*), broad-leaved cattail (*Typha latifolia*), and willow (*Salix spp.*) are common. Sparsely vegetated rocky bluffs line the north and south edges of the Monument. The remaining area between the bluffs and the river is dominated by mixed-grass prairie species such as grama grasses (*Bouteloua spp.*), needle-and-thread grass (*Hesperostipa comata*), low lupine (*Lupinus pusillus*), and prickly poppy (*Argemone polyanthemus*). Non-native plants such as smooth brome (*Bromus inermis*), tumbling mustard (*Sisymbrium altissimum*), and Russian thistle (*Salsola kali*) are also common.

The Monument supports a wide diversity of Northern Great Plains vertebrates. According to Graetz et al. (1995) there are at least 92 species of birds, 21 species of mammals, 16 species of reptiles, and 6 species of amphibians. The Monument occurs in an area of the Great Plains with high bird diversity, with the bird species richness at the Monument similar to larger NGP Network parks such as Badlands NP and Theodore Roosevelt NP (Powell 2000). The Monument also provides habitat for 10 fish species, including the Iowa darter and plains topminnow, both species of concern in Nebraska.

NATURAL RESOURCE GOALS AND OBJECTIVES:

A primary management goal of Agate Fossil Beds NM is to contribute to the conservation of biological diversity in northwest Nebraska. This may mean, in part, maintaining large portions of the prairie habitat in late successional seral stages since much of the surrounding lands are heavily grazed (Graetz et al. 1995).

NATURAL RESOURCE ISSUES:

The Monument expects to maintain large portions of the park in late successional seral stages; however, the park is also considering reintroducing bison to the property and implementing prescribed burns to mimic ecological processes and maintain the ecological integrity of the grassland. The spread of exotic plants is a top management issue for the Monument. Interpretation of rare plants and other biological resources is of particular interest at the Monument.

RARE COMMUNITIES OR ELEMENTS:

The Monument supports a western alkali meadow.

RARE SPECIES:

The Monument supports at least 12 plant species, one fish, one herp, and one mammal that are considered rare. No federally listed species are known to occur at the park on a regular basis.

POTENTIAL LOGISTICAL SUPPORT FOR THE I&M PROGRAM:

The Monument does not currently have natural resources staff; however, it intends to pursue base increases for natural resources staff in the near future. Housing is available at the Monument: depending on other commitments, it may be available to support I&M staff and activities. The Monument has a professional curator on staff that meets 36 CFR 79 standards.

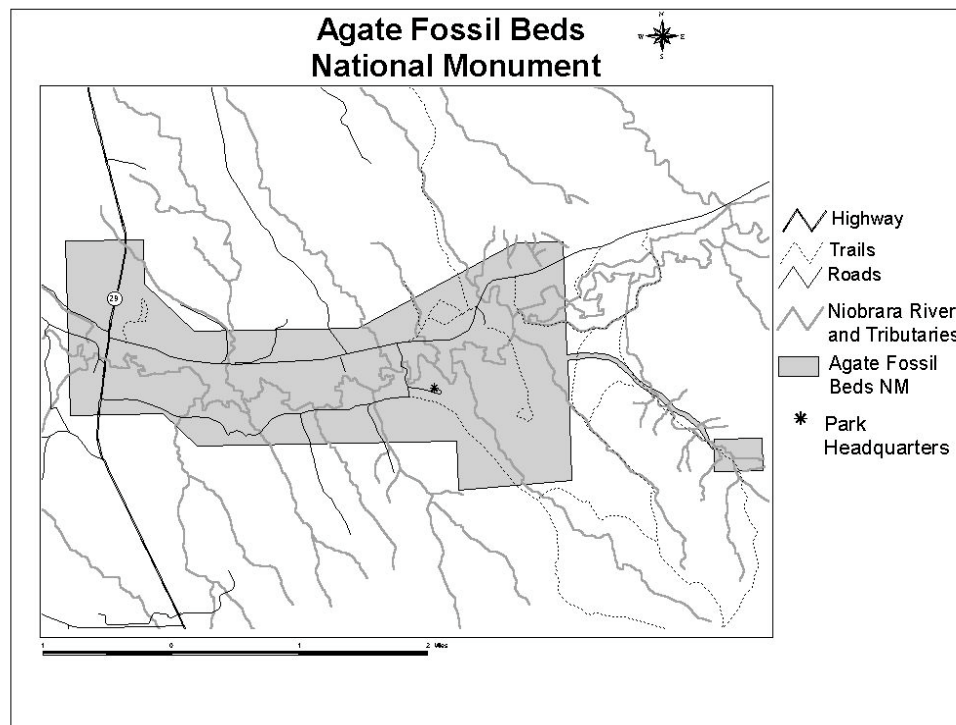


Figure 3. Map of Agate Fossil Beds National Monument

Badlands National Park

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Congress created Badlands National Monument in 1929 to preserve the scenic and scientific value of a portion of the White River Badlands for the benefit and enjoyment of the people. The badlands formation was formed by wind and water having eroded volcanic ash and sediment to create multi-banded, multi-colored needles, razor-thin ridges, and wrinkled slopes. These stark formations are largely devoid of vegetation and continue to change under the forces of erosion. These geological features and the paleontological resources found within were the original impetus for establishing the national monument. The original monument was 111,000 acres; a second South Unit of 133,000 acres of the Pine Ridge Indian Reservation was added in 1968, and intended to be managed in cooperation with the Oglala Sioux Tribe. In 1976 a 64,000

acre Wilderness Area was designated within the North Unit of the park. In 1978, Badlands National Monument became Badlands National Park. Today, the expansive mixed-grass prairie, which covers about 50% of the park, is recognized as an important and unique resource.

DESCRIPTION OF NATURAL RESOURCES:

Almost half of Badlands NP is comprised of badlands formations that are either sparsely vegetated or devoid of vegetation. Most of the remaining area is mixed-grass prairie and is dominated by species such as western wheat grass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), and little bluestem (*Schizachyrium scoparium*: Von Loh et al 1999). Woodlands and shrubs are found in riparian areas along the White River and smaller drainages. Numerous, unique vegetation communities occur in the Park that have a high potential for rare plant species.

Badlands NP includes many wildlife species associated with mixed-grass prairie habitat, including several species that are often missing in other areas. For example, bison were reintroduced in 1963 and bighorn sheep in 1964. The federally endangered black-footed ferret has recently been reintroduced into a large prairie dog complex that spans the Park and neighboring National Grasslands. Cattle grazing has been eliminated from the North Unit of the Park, but still continues in the South Unit.

NATURAL RESOURCE GOALS AND OBJECTIVES:

As part of strategic and General Management Plan planning efforts, Badlands National Park has developed “purpose” statements which essentially describe the goals of the park and the natural resource program. The purpose of the park is to:

- Protect the unique landforms and scenery of the White River Badlands for the benefit, education, and inspiration of the public
- Preserve, interpret, and provide for scientific research the paleontological and geological resources of the White River Badlands
- Preserve the flora, fauna, and natural processes of the mixed-grass prairie ecosystem
- Preserve the Badlands Wilderness Area and associated wilderness values
- Interpret the history of the Sioux Nation

The goals can be refined into more specific objectives for natural resources:

- Preserve and/or restore the native mixed-grass prairie plant communities through invasive non-native plant control, seeding with native seed, native ungulate grazing and wildland and prescribed fire.
- Restore bighorn sheep populations to levels sufficient for long-term viability.
- Restore black-footed ferrets to self-sustaining population as part of the Conata Basin/Badlands Recovery Area; restore prairie dog communities to pre-European levels and complexity.
- Manage the bison herd, within constraints of available habitat, in as close an approximation of a free-ranging herd as possible throughout all habitat in the park. Remove animals from the herd only when necessary, and in a manner that preserves genetic diversity, age classes, and appropriate sex ratio of the herd.
- Monitor, long-term, key indicators of ecosystem health; manage data and conduct analysis to provide a scientifically sound basis for management decisions.
- Conduct a comprehensive parkwide survey of significant fossil resources. Preserve in situ where appropriate, and salvage, preserve and curate in an appropriate storage facility where necessary.

- Manage Native Americans traditional uses of the South Unit to protect ecosystem integrity.

NATURAL RESOURCE ISSUES:

There are several natural resource issues at Badlands NP that are relevant to the I&M initiative. Preserving the mixed-grass prairie ecosystem in a state as close as possible to pre-Columbian conditions is a primary management goal.

Currently, non-native plants such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and yellow sweetclover (*Mellilotus officinalis*) are a particular problem in the North Unit. Controlling these species, and their impact on rare plants, is a high management priority. The park uses fire as a management tool to control exotic plants and to meet other management goals. The park also uses herbicides and biological control for some exotics.

The park is the only unit in the National Park System that supports the endangered black-footed ferret. The park has a ferret management program. The park supports thousands of acres of black-tailed prairie dogs and may attempt to increase the acreage in the future. The park is considering reintroducing swift fox in the near future. At present, the 500-700 bison are enclosed within only 60,000 acres of the park. Expanding the herd and re-establishing it to all suitable habitat in the park (including the South Unit) is a desired future condition. Removal of cattle from the South Unit (and replacing them with bison) is a long-term goal of the NPS. While the Oglala Sioux Tribe supports this in principal, it is not yet willing to give up grazing revenues. The park's bison herd is culled every few years to maintain the population at desired levels.

A large portion of the North Unit is designated Wilderness. Maintaining wilderness values is an important goal. Within the wilderness are water impoundments necessary to provide water for ungulate species that cannot leave the park to access natural water sources. The park maintains these impoundments by using explosives to de-silt them. Impacts of this activity are not known.

Controlling access to all units of the park, but particularly the South Unit and Sage Creek Wilderness, is a management issue.

RARE SPECIES:

The black-footed ferret has been reintroduced to the park. The park has an active ferret monitoring program. A small number of bighorn sheep exist in the park and an unknown number of mountain lions may occur. State-listed rare plants found at the park include Barr's milkvetch (*Astragalus barrii*), Dakota buckwheat (*Eriogonum visherii*), Easter daisy (*Townsendia exscapa*), largeflower townsend daisy (*Townsendia grandiflora*), and secund bladderpod (*Lesquerella arenosa* var *argillosa*).

POTENTIAL LOGISTICAL SUPPORT:

Horses and mules may be available on a limited basis to transport researchers to field sites. Housing is very limited in the park during summer months, but is generally available the rest of the year. Camping facilities are available year-round. The Park has several GPS units that may be available.

Devils Tower National Monument

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Devils Tower National Monument (1,347 acres) was established in 1906 as the nation's first national monument under the Antiquities Acts as "*a natural wonder and object of great scientific interest... to reserve, preserve, and protect the lofty isolated rock and surrounding reserved public lands as an object of historic and scientific interest for the public benefit.*" Devils Tower, a monolith made of igneous rock, commands attention due to many symmetrical joint columns. At 867 feet high, it is a dominant landmark in the Northern Great Plains. The Tower is sacred to many peoples. It figures prominently in the belief systems and narratives of Northern Plains Indians. The Tower is one of the premiere rock climbing areas in North America and boasts a colorful 100-year climbing history.

DESCRIPTION OF NATURAL RESOURCES:

Mountain and plains species meet at Devils Tower NM in the ecological mix distinctive of the Black Hills. The invasion of non-native plants and the loss of natural regeneration of cottonwoods (*Populus deltoides*) and willows (*Salix spp.*) along the Belle Fourche River are of concern to management.

NATURAL RESOURCE GOALS AND OBJECTIVES:

Management objectives at Devils Tower NM include:

- Restore and maintain the health and diversity of the Monument's natural systems
- Preserve archeological, historic, and ethnographic values
- Interpret the significant and varied themes of Devils Tower
- Balance educational, spiritual, and recreational uses of the Tower and its surrounding landscape to provide meaningful visitor experiences

NATURAL RESOURCE ISSUES:

Management issues at Devils Tower NM include the management of a prairie dog town. The colony has expanded into a campground and administrative area.

Fort Laramie National Historic Site

ENABLING LEGISLATION/HISTORICAL CONTEXT:

The Presidential proclamation creating Fort Laramie NHS states:

"Whereas The Historical Landmark Commission of Wyoming has donated to the U.S. in trust certain lands with the structures thereon comprising the abandoned Fort Laramie, for the purpose of improving, preserving and conducting such lands and structures as a public historical site; and Whereas the lands and structures are of great historic interest and constitute a historic landmark; and Whereas it appears that it would be in the public interest to preserve such lands and structures as a national monument, to be known as the Fort Laramie National Monument."

Congress changed the boundary and name in 1960 and again in 1978.

Fort Laramie NHS represents American westward expansion and Manifest Destiny from 1842-1890. The site played major roles in every facet of history in the Northern Great Plains. Major fur trading posts occurred at the site from 1834-1849. From 1849-1890, Fort Laramie was an important military fort on the western frontier and

played a vital role in the westward overland migrations of over 350,000 pioneer emigrants to Utah, Oregon, and California. Historic trails and routes that passed through Fort Laramie include the Oregon, California, and Mormon Trails, a Pony Express route, the transcontinental telegraph line, and the Cheyenne-Deadwood stage route. Indians, fur trappers, traders, soldiers, emigrants, and settlers all passed through Fort Laramie.

A number of High Plains Indian campaigns were launched or supported by troops from Fort Laramie during the Indian Wars. Two important Indian peace treaties, the Treaty of 1851 and the Treaty of 1868, were signed at the Fort.

NATURAL RESOURCE ISSUES:

The surrounding landscape is important to park management. Isolation, vast open spaces characteristic of the west, clear views of distant landscapes such as Laramie Peak, are all important in maintaining the integrity of the park and visitor experience. The lack of modern intrusions, a rural landscape, open space, low noise levels, and good air quality all help to define and interpret the environment experienced by Native Americans, fur trappers, traders, emigrants, and soldiers assigned to the isolated post. Specific management issues related to inventory and monitoring are the management of visual resources, determination of compatible uses, location of park facilities, and restoration of historic structures.

Fort Union Trading Post National Historic Site

ENABLING LEGISLATION/HISTORICAL CONTEXT:

The American Fur Company established Fort Union Trading Post in 1828. During its operation from 1828-1867, Fort Union employed up to 200 people who traded cloth, guns, and other goods to Native American tribes (primarily the Assiniboin) for bison robes. The post was the longest-operating post of the American Fur Company in the continental United States. In 1867, the U.S. Army bought the post and removed much of the building materials to construct Fort Buford, a few miles from Fort Union. Congress established Fort Union Trading Post National Historic Site in 1966. Local interest was instrumental in preserving the site. A large portion of the post has been reconstructed as it was in the 1850s.

DESCRIPTION OF NATURAL RESOURCES:

The 442-acre Fort Union Trading Post NHS is located in extreme northwest North Dakota. The park straddles the Missouri River just above its confluence with the Yellowstone. The land within the park boundaries is comprised of two distinct vegetative zones: the ancient floodplain on which the fort is located, and the active floodplain along the Missouri River (Fort Peck Dam in central Montana now regulates river flows). Thick stands of trees and shrubs interspersed with grassland and willow (*Salix spp.*) thickets occur in the active floodplain. Dominant species include cottonwood (*Populus deltoides*), ash (*Fraxinus spp.*), elm (*Ulmus spp.*), and sedge (*Carex spp.*; Willard 1980). The more upland area (i.e., the ancient floodplain) is generally a mixture of native and exotic grasses typical of the present mixed-grass prairie. Prior to NPS ownership, the area immediately surrounding the fort was farmed. It is presently being restored to native prairie vegetation. The Bodmer Overlook—a 40-acre parcel that overlooks the fort—is less disturbed and is primarily native vegetation. Dominant species at the overlook site include needle-and-thread

(*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), and prairie coneflower (*Ratibida* spp.: Willard 1980).

The mixture of woodland and prairie vegetation provides habitat for a variety of vertebrate species. Woodpeckers, raptors, owls, bats, and mice are likely inhabitants of the woodlands while meadowlarks, sparrows, ground squirrels, and deer use the upland prairie habitat.

NATURAL RESOURCE ISSUES:

Maintaining and re-creating the 1850s vistas and natural scenery of Fort Union Trading Post is a primary issue of management concern. A project is underway to restore the uplands, within practical limits, to the vegetation found in the mid-1800s. A prescribed fire program and exotic weed control program are elements of the restoration project. Contributing to the protection of Missouri River resources, such as the federally listed pallid sturgeon, is also of management concern at Fort Union Trading Post NHS.

POTENTIAL LOGISTICAL SUPPORT:

The park has a professional curator and collections storage facilities which can accommodate voucher specimens of vascular plants and vertebrates. The park may have housing or camping accommodations for researchers.

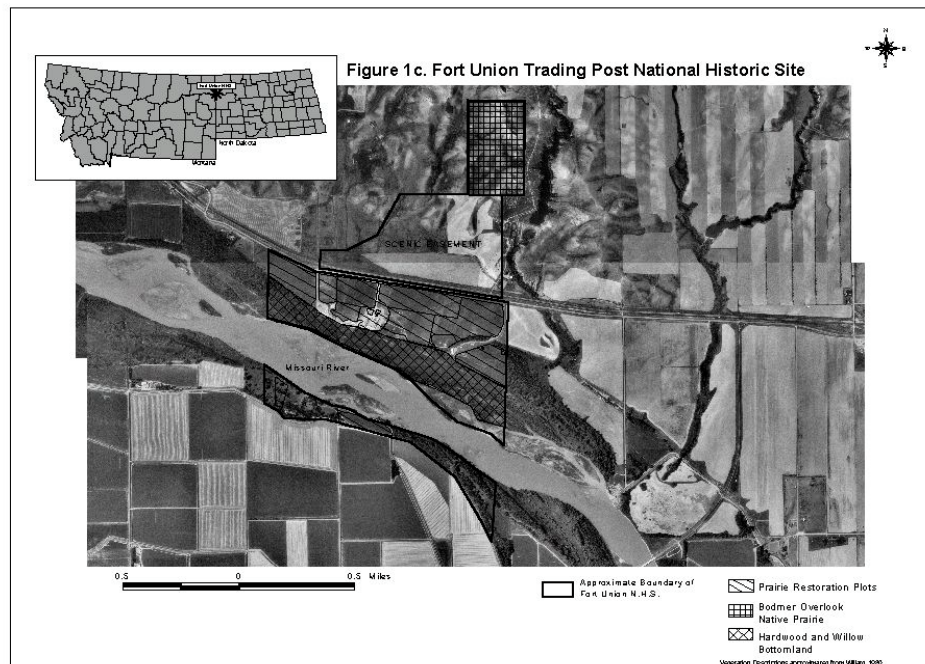


Figure 4. Map of Fort Union Trading Post National Historic Site

Jewel Cave National Monument

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Jewel Cave has been a tourist attraction since 1900, when the first claim on the mine was made. When the National Park Service acquired the land, the enabling legislation recognized the scientific value and public interest in the cave, as well as the need for adequately protecting the land surface above the cave.

DESCRIPTION OF NATURAL RESOURCES:

Jewel Cave lies in the southwestern portion of the Black Hills. When the uplift of the Black Hills occurred about 60 million years ago, a multitude of cracks and fissures were created in the underlying layers of limestone. When the water table subsequently rose and fell, water filled the cracks and dissolved the limestone creating the cavity known as Jewel Cave.

The uplands are largely dominated by Ponderosa pine (*Pinus ponderosa*) forest. However, recent vegetation mapping identified 13 distinctive vegetation types. In addition to six types dominated by Ponderosa pine, stands of boxelder (*Acer negundo*), aspen (*Populus tremuloides*), and chokecherry (*Prunus virginiana*) are found along drainage bottoms. Western snowberry (*Symphoricarpos occidentalis*) shrublands are also present. Herbaceous openings in the forest are dominated by western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), and thread-leaved sedge (*Carex spp.*). Despite the pervasiveness of ponderosa pine, the flora of Jewel Cave NM is relatively diverse due in part to microhabitats such as springs and seeps (Marriot 1985).

Of all of the wildlife at Jewel Cave NM the bats are the most well known. Nine species of bats use Jewel Cave at some point during the year. The cave is a hibernaculum for five species of *Myotis* and one species of *Corynorhinus*. Over 800 Townsend's big-eared bats hibernate in Jewel Cave each winter, making it the largest known colony of these bats in the western United States. This is particularly important since Townsend's big-eared bat is a species of concern in South Dakota. Over sixty species of birds have been documented at Jewel Cave during the breeding season, including the Cassin's finch, brown creeper, Lewis' woodpecker, and common poorwill, all rare species in South Dakota. Jewel Cave NM is the only park in the NGP Network that does not have any fish habitat.

NATURAL RESOURCE GOALS AND OBJECTIVES:

Management objectives for Jewel Cave NM are:

- To monitor, maintain, restore, and protect the natural systems and conditions that exist in the Monument
- To plan and manage surface resources and developments in order to maintain, restore, and protect natural systems and conditions within the Monument
- To work with the Black Hills National Forest and neighboring landowners to ensure that land uses adjacent to the Monument do not threaten portions of the cave system that extend beyond park boundaries
- To identify, document, and protect significant plant and wildlife resources within the Monument

NATURAL RESOURCE ISSUES:

Jewel Cave exists under about three square miles of surface area, but only two-thirds of this area lies within the boundaries of the Monument. This makes working with neighboring landowners and agencies extremely important. Approximately 80-90% of Jewel Cave NM burned during the Jasper Fire in 2000. Recovery of vegetation has occurred in some sites, but not others. Plans for future inventories need to consider this event. Feral cats have been a problem at the park, specifically at the entrance to the caves where they are suspected of taking bats.

Knife River Indian Villages National Historic Site

ENABLING LEGISLATION/HISTORICAL CONTEXT:

On October 26, 1974, Congress enacted Public Law 93-486 which established Knife River Indian Villages National Historic Site. Knife River Indian Villages NHS lies in central North Dakota. The park encompasses both sides of the Knife River at its confluence with the Missouri. The park is located on a reach of the Missouri River that is not inundated by a reservoir.

The history of land use in the vicinity of Knife River Indian Villages NHS begins 10,000 years ago with Native Americans who traversed the area while hunting and gathering. For nearly a millennium this area was a trading hub established by the earth-lodged Hidatsa and Mandan tribes. It was an important place where Native American culture and agriculture developed. After the smallpox epidemic in 1837 the Hidatsa and Mandan tribes abandoned their villages and moved approximately 60 miles up river.

During the second half of the 19th Century steamboats frequented the area and created "wood yards" on the Missouri River bottomlands. The largest of these yards occurred at the present day site of Knife River Indian Villages NHS. Permanent settlement of the area by European-Americans occurred in 1882 when the village of Stanton was established.

DESCRIPTION OF NATURAL RESOURCES:

The park consists of approximately 1700 acres of land in a narrow strip along both sides of the last three miles of the Knife River before its confluence with the Missouri. Two physiographic zones exist within the park. The first and lowest of these is the floodplain found immediately adjacent to the Knife and Missouri Rivers. Historically, the floodplain was scoured and inundated during spring runoff or large rainstorms. Today, the area is covered by established woodlands known as the Missouri River bottomlands. Dominant tree species include green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), American elm (*Ulmus americana*), and peach-leaved willow (*Salix amygdaloides*). In less disturbed areas native plants such as chokecherry (*Prunus virginiana*) and big bluestem (*Andropogon gerardii*) are found. The exotic smooth brome (*Bromus inermis*) dominates the understory in the heavily disturbed woodlands (Lenz 1993).

The second physiographic zone is the "terrace" (i.e., the older and higher floodplain). This zone is usually separated from the lower floodplain by a distinct scarp or edge. The terrace is a mosaic of native mixed-grass prairie, old agricultural fields, and restored prairie. The native prairie is dominated by grasses such as needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*) and green needlegrass (*Nassella viridula*). Smooth brome (*Bromus inermis*), alfalfa (*Medicago sativa*), and yellow sweetclover (*Melilotus officinalis*) are common in the old fields (Lenz 1993). The restored prairie sites were seeded with native grasses and forbs; however, control of weedy species is an issue at these sites.

Associated with these vegetative communities are many species of fauna. Larger birds and mammals rely on the wooded areas for winter cover and rearing young. For example, white-tailed deer, bald eagles, skunks, owls, raptors, wild turkeys, badgers, coyotes, and beaver are found in the wooded areas. Other species found in the park include weasels, sharp-tailed grouse, pheasant, waterfowl, raccoon, ground squirrels,

and rabbits. The river reaches within the park provide habitat for at least 26 species of mollusks and nine species of fish.

NATURAL RESOURCE ISSUES:

The long history of disturbance related to human activities has contributed to many of the natural resource issues at Knife River Indian Villages NHS. Invasion by non-native species is of particular concern. Leafy spurge (*Euphorbia esula*) is found scattered throughout the park, primarily in wooded areas. Smooth brome has completely dominated the understory in much of the woodland areas (Lenz 1993). In addition, heartrot fungus and Dutch elm disease have had a large impact on the trees of Knife River Indian Villages NHS (Lenz 1993). There is also concern over the lack of cottonwood (*Populus deltoides*) regeneration within the park. External influences on the park include energy development, the effects of upstream dams, and intensive agriculture.

POTENTIAL LOGISTICAL SUPPORT:

The park has a GPS receiver that may be available during inventory work. The park also has space to add some voucher specimens to their collections.

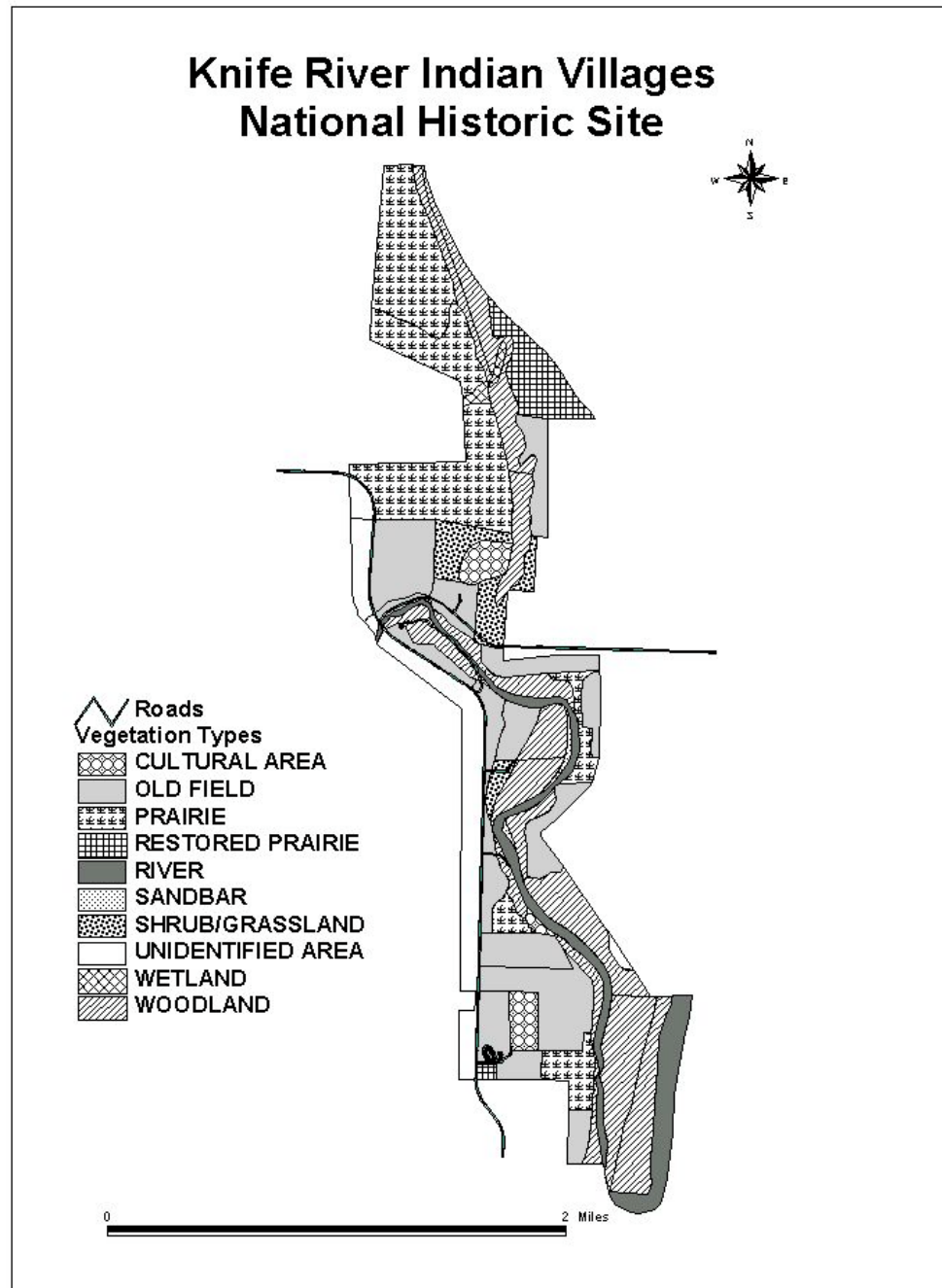


Figure 5. Map of Knife River Indian Villages National Historic Site

Missouri National Recreational River

DESCRIPTION OF NATURAL RESOURCES:

The Missouri National Recreational River comprises 33,389 acres consisting of two sections: a 59-mile eastern reach designated in 1978 and a 39-mile western section designated in 1991. The western section also includes 20 miles of the lower Niobrara River and 8 miles of Verdigre Creek. These areas were designated to preserve the free-flowing nature of these river sections and the wildlife dependent upon them. Less

than one-third of the Missouri is undammed and unchannelized; therefore, these sections are considered prime examples of the river in its natural state. Old growth cottonwoods (*Populus deltoides*) on the riverbanks and on numerous large islands provide nesting and roosting habitat for bald eagles and other raptors. Shifting sandbars provide essential nesting habitat for the federally listed piping plover and interior least tern. Wetlands and backwater chutes provide warm calm waters for the federally listed pallid sturgeon.

DESCRIPTION OF NATURAL RESOURCE ISSUES:

The park is unconventional in that it does not own property. The park achieves its mission and management goals by coordinating and collaborating with a myriad of federal, state, and local jurisdictions and private landowners.

A 60-acre island in the Missouri River known as Goat Island may be transferred to the park for administration and management (administration currently rests with the Bureau of Land Management). The forested island is well established. It appears that Lewis and Clark may have referenced the island in their journeys.

POTENTIAL LOGISTICAL SUPPORT:

The park has recently hired a GIS specialist who may be able to assist in inventorying and monitoring.

Mount Rushmore National Memorial

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Mount Rushmore NMEM memorializes the birth, growth, preservation, and development of the United States of America. In 1925, legislation was passed to authorize the carving of the southeastern face of Mount Rushmore as, "a memorial....commemorative of our national history and progress" (NPS 2000). Between 1927 and 1941, Gutzon Borglum and 400 workers sculpted the 60-foot busts of Presidents George Washington, Thomas Jefferson, Theodore Roosevelt, and Abraham Lincoln. In 1933, Mount Rushmore became part of the National Park Service. Nearly 2 million people visit the Memorial each year to view the granite sculpture. Also of interest is the Sculptor's Studio built under the direction of the artist, Gutzon Borglum, in 1939. Unique plaster models and tools related to the sculpting process are displayed there. In addition, the rugged terrain and ponderosa pine forest which surround the sculpture make a significant contribution to visitors' overall enjoyment of the Memorial.

DESCRIPTION OF NATURAL RESOURCES:

Mount Rushmore consists of 1,238 acres set in the central Black Hills in southwestern South Dakota. The topography is rugged and steep with rocky outcroppings. There are three drainages at the Memorial; Lafferty Gulch in the north central area, Starling Basin along the western and southern edges, and Grizzly Creek along the eastern side. Although most of the Memorial is dominated by ponderosa pine (*Pinus ponderosa*); paper birch (*Betula papyrifera*), beaked hazel (*Corylus cornuta*), and bur oak (*Quercus macrocarpa*) do occur. One of the most important natural resources at the Memorial is a stand of old-growth ponderosa pine in the Starling Basin that is estimated to be over 200 years old (Hoffman and Hansen 1986). Since much of the surrounding Black Hills National Forest has been logged, this old-growth stand is a unique and valuable resource.

Very little research has been done on the vertebrates of Mount Rushmore National Memorial. There have been Breeding Bird Surveys conducted by the U.S. Fish and Wildlife Service and the South Dakota Ornithologists' Union. These surveys indicate that over 50 species of breeding birds are found at the Memorial. The park has a population of introduced mountain goats. Future inventories may document many of the vertebrates typical of the Black Hills, including potentially rare species such as the Black Hills red belly snake, Clark's nutcracker, Townsend's big-eared bat, and the northern flying squirrel.

NATURAL RESOURCE GOALS AND OBJECTIVES:

Natural resource management goals at Mount Rushmore include the "protection, restoration or maintenance of ecosystems, rare plant and animal populations...relevant to the purpose and/or significance of the memorial" (NPS 2000). Developing protection and management strategies with neighboring landowners is also a high priority of the Memorial.

NATURAL RESOURCE ISSUES:

There are about 100 acres of land at the Memorial that were disturbed as the result of development activities. These acres are in need of native plant restoration. In addition, exotic plants have invaded almost 200 acres of the Memorial. Mapping the spread of these species and containing at least a portion of them is one of the natural resource management goals at the park. The park has a small population of mountain goats that are not native to the Black Hills. The impact that these animals are having on the high-elevation and less-accessible vegetation is unknown.

POTENTIAL LOGISTICAL SUPPORT:

Housing may be available during the off-season. There is a Black Hills National Forest campground just outside of the Memorial. Mount Rushmore has a full time curator with an interest in natural history collections. The Memorial currently houses the collections for Jewel Cave and Devils Tower NM. The Memorial may have additional space for a limited number of specimens.

Mount Rushmore National Memorial

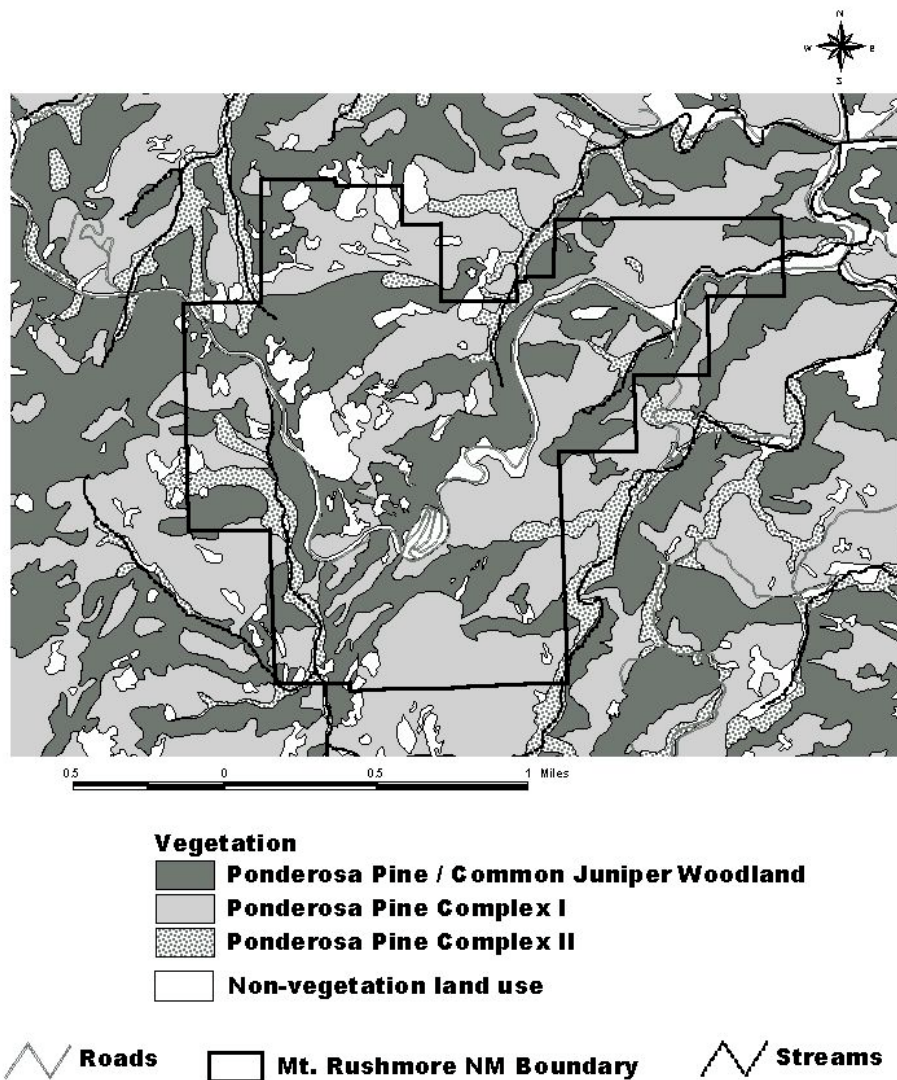


Figure 6. Map of Mount Rushmore National Memorial

Niobrara National Scenic River

ENABLING LEGISLATION/HISTORICAL CONTEXT:

The Niobrara National Scenic River was established in 1991 to preserve the natural free-flowing river, the unique association of plant communities, internationally significant paleontological resources, and the rural landscape of the valley.

DESCRIPTION OF NATURAL RESOURCES:

This 21,035-acre (76 mile long) portion of the Niobrara River Valley has many cliffs and spring-fed waterfalls, unusual in the Northern Great Plains. Relic populations of boreal forest species exploit the cool moist conditions. The river valley provides an unbroken east/west corridor connecting the dryer western landscape with the more humid eastern prairies and forests. Biological diversity is high due to this juxtaposition of ecosystems.

DESCRIPTION OF NATURAL RESOURCE ISSUES:

Because biological diversity is identified as one of the remarkable features of the Niobrara National Scenic River, any loss of species degrades not only integrity of the ecosystems, but also the value and purpose of the park. Of particular interest to management are the federally listed interior least tern, piping plover, and whooping crane that use the habitats protected in the park. The location of the park—at the edge of many species distributions—may make the park an important site for monitoring.

The park is unconventional in that it does not own property. The park achieves its mission and management goals by coordinating and collaborating with a myriad of federal, state, and local jurisdictions and private landowners.

Scotts Bluff National Monument

ENABLING LEGISLATION/HISTORICAL CONTEXT:

The 1919 Presidential Proclamation establishing Scotts Bluff National Monument identifies the significance of the site as being a landmark to immigrants and frontiersmen traveling the Overland Trail on their journey to the west. The enabling legislation also recognizes the unique geology of the bluff and surrounding terrain.

DESCRIPTION OF NATURAL RESOURCES:

The North Platte River runs along the northern border of the Monument. The riparian woodland habitat is dominated by cottonwood (*Populus deltoides*), boxelder (*Acer negundo*), willow (*Salix spp.*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*). Much of the Monument is covered with mixed-grass prairie comprised of needle-and-thread grass (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), prairie sandreed (*Calamovilfa longifolia*), and side-oats grama (*Bouteloua curtipendula*). Scotts Bluff, as well as the south bluff along the southern edge of the Monument, are dotted with ponderosa pine (*Pinus ponderosa*) and Rocky Mountain juniper (*Juniperus scopulorum*; Cox and Franklin 1989).

NATURAL RESOURCE GOALS AND OBJECTIVES:

The purpose of Scotts Bluff NM is to preserve the existing remains of the trail and trail experience, the natural resources including associated flora and fauna, the geology of the bluff including the fossils of the area, and the scenic views one has from the summit of Scotts Bluff.

NATURAL RESOURCE ISSUES:

The park has recently completed an Environmental Assessment on a proposed trail through the park that would connect the cities of Gering and Scotts Bluff. The trail may impact wetland and upland communities.

The small size of the park and its proximity to urban areas limits its ability to implement prescribed fire and to restore large grazing animals such as bison.

Theodore Roosevelt National Park

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Theodore Roosevelt National Memorial Park was established in 1947 as a memorial to its namesake, who made significant contributions to the conservation movement and the development of the West. The natural resources of the region played a significant role in shaping the life of Theodore Roosevelt, which consequently influenced his role as a conservationist while President of the United States. In 1978, Congress reestablished the park as Theodore Roosevelt National Park including the Theodore Roosevelt Wilderness.

DESCRIPTION OF NATURAL RESOURCES:

Lying in the Little Missouri Badlands of western North Dakota, the 70,446-acre park is divided into a North Unit (24,030 acres), a South Unit (46,200 acres), and a Elkhorn Unit (220 acres). There are 19,410 acres of wilderness in the North Unit and 10,510 acres in the South Unit. A central unifying feature of the park is the free-flowing Little Missouri River which winds its way through the South and North Units and forms the eastern boundary of the Elkhorn Unit. The highly eroded soils of the badlands ridges, slopes, and hills are sparsely vegetated. Areas where the soils are deeper, such as the plains and valleys, support mixed-grass prairie vegetation. Dominant grass species include blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), and needle-and-thread grass (*Hesperostipa comata*). Shrublands and woodlands, of both evergreen and deciduous trees, occur throughout the park in major drainages, draws, and hillsides, although they tend to be taller within the river floodplain. Rocky Mountain juniper (*Juniperus scopulorum*) is quite common on draws and hillsides, whereas cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), elm (*Ulmus americana*), silver sagebrush (*Artemisia cana*), chokecherry (*Prunus virginiana*), and aspen (*Populus tremuloides*) are more common along the Little Missouri River floodplain.

The fauna of Theodore Roosevelt NP is typical of the mixed-grass prairie ecosystem. The black-tailed prairie dog, a candidate species under the Endangered Species Act, is abundant at the park. The Park also has a full complement of prairie ungulates including bison, elk, white-tailed and mule deer, bighorn sheep, and pronghorn, as well as a herd of wild horses. Amphibian diversity is limited somewhat by a lack of water; however, species are found near the Little Missouri River and the natural springs during the summer months. Several species of fish inhabit the Little Missouri River, with plains minnows and white suckers particularly common. The U.S. Fish and Wildlife Service is trying to restore the sturgeon chub, another candidate species, to the river.

NATURAL RESOURCE GOALS AND OBJECTIVES:

Theodore Roosevelt NP is managed to protect and interpret the badlands ecosystem surrounding the Little Missouri River and the cultural resources associated with human habitation of the area. Of primary importance are maintenance and restoration of the natural environment, and protection and interpretation of human history with special emphasis on Theodore Roosevelt. The goal of resource management in the park is to restore and/or maintain to the extent feasible, the

cultural, physical, and biological resources and processes which interact to form the park's ecosystem.

NATURAL RESOURCE ISSUES:

Management issues of particular concern include degradation of park resources due to exotic species such as leafy spurge (*Euphorbia esula*) and Canada thistle (*Cirsium arvense*). Issues related to significant oil drilling around the Park, and water and air pollution are also of concern.

The Park will soon be preparing a wildlife management plan that will identify management objectives and needs for bison, elk, mule and white-tailed deer, bighorn sheep, pronghorn, horses, and other wildlife. Horses are not native to the park but are viewed by some as a cultural resource. The Park currently supports about 850 acres of black-tailed prairie dogs, a federal candidate species.

POTENTIAL LOGISTICAL SUPPORT:

The Park may have vehicles available for researchers depending on the needs and time of year. There is a full time GIS specialist at the Park with a map plotter and several GPS units. There may be limited accommodations during the winter in Park housing. The park has an assortment of wildlife equipment which may be of use to the I&M Program, such as automated photography systems for monitoring wildlife.

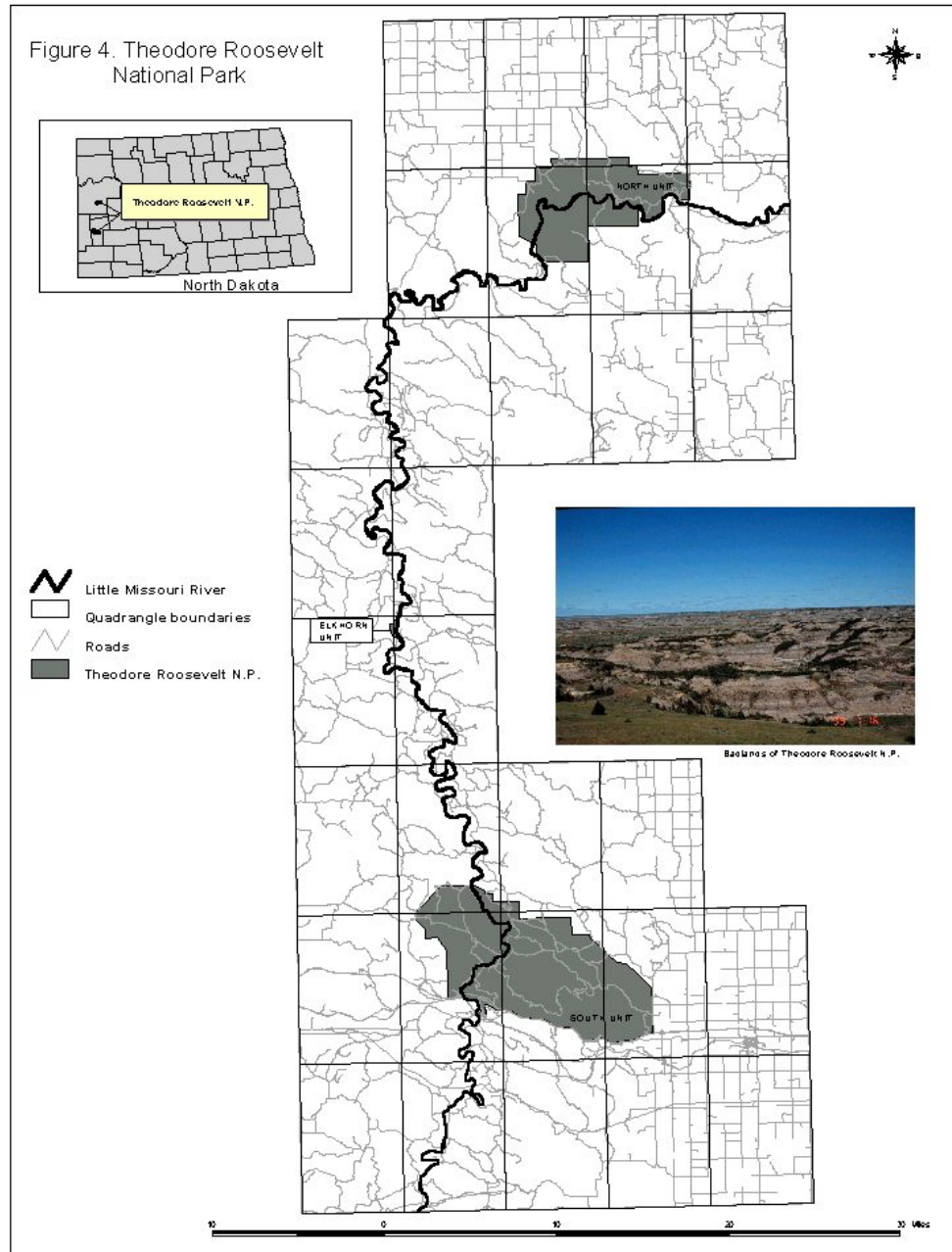


Figure 7. Location of Theodore Roosevelt National Park

Wind Cave National Park

ENABLING LEGISLATION/HISTORICAL CONTEXT:

Wind Cave National Park was established in 1903 to preserve and protect the cave, the first National Park to be established for such a purpose. Wind Cave is one of the largest and most complex caves in the world and is known for its “boxwork,” a unique cave formation. In 1912, the Wind Cave National Game Preserve was established on a portion of Wind Cave NP and adjoining lands. Bison, elk, and pronghorn were shipped to the preserve. The Preserve ultimately became part of Wind Cave NP and under the management of the Park’s natural resource program. Since 1903, Wind Cave NP has grown from its original size of 10,532 acres to its present size of 28,295 acres.

DESCRIPTION OF NATURAL RESOURCES:

The vegetation of Wind Cave is a mixture of woodlands, shrublands, and mixed-grass prairie vegetation. Ponderosa pine (*Pinus ponderosa*) covers approximately 30% of the park and generally occurs at higher elevations. Drainages may have mixes of hardwoods and shrubs such as boxelder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), elm (*Ulmus americana*), and mountain mahogany (*Cercocarpus montanus*). From west to east across the park the vegetation changes from primarily woodlands to mixed-grass prairie (Cogan *et al.* 1999). Common mixed-grass prairie species include western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), green needlegrass (*Nassella viridula*), and side-oats grama (*Bouteloua curtipendula*). Twenty-eight vegetation types have been identified at the park (USGS/BRD).

Wind Cave NP is managed to create an environment that resembles pre-European settlement. Many of the wildlife components of the mixed-grass prairie ecosystem occur at the park. These include large ungulates such as bison, elk, and deer. The black-tailed prairie dog—a keystone prairie species—is common. Predators, such as coyotes, bobcats, skunks, and rattlesnakes—which were part of a historical eradication program—are present and recognized as valuable components of the ecosystem. There are over 100 species of birds that nest at Wind Cave NP, as well as several fish species and nearly 20 species of amphibians and reptiles.

NATURAL RESOURCE GOALS AND OBJECTIVES:

Wind Cave NP has many resource management objectives that it incorporates into its daily operations. The following objectives are relevant to the inventory and monitoring effort:

- To preserve the surface and subsurface resources and protect them from threats originating within and outside the park boundary, and to increase public awareness of natural systems and to conduct and encourage scientific study
- Preserve the surface resources (vegetation, wildlife, geological, and paleontological resources) that are representative of the prairie and Black Hills environment
- To maintain healthy plant and animal populations; to maintain wildlife populations at a level that is in harmony with the maintenance of natural communities and to use management-ignited prescribed fire as a tool to perpetuate native plant and animal species and communities

DESCRIPTION OF NATURAL RESOURCE ISSUES:

The Park has an active fire management program. Bison are culled annually for purposes of reducing grazing pressure. The pronghorn population has declined dramatically from past levels with the cause of the decline unknown. The Park may soon begin managing for an increase in prairie dog acreage, partly in hopes of reintroducing black-footed ferrets.

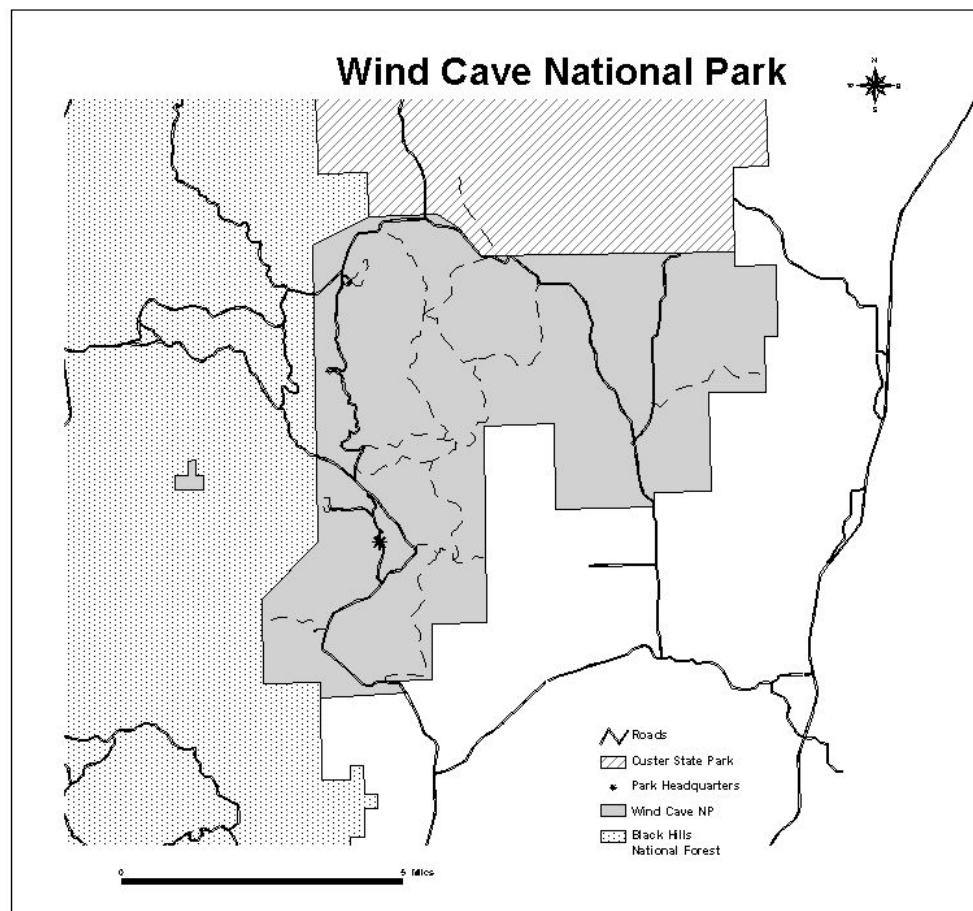


Figure 8. Map of Wind Cave National Park

SECTION 2. PREVIOUS INVENTORIES AND CURRENT STATUS

In 1999, the Northern Great Plains Network submitted a pre-proposal to begin work associated with the inventory phase of the I&M Program. The pre-proposal was approved for funding. This study plan builds on and refines the information and tasks identified in that pre-proposal.

A scoping workshop was held in Rapid City, South Dakota, in April of 2000. The Network invited numerous subject-matter experts to assist in: evaluating the quality and completeness of existing inventories and information, identifying additional needs and priorities, and, selecting methods to accomplish the needs. The input of the subject-matter experts is captured in the following park-specific discussions.

On November 2, 2000, the NGP Network received from the NPS Servicewide I&M Program Manager via memorandum a critique of progress to date, and suggestions and recommendations for the future. The NGP Network used that information to better refine the inventory study plan and the direction of the program.

In May of 2001, a Network-wide meeting was held in Rapid City, South Dakota. In addition to discussing the completeness of existing inventories, the Network also discussed and ranked inventory needs of direct importance to the parks. Park representatives at the meeting used a quantitative approach to identify high priority inventory needs consistent with the second and third objectives of the I&M Program.

Since approval of the pre-proposal, the Network has made great progress in populating the Inventory & Monitoring Dataset Catalog, NPSpecies, and NPBib (formerly NRBib). This work is described in more detail below. This work will continue for the duration of the inventory phase of the I&M Program.

DATA MINING

The NGP Network identified data mining as a high priority. Reports, data, and other information from park files have been compiled and, when appropriate, entered into national databases. For example, as of September 2001, over 5,700 records from the NGP Network have been entered into NPSpecies. The Network has expanded its data mining efforts beyond just park-housed information by conducting Internet searches, coordinating with subject-matter experts in addition to those at the April 2000 scoping meeting, contacting other agencies and organizations (see Appendix D), and conducting via contract a comprehensive review of published literature.

The results of this data mining have been extremely successful. For example, several studies were found of Missouri River fish that are relevant to three of the Network parks. The studies were conducted by the U.S. Geological Survey, Montana State Game and Fish Department, North Dakota Game and Fish Department, and the Nebraska Game, Fish and Parks. Several new studies were also found for birds. Both the South Dakota and Nebraska Breeding Bird Atlas projects provided enough information on species occurrences from their databases to complete or nearly complete bird inventories for the Missouri National Recreational River, the Niobrara NSR, and Mount Rushmore NMEM.

The data mining effort has also produced secondary benefits. For example, contacts were made that could lead to future collaboration with the Black Hills National Forest and the South Dakota Natural Heritage Program (see Appendix D).

The NGP Network will continue to mine for additional information relevant to the three inventory objectives of the I&M Program. This effort will intensify with the hiring of a data technician in FY02. In addition, in the fall of 2001, the Network entered into an agreement with the University of Nebraska to conduct a thorough search of museums that may house voucher specimens from Network parks. The objectives of the effort are to: 1) verify that specimens collected from NGP Network parks are indeed present at the institutions as reported, and that they are properly identified, catalogued, and cared for, 2) search the institutions for specimens that came from Network parks, but are not documented as such, and, 3) enter the newly found data into the NPSpecies database. The terms of the agreement require site visits to institutions by taxa experts. The project will conclude at the end of FY03.

SUMMARY OF EXISTING INFORMATION BY TAXA

In April 2000, the subject-matter experts attending the scoping session gave a preliminary assessment of the completeness of past inventory efforts for each taxon at each park. Since then, the NGP Network has greatly refined its understanding of inventory completeness, especially in regards to the first objective of the I&M Program (i.e., document 90% of expected species at a park). This section describes in detail the status of vertebrate and vascular plant inventories in the NGP Network, specifically in regards to documenting the presence of 90% of the species expected to occur at the parks.

A prerequisite for assessing the completeness of past inventory efforts is to have some sense of what a "documented" species is and what an "expected" species is. The NGP Network primarily used the input of the subject-matter experts to determine "documented" species. The experts were asked to make a determination on past inventory efforts and whether the investigators/authors were competent and qualified to identify species. The subject-matter experts were also asked to assess the currentness of the report in light of their knowledge of changing habitats, species distributions, changes in taxonomy, etc.. No vertebrate publications older pre-dating 1975 were used in determining documented species. A small number of plant reports and plant specimens in herbariums were used to document plant occurrences. Most species were documented within the past 20 years.

The NGP Network defined "expected" species as those that are likely to occur at a park. Expected species are those where a researcher would reasonably anticipate finding the species in a thorough search. In other words, species were considered to be expected if "the species was likely to be found if we spent all of the inventory money on that taxon in that park." For birds, only species that were likely present during the breeding season were included in the expected list. This definition reduced the number of species in the expected list from what would be developed by simply using existing range maps, habitat descriptions, or historical information. Although it is possible that some species not included in the expected list may be detected in the future, they are not expected to occur on a regular basis. In addition, new information may result in modifications to the expected list, although these revisions should be minimal.

Various methods were used to develop lists of species that are expected to occur in the parks in the Network. Generally speaking, expected lists for vertebrates were developed

by reviewing existing inventories and published literature. A subject-matter expert then reviewed each list. For some parks, expected lists for plants were developed via contract with a qualified botanist. For other parks, state Natural Heritage Databases were used. For still other parks, a list of expected plant species was derived from an exhaustive plant inventory on nearby lands.

Table 2. Primary sources for lists of species expected in parks

Parks	Plants	Birds	Fish	Herps	Mammals
AGFO	Bennett 1995	Dinan	Stasiak	Ballinger	Genoways
BADL	Reed 2001	Peterson	Berry	Smith	Backlund
DETO	WNHP 2000	Peterson	Patton et al. 1998	Smith	Genoways
FOLA	WNHP 2000	Armstrong & Adams 1988	Chipps	Ballinger	Genoways
FOUS	Reed 2001	Stewart 1975	Rychman	Newman	Genoways
JECA	Reed 2001	Peterson	N/A	Smith	Backlund
KNRI	Reed 2001	Moore et al. 1989	Rychman	Newman	Genoways
MNRR	NNHP 2001	Johnsgard 2000	Stasiak	Ballinger	Genoways
MORU	Reed 2001	Peterson	Erickson 2000	Smith	Backlund
NIOB	Behrens	Dinan	Stasiak	Ballinger	Genoways
SCBL	Bennett 1995	Powell	Stasiak	Ballinger	Genoways
THRO	Reed 2001	Lueders	Rychman	Newman	Genoways
WICA	Reed 2001	Peterson	Erickson 2000	Smith	Backlund

* For dated sources see the Reference section. Undated sources are subject-matter experts; see Section 5. Citing a subject-matter expert does not imply they approved the final expected species list, but merely that they contributed to development of the list. WNHP = Wyoming Natural Heritage Program. NNHP = Nebraska Natural Heritage Program. N/A = not applicable, i.e., no expected list was developed.

For the NGP Network as a whole, plants are the most thoroughly inventoried taxon, although several parks are in need of field inventories. In addition to the plant inventories identified in this study plan, the Missouri National Recreational River may need an inventory, depending on the results of a 2001 inventory being conducted at a Nebraska State Park within the MNRR boundary. It's worth noting that the inventory for the Niobrara National Scenic River did not occur on land owned by the federal government, but rather, on The Nature Conservancy land within the administrative boundary of the park (since the park does not own land this is also true for the other taxa). Both Agate Fossil Beds and Scotts Bluff National Monuments are part of the Prairie Cluster Long-term Ecological Monitoring Program and therefore have ongoing field work. Because of the intensive monitoring effort at these two parks, they are both considered 100% inventoried for plants.

Plants

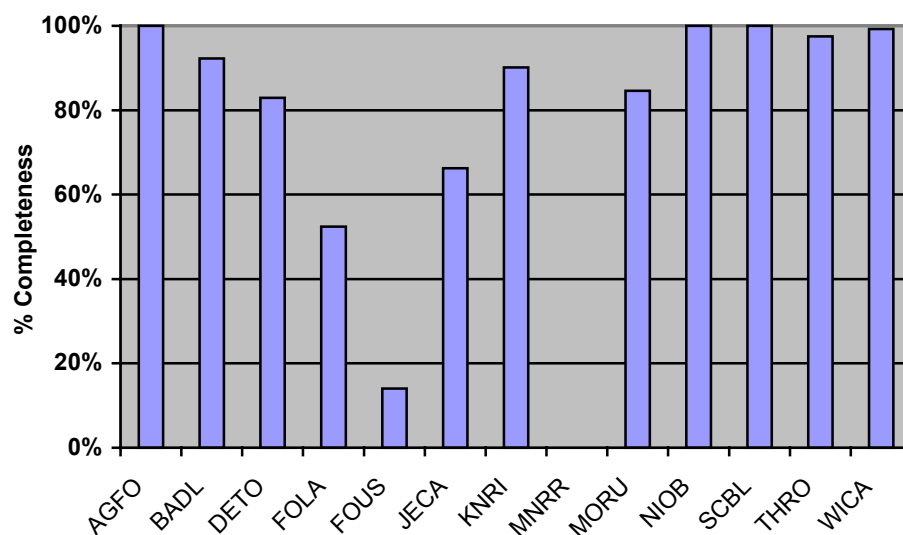


Figure 9. Completeness of plant inventories in the Northern Great Plains Network

Birds are well inventoried at several NGP Network parks. They are the best inventoried of the vertebrate taxa.

Birds

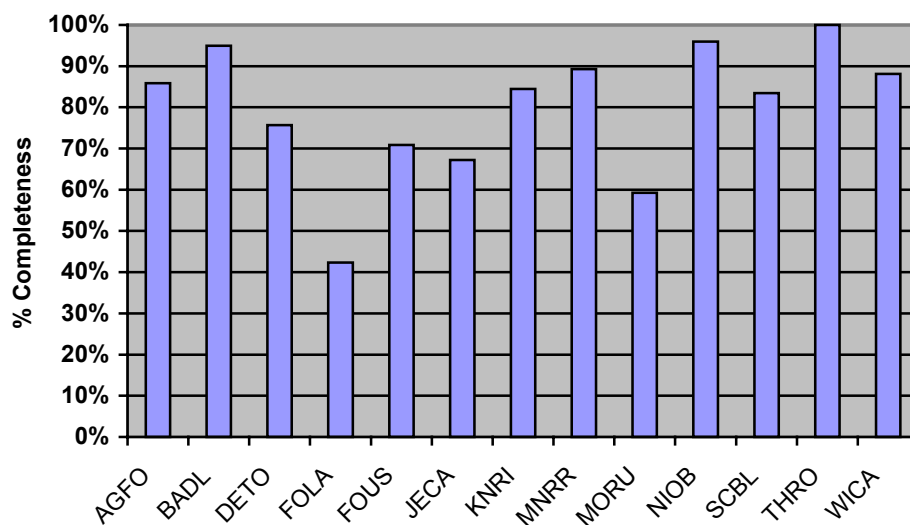


Figure 10. Completeness of bird inventories in the Northern Great Plains Network

The Network has few fish resources and issues compared to many other Networks. The field inventories conducted in 2001, and further refinement of the expected species list for Badlands NP, should result in all parks meeting the 90% objective. Badlands NP anticipates receiving a final report of fish inventories in the fall of 2001; although the final report will not add any more documented species, it should allow for the reduction of the expected species list.

Fish

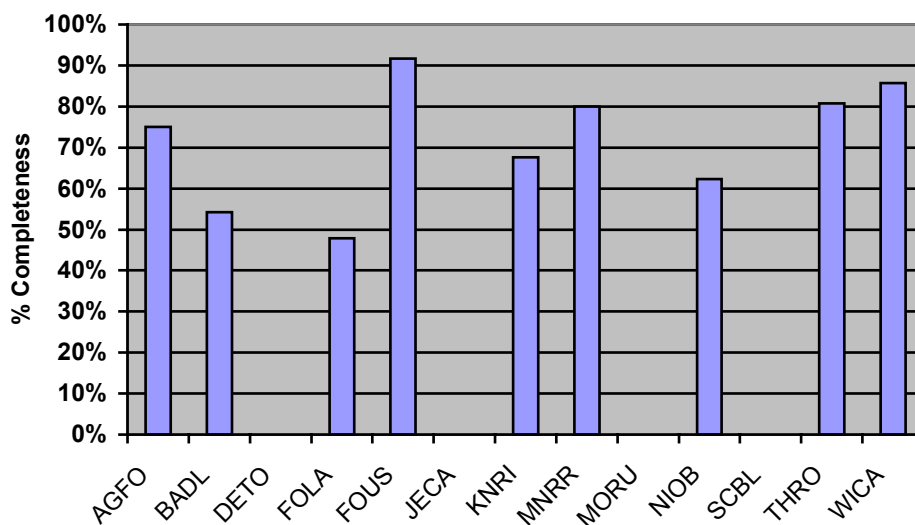


Figure 11. Completeness of fish inventories in the Northern Great Plains Network (excluding 2001 inventories)

Herps are the most under surveyed taxon in the NGP Network. However, the addition of a few species could significantly change the percentage of species documented.

Herps

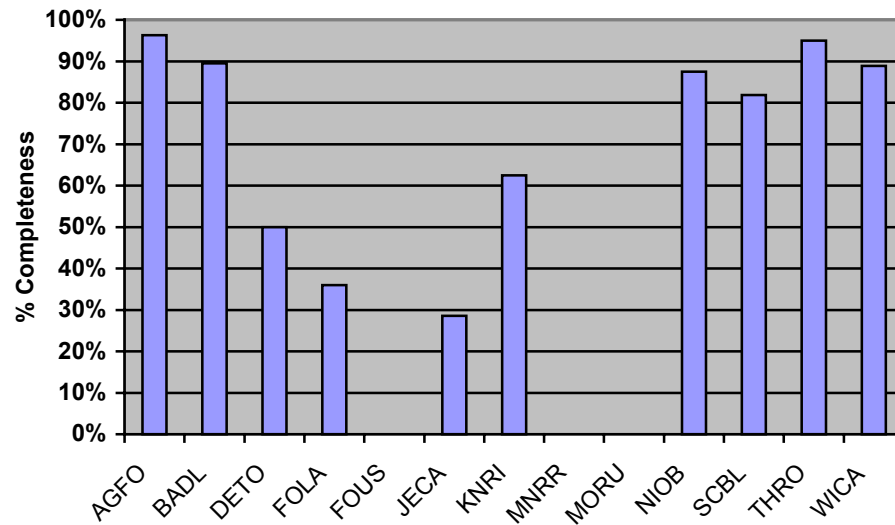


Figure 12. Completeness of herp inventories in the Northern Great Plains Network

Mammals are well inventoried in some parks and not inventoried in others. Generally speaking, bats and small mammals are under-inventoried. Some large mammals (e.g., mountain lion) may occasionally traverse some of the small parks, but they do not meet the definition of an "expected" species and therefore are not on the lists for several parks.

Mammals

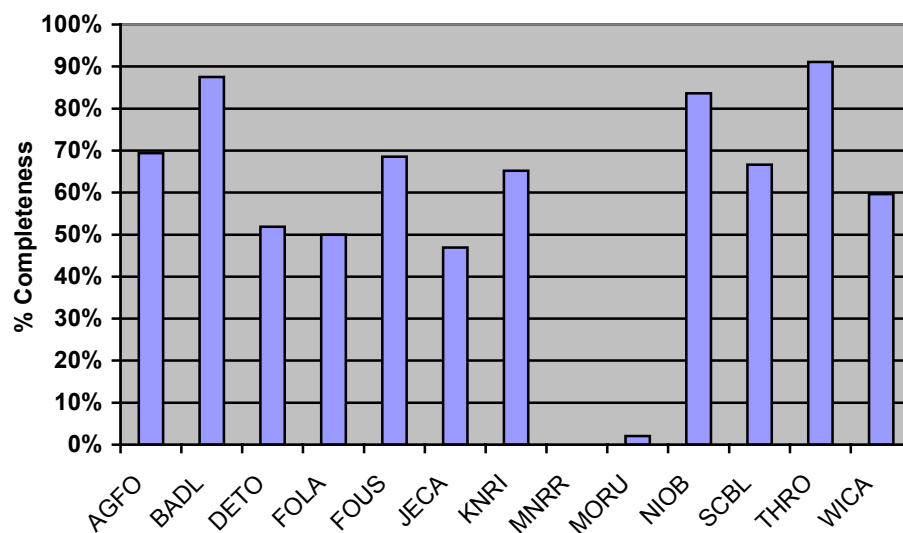


Figure 13. Completeness of mammal inventories in the Northern Great Plains Network

DATA MANAGEMENT

Data management is a priority for the NGP Network. This had been demonstrated by the network's progress toward data mining and transferring most existing inventory data into NPSpecies, NRBib (i.e., NPBib), and other national databases. A term data management position is currently being advertised.

WASO I&M has focused much effort on developing tools to archive and manage data (e.g., NPSpecies, Dataset Catalog, Theme Viewer) at the national level. Additionally, excellent data management guidance regarding collection, handling, and validation is contained in the NPS data management protocols. The NGP Network data management system will use these resources to assist in the collection and handling of inventory data. Further, by focusing on collection and handling, the work of the NGP Network may contribute to the larger data management efforts by supplementing existing information and tools.

Microsoft Access has and will be used to develop relational databases and user interfaces. A centralized Access database will incorporate one shared set of tables used to identify site, event, and taxon that are linked to individual data sets. For organizational purposes, standardized site, event, and taxon codes will be applied consistently from the field data sheet through the summary report. Tabular data will be associated with related protocols and reports using the NRBib identification number. The structure of the database will allow data summaries at the site, park, and network level. Information will also be available for regional and national summaries as needed. A relational database structure will also ensure data integrity. Table definitions will include a description of each field. Standard forms will be developed for use and drop-down menu format will be incorporated in the structure to allow easy input of data to the various databases, and to prevent transcription errors. Key elements of the data management system include: 1) standardized data fields to promote relatedness among data; 2) data verification and validation requirements including minimum accuracy standards for contracts; 3) a database design that utilizes table relationships to maintain referential integrity between data and metadata; 4) a system design that encourages data exploration through inter-relating data through time, space, and taxa; and 5) a long-term data archival strategy. Principle investigators of the field inventories will be responsible for delivering raw data in MS Access format.

The creation and maintenance of metadata is a critical element to the success of the biological inventory project. Metadata are used to provide documentation for data products, by answering questions about who, what, when, why, and how the data were created and about the process. Additionally, metadata help publicize and support the data that will be collected, compiled, and distributed. The NGP Network will require investigators to assist in the development of these metadata by documenting the standard operating procedures used during the course of the study. Documentation should describe step-by-step the procedure used for data collection, including any modifications or adjustments made to accommodate field conditions, the precision of instruments, etc.. To facilitate complete data collection, standardized data forms that cue investigators to record pertinent data in an appropriate sequence will be developed. Where appropriate, the Access databases will include standard "report" formats for printing field forms, complete with sample site coordinates and attributes.

Each project will identify the type of metadata required from each principal contractor. In addition to documentation of standard operating procedures, metadata requirements include whom, where, when and the methods employed. Furthermore, metadata should

include ancillary information about weather conditions, vegetation phenology, unique situations (e.g., illness, injury, equipment trouble), verification and validation results, data edit log, etc.. Metadata are critical to verifying the accuracy of the data and must be intrinsically secured to the data itself. Data and metadata will be linked using database management tools (e.g., key fields, join types, and referential integrity).

Appropriate archiving and dissemination of the data is the final step toward ensuring accessibility to the data and maintaining data quality. All inventory data and reports will be incorporated into the national NPS databases (e.g., NPSpecies, NPBib, Dataset Catalog) by either the Network Coordinator or the Network Data Technician (or under their supervision and oversight). The Dataset Catalog, available from WASO, contains metadata about datasets available. Only GIS layers are currently entered in the Dataset Catalog, but as information about other datasets from the various NGP Network parks becomes available, it will be added. This catalog will be brought up to date over the next few years as more information can be identified, verified, and compiled. Original field data sheets will be stored in the NGP Network office, with a copy stored at the park. Copies of digital data, metadata, reports, and summaries will be distributed to the parks and Regional I&M Coordinator. Final reports will be distributed to relevant parks, the Network Coordinator, the Regional I&M Coordinator, and the WASO I&M Program Manager.

Lastly, the NGP Network anticipates working closely with other federal agencies, specifically, the U.S. Forest Service. The Network will to the extent practicable assure that data collected can be integrated with Forest Service databases (e.g., FAUNA).

GIS AND SPATIAL DATA

Geographic Information Systems (GIS) will be used in the NGP Network I&M Program to support study design, data analysis, interpretation, and decision making. In many ways, data mining for GIS information is as important as data mining for species presence. GIS can effectively support the I&M Program by transforming data (independent records and measures) into information (the meaning of data, including contextual and spatial relationships derived from analysis and/or mapping). GIS does not stand alone, but rather is an integrated tool for NPS operations. The NPS Strategic Plan requires that *“management decisions about resources and visitors are based on adequate scholarly and scientific information”* and that acquiring outstanding data sets is necessary. These data sets can only be properly applied through the use of an adequately maintained and integrated GIS system that is available to and supported by the parks and I&M Program. The following text identifies the GIS program development needed to satisfy and support the NGP Network.

From the perspective of individual park operations, the current decentralized nature of GIS development and use in the NGP Network is effective. Problem solving within the context of individual parks is facilitated by the flexibility inherent in GIS software and databases. At the Network level, however, the lack of consistency in database definitions and structure decreases the value of combinations of park data. When feature form (i.e., point, line, polygon) differs from park to park it becomes necessary to re-process data sets to a common structure to enable analysis and across-park comparisons. Even when feature form is consistent, differences in attribute definition (e.g., character strings vs. numbers or dates, or the number of characters in a character string) make merging data sets time consuming and problematic. Although incompatible data can be “massaged” to get data sets to complement each other, the quality (e.g. accuracy) of data is often degraded.

Analyzing information at the Network level on discontinuous park units of varying sizes requires a comprehensive, compatible, and highly accurate set of data. A centralized, integrated GIS database will provide the ability to relate park resource data to each other in ways not possible with paper maps or numeric databases. A centralized GIS database will require a significant investment and commitment by the NGP Network. A less-than substantial investment can result in disastrous consequences. The NPS Inventory and Monitoring Program Draft Data Management Protocol states that:

“data can be lost through accident or disaster, corrupted through mishandling or neglect, rendered legally indefensible because of inadequate documentation and quality assurance, or found to be useless beyond a narrow purpose...the ultimate cost of poorly managed data can be astronomical, but most major problems can be avoided with good data management practices, procedures, and policies.”

GIS data development, documentation, handling, and analysis requires a long-term commitment of attention to detail and data stewardship. The NGP Network intends to make that commitment. All GIS products produced during these inventories will be compatible with the ArcView GIS Theme Manager and have FDGC-compliant metadata. NGP Network personnel will review products for compliance. All spatial data will be stored in Universal Transverse Mercator (UTM) coordinates, North American 1983 (NAD83) datum.

Problems of multi-park data integration have been partially rectified through the use of Microsoft Access™ databases like NPSpecies. As increasing numbers of parks come online with GIS, and as those GIS programs independently normalize and document legacy data sets, the volume of data available to the I&M Program will increase. A plan for creating a Network-wide GIS program is a high priority.

Purposes of the NGP Network GIS program are:

- To outline the long-term goals of GIS in the I&M Program
- To associate those goals with the long-term goals of the parks
- To identify elements for a functional, Network-wide GIS program
- To organize the development of a multi-park data handling program
- To encourage NPS staff to discover the benefits of GIS

To support the I&M Program two primary classes of GIS data need to be developed and maintained. The first of these are base-map data, consisting of park boundaries, roads and trails, contour lines, and hydrographic features. The other class of data is thematic, consisting of topic-specific data sets like nest and burrow locations, species locations and ranges, survey sites, etc.. As the GIS program evolves, additional derived data will be created as products of analyses and mapmaking projects.

At present, limited GIS data are available for most parks in the Network. Availability, however, does not necessarily mean compatibility between park data sets.

Table 3. GIS data layers and programs in Northern Great Plains Network parks.

	AGFO	BADL	DETO	FOLA	FOUS	JECA	KNRI	MNRR	MORU	NIOB	SCBL	THRO	WICA
Boundary	X	X	X	X	X	X	X	X		X	X	X	X
Hydrography	X	X		X	X	X	X			X	X	X	X

Elevation		X	X	X	X	X	X			X		X	X
Soils		X	X							X	X	X	X
Geology		X	X							X		X	X
Wetlands		X					X			X		X	X
Vegetation	X	X	X	X			X			X	X	X	X
Exotic plants	X	X	X	X			X			X		X	X
Wildlife		X	X								X	X	X
T&E species										X		X	X
Prescribed fire		X	X		X		X					X	X
Roads	X	X	X	X	X	X	X			X	X	X	X
Trails	X	X	X	X	X		X			X	X	X	X
Structures			X	X	X		X			X		X	X
Hardware	X	X	X	X		X	X	X		X	X	X	X
GIS Program	X	X	X	X						X		X	X

A more thorough NGP Network GIS assessment will be completed over the next couple years. In parks where GIS is currently in use, an assessment should be either a confirmation that data development and use are progressing satisfactorily, or an assessment of needs not being met. For parks where GIS is not currently in use the assessment can help to identify ways that parks can share facilities and staff, or where the I&M Program might need to act as a service-center.

The GIS assessment should include an evaluation of existing spatial data in any form (maps, tables, databases with coordinates, or other location data), metadata, personnel, computing and software resources, GPS, and data conversion tools (e.g., digitizing tablets, scanners, etc.). The assessment is also an opportunity to engage the regional GIS support office, and to evaluate the local or regional community for access to college or university departments willing to become involved in mapping in parks. Recommendations coming from the assessment process should enable decision makers to budget for improvements or resource sharing, when appropriate.

The collection, storage, and analysis of spatial data will be critical to the success of the NGP Network. Data management is essential to evaluate change over space and time. Making data accessible, in a form useful by park decision makers is paramount. The following goals are proposed:

1. Network data assessment
 - a. conduct needs assessment at park and network levels
 - b. inventory data available at park level
 - c. assess status of metadata for data relevant to the I&M Program
 - d. assist parks in developing metadata
 - e. determine data quality
 - f. document data assessment
2. Evaluation of data relevant to I&M Program
 - a. assess available data for utility in I&M Program
 - b. code data for quality (some data may have low positional accuracy yet are of value)
 - c. evaluate the cost of maintaining data (e.g., satellite imagery, etc.)
 - d. document data evaluation
3. Develop network database
 - a. utilize NPS theme manager data structure
 - b. organize data for access by multiple tools (e.g., Synthesis)

- c. ensure all data projected into common projection and datum
 - d. document NGP Network database structure
4. Develop data security and distribution protocols
 - a. identify sensitive data (e.g., exempt from FOIA) and establish protections
 - b. develop data inspection/update/documentation schedule
 - c. develop backup and archiving procedures and schedules
 - d. develop and implement data distribution back to parks and to data clearinghouses
 - e. develop and implement data distribution tracking and auditing system
 - f. document security and distribution protocols
 5. Develop software/data orientation and training program
 - a. evaluate staff training levels in NGP Network parks
 - b. develop topic-specific "short-courses" for on-site or electronic delivery
 - c. schedule and offer/deliver training
 - d. develop and implement training update schedule
 - e. document orientation and training program
 6. Determine budget and staffing needs and physical location for I&M Network GIS program
 7. Plan evaluation and update schedule
 - a. schedule annual/biannual NGP Network GIS program evaluation and update.

Many parks in the Network are actively upgrading their GIS capabilities. Currently, GIS programs range from state-of-the-art at some parks to non-existent at others. It is anticipated that the NGP Network will hire a fulltime information manager with strong GIS expertise once it enters the monitoring phase.

SUMMARY OF EXISTING INFORMATION AND NEEDS BY PARK

Agate Fossil Beds National Monument

SUMMARY STATEMENT:

The vascular flora of Agate Fossil Beds National Monument has been well described (see Bennet 1995), and on-going monitoring of vegetation is being conducted by the Prairie Cluster Long Term Ecological Monitoring (LTEM) program. Vertebrates are also well inventoried at the Monument; however, some supplemental or targeted mammal surveys (e.g., bats) may be needed (for all parks and all taxa see Appendix F for a list of documented species and species expected but not yet documented).

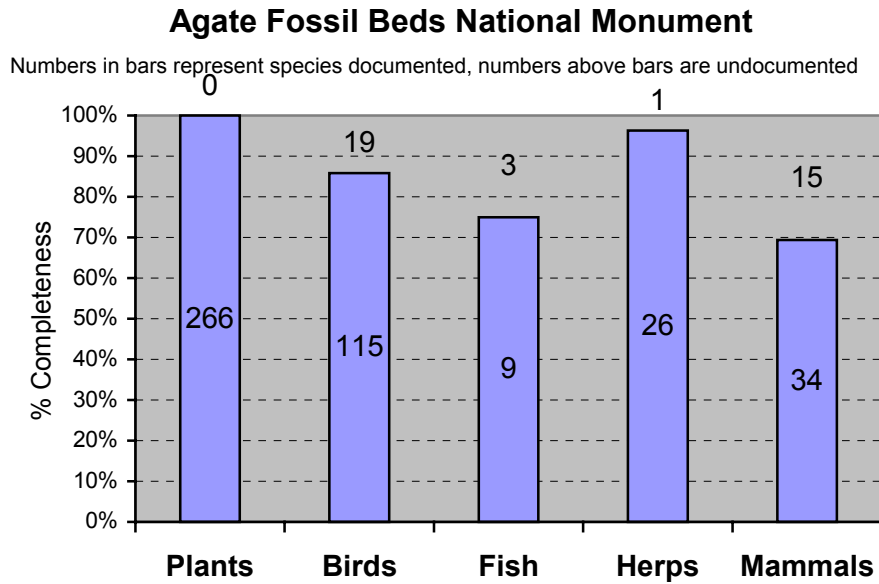


Figure 14. Completeness of Inventories at Agate Fossil Beds National Monument

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the park.

SPECIMEN STORAGE:

The park has a herbarium. Some plant vouchers are stored at Chadron State University in Chadron, Nebraska, and at the University of Nebraska - Lincoln. The park has a professional curator that meets 36 CFR standards. The park could store vertebrates if necessary.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

Subject-matter experts concurred that the plant inventory is 90% complete; however, they felt that vouchers needed verification (vouchers have since been verified and annotated by Steve Rolfsmeier). The subject-matter experts concluded that fish are well inventoried. There were not many comments on herps at the meeting (however, the list that is now available shows that herps are well inventoried). The experts concurred that the bird inventories are very complete. The experts felt that documentation for mammals was only at about 50% (subsequent work determined that mammals were about 70% documented), and that future work may need to focus on bats.

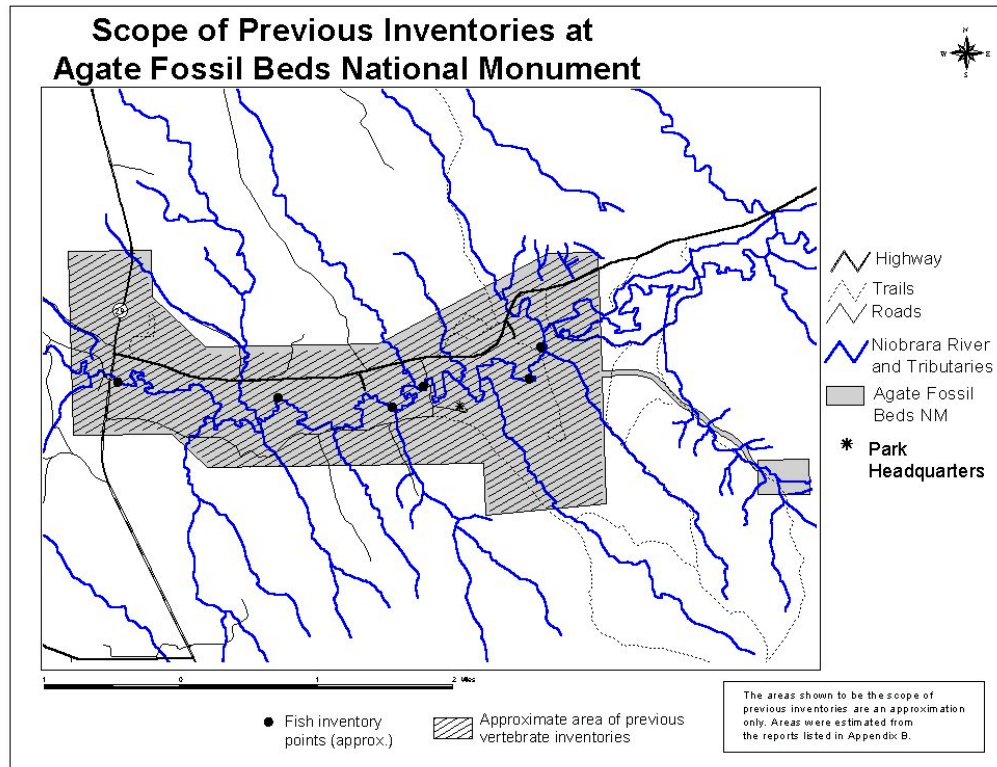


Figure 15. Location of previous inventories at Agate Fossil Beds National Monument

Badlands National Park

SUMMARY STATEMENT:

Generally speaking, Badlands National Park is well inventoried. However, almost all of the biological inventory work has occurred in the North Unit. Inventories in the South Unit would benefit management, but may not contribute many more species to the park-wide inventory list. A fish inventory has recently been completed on the White River; however, the Park has not yet received the final report. Although the report will not add any species to the documented list (the park has already received that information), it should allow for a better assessment of how thoroughly the park has been inventoried, and whether the remaining expected-but-undocumented species can be removed from the expected species list.

Badlands National Park

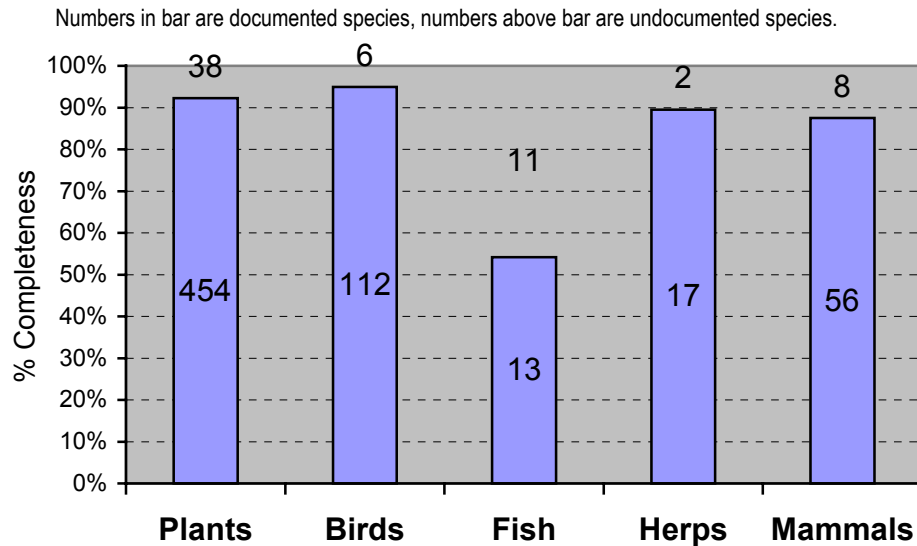


Figure 16. Completeness of inventories at Badlands National Park

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the Park.
The Park has an extensive GIS database of vegetative cover.

SPECIMEN STORAGE:

Although the Park has a curatorial storage facility, space is limited. The Park would like to keep 1-2 reference specimens on site (except for rare species), all others they would like to store off site in some type of Network repository.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The subject-matter experts felt that the South Unit needed more work for vegetation, including the Palmer Creek Area, in part because the South Unit is subjected to grazing by domestic livestock (under Bureau of Indian Affairs management), although such inventories would likely not reveal many undocumented species. The experts said that a rare plant inventory should be considered. The fish experts felt that the current project underway on the White River should document 90% of the species present; they also felt that it may be important to sample stock ponds for management purposes. The herpetofauna experts felt that the current list was of high quality. They felt that there may need to be short, directed efforts to sample species found in sandy soils, tablelands, and stock ponds. The bird experts felt that the bird list was acceptable. The mammal experts felt that the mammal list was generally acceptable. They noted that the existing list came from a variety of reports and it was unclear whether or not there were vouchers and/or their location. The mammal experts also felt that the North Unit has been well inventoried, but much more work is needed in the South Unit.

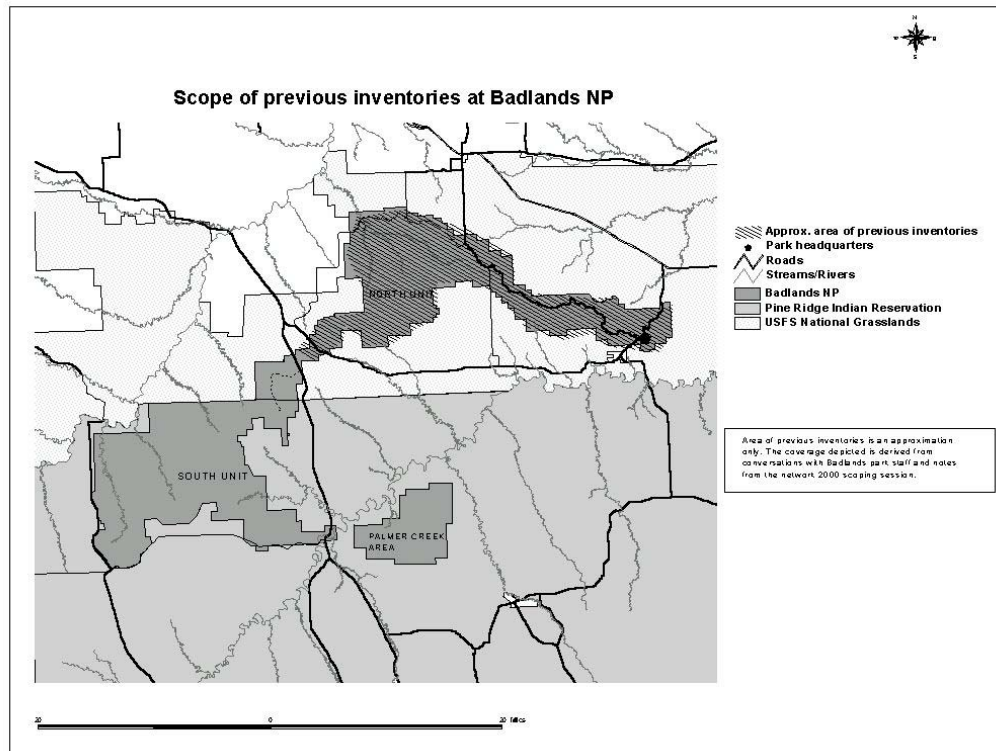


Figure 17. Location of previous inventories at Badlands National Park

Devils Tower National Monument

SUMMARY STATEMENT:

A vegetation inventory at Devils Tower National Monument has been completed. The Monument had a survey in 1987 of herps and mammals. Although the mammal inventory (Armstrong 1987) is of high quality, it is unclear if vouchers were collected. Britten conducted a non-systematic survey of birds in the summer of 1992, with special emphasis on the tower. No systematic inventories of fish have been conducted, although a fish inventory is being conducted in 2001.

Devils Tower National Monument

Numbers in bar are documented species, numbers above bar are undocumented species.

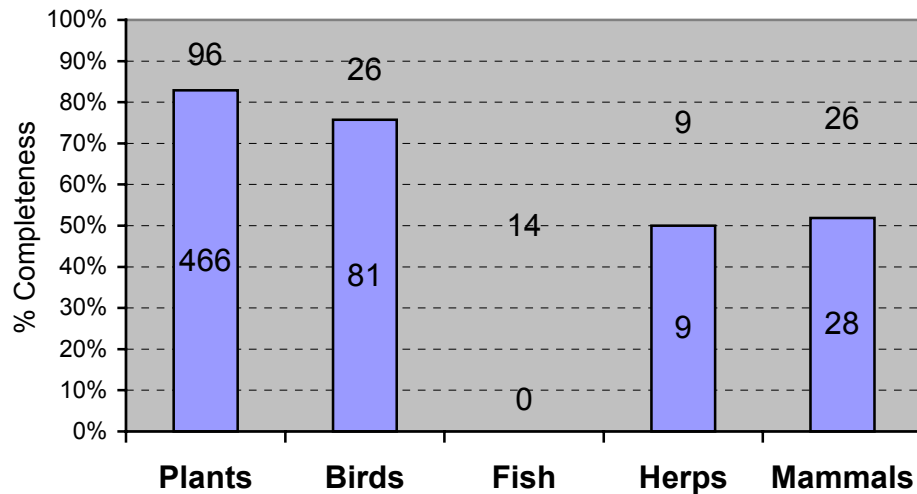


Figure 18. Completeness of inventories at Devils Tower National Monument

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the park.

SPECIMEN STORAGE:

The Monument has a herbarium. Some vouchers may be at Mount Rushmore National Memorial and Black Hills State University in Spearfish, South Dakota. The Monument anticipates storing future collections at Mount Rushmore National Memorial.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

Subject-matter experts felt that the Wyoming Natural Heritage Program has done a lot of work at the Monument, so species of concern are likely well covered. The park may be able to coordinate rare plant inventories with the Black Hills National Forest. The experts stated that a fish inventory was needed (this is occurring in the summer of 2001). The experts said that a herp inventory was needed, primarily for amphibians and turtles. The experts identified the need for a comprehensive bird inventory (this determination was made prior to discovery of the Britten [1992]). The experts said a small mammal and bat inventory was needed.

Scope of previous inventories at Devils Tower NM

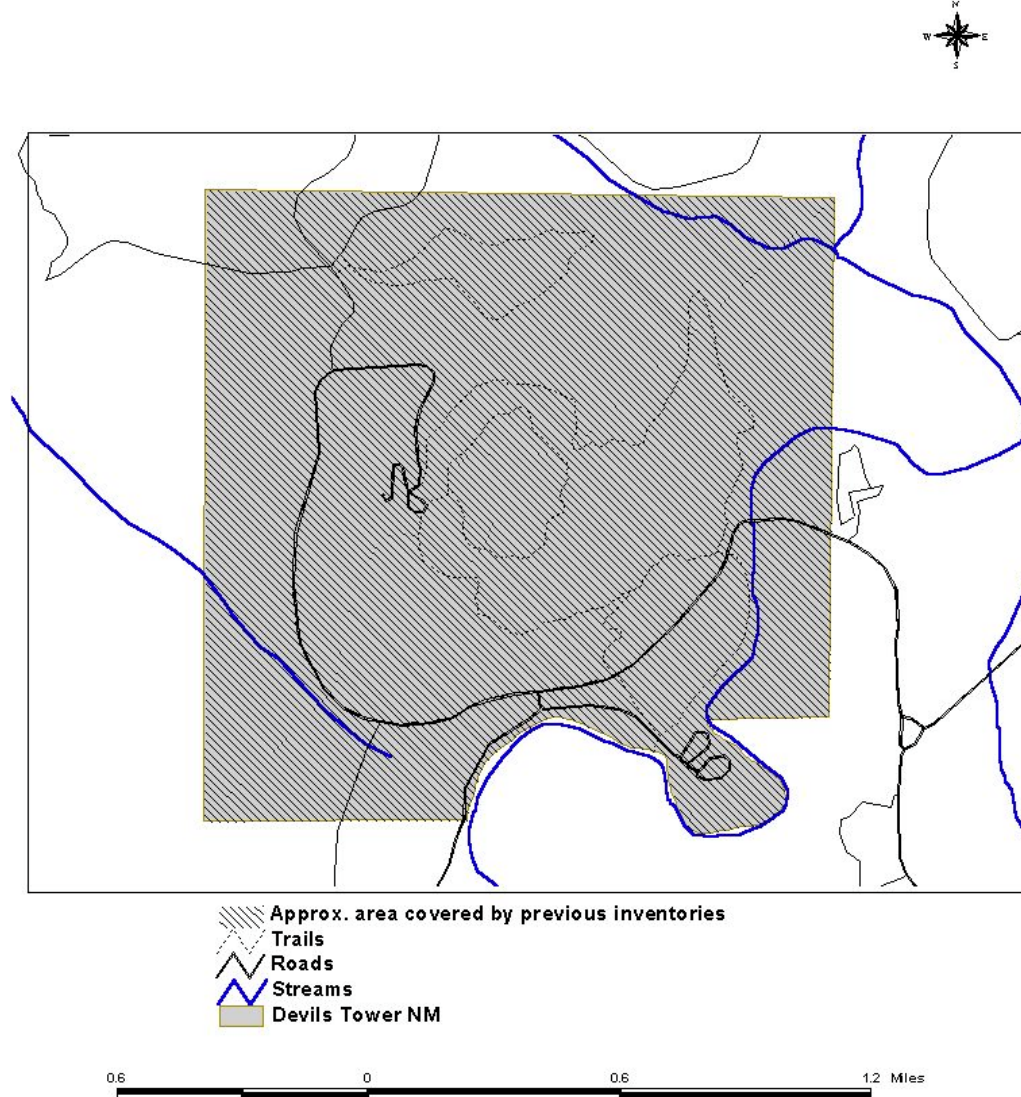


Figure 19. Location of previous inventories at Devils Tower National Monument

Fort Laramie National Historic Site

SUMMARY STATEMENT:

Fort Laramie NHS has a vegetation map and previous inventory work, however, the plant list is incomplete. A vertebrate inventory was conducted at Fort Laramie NHS in 1988 by David Armstrong and Rick Adams, but more work is needed. All vertebrate inventories are considered incomplete.

Ft. Laramie National Historic Site

Numbers in bar are documented species, numbers above bar are undocumented species.

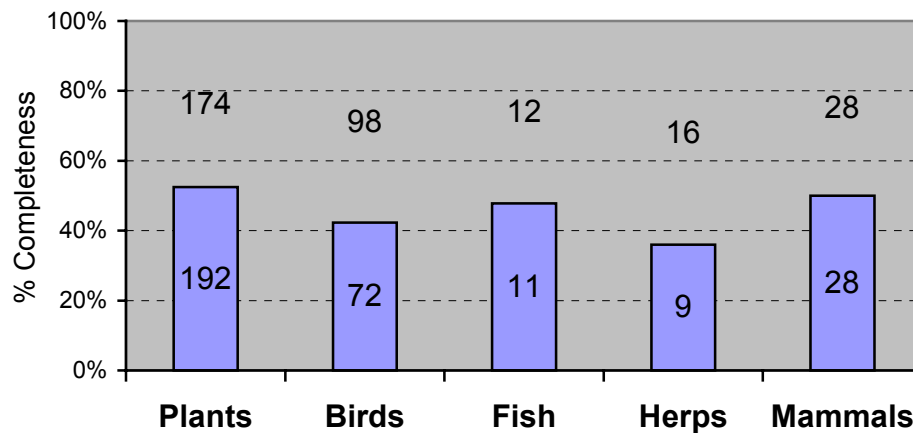


Figure 20. Completeness of inventories at Fort Laramie National Historic Site

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the park.

PARK HERBARIUM:

The park has a herbarium and is willing to store plant specimens on site.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The subject-matter experts felt that more plant sampling is needed in early spring and fall as well as in wetland areas. They felt that the voucher specimens need additional verification. Inventories were needed for both birds and herps. They identified the need for comprehensive fish surveys on the North Platte and Laramie Rivers (to be conducted in 2001) and that there may also be old data to compile. The experts felt that bat and small and medium sized mammal inventories were needed.

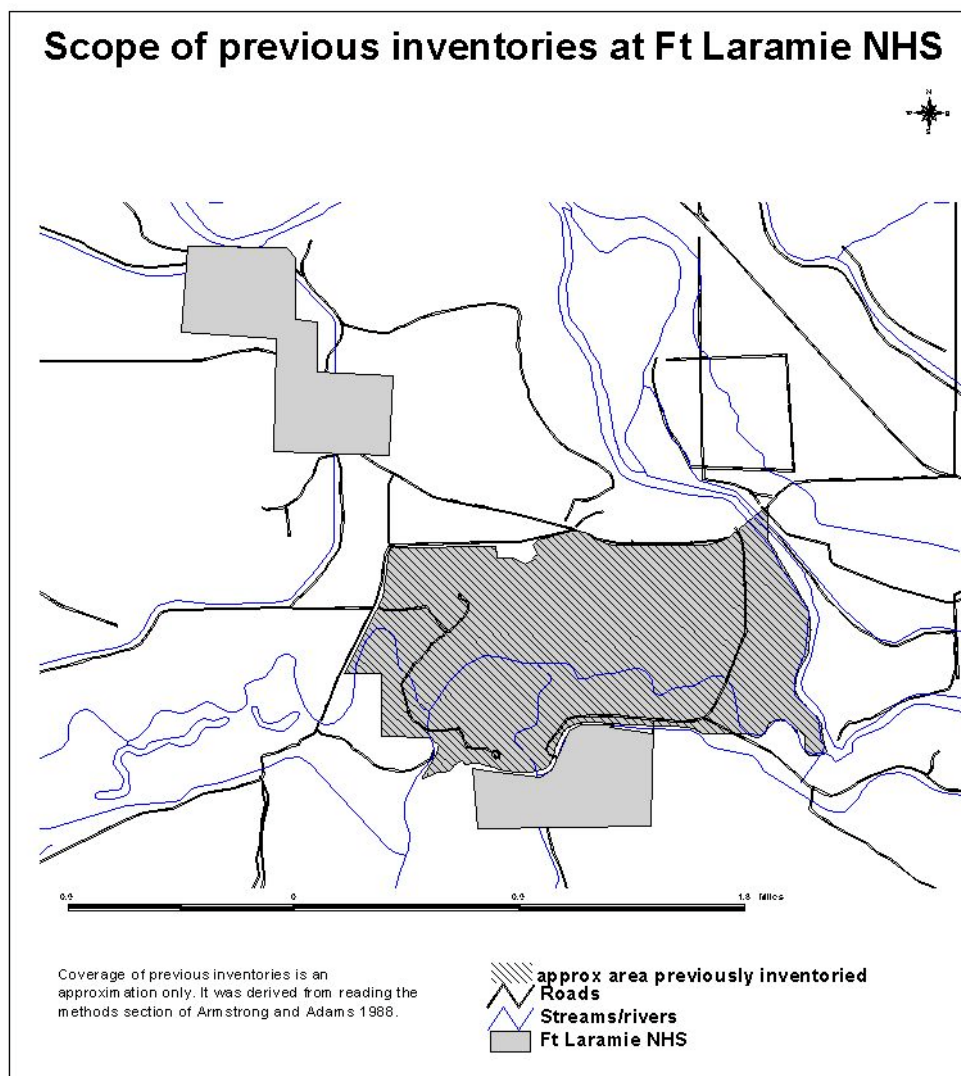


Figure 21. Scope of previous inventories at Fort Laramie National Historic Site

Fort Union Trading Post National Historic Site

SUMMARY STATEMENT:

A vegetation study was conducted in 1980, however, the species list is only about 10% complete and almost no voucher specimens exist. Fish in the surrounding Missouri River and Yellowstone River have been well inventoried by other agencies, however, inventories for all other taxa are needed.

Ft. Union Trading Post NHS

Numbers in bar are documented species, numbers above bar are undocumented species.

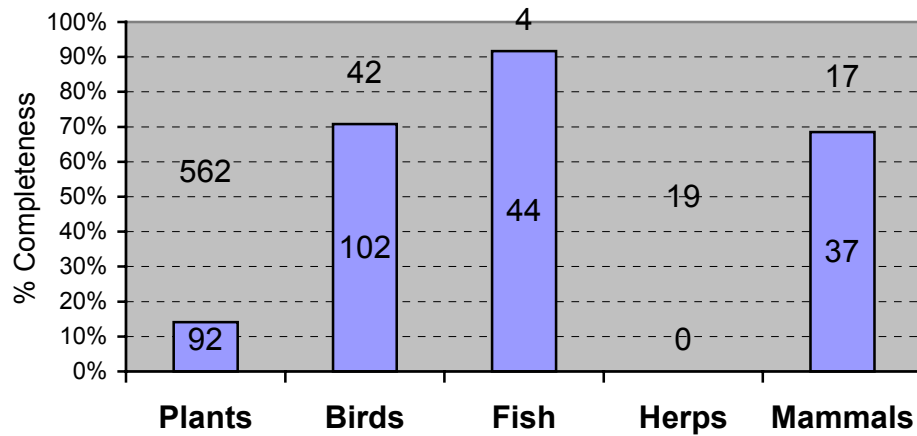


Figure 22. Completeness of inventories at Fort Union Trading Post National Historic Site

VEGETATION MAPS:

A vegetation map is available from 1980. The USGS-NPS Vegetation Mapping Program is working on a proposal to start mapping process in 2001.

SPECIMEN STORAGE:

The park does not have specimen storage, but they would like to establish one.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts stated that a baseline plant inventory is needed as well as a vegetation map. The experts stated that this area may be too small to produce a species area curve. The experts stated that the fish inventories conducted by other agencies should produce a list near 90% complete. The experts identified birds, herps, and mammals as all needing inventories. Although there are historical records of mammals, there are no records from the recent past. The experts stated that some vouchers may have been collected at Fort Buford.

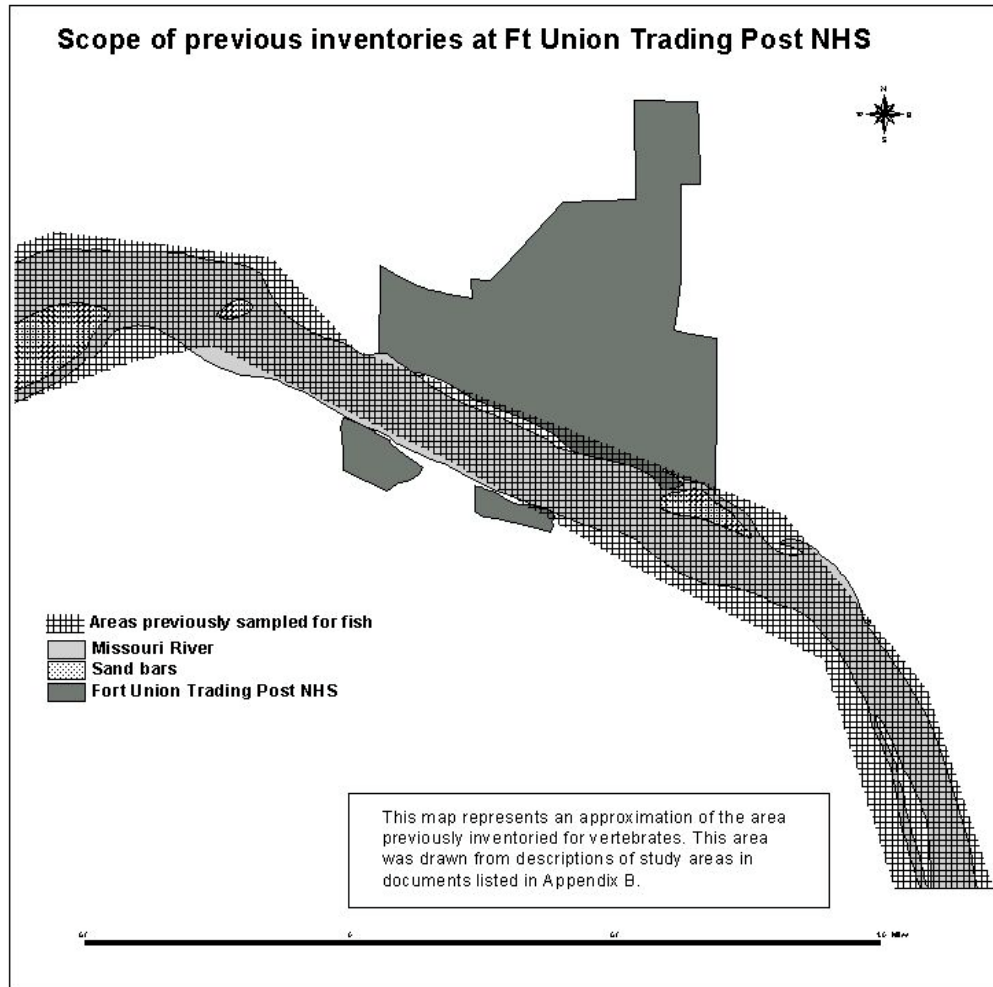


Figure 23. Scope of previous inventories at Fort Union Trading Post National Historic Site

Jewel Cave National Monument

SUMMARY STATEMENT:

Although plant inventories have been conducted at Jewel Cave NM, they did not documented 90% of the species expected to be at the park. Furthermore, a large portion of the park burned in 2000, necessitating new inventories. Birds are the best inventoried taxon at the Monument. Additional inventory work needs to be done on herps and mammals. There is no fish habitat at the Monument.

Jewel Cave National Monument

Numbers in bar are documented species, numbers above bar are undocumented species.

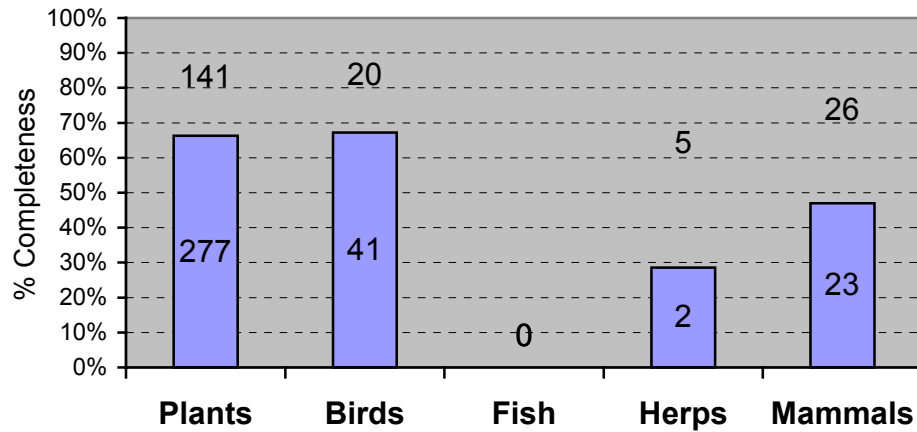


Figure 24. Completeness of inventories at Jewel Cave National Monument

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the park.

SPECIMEN STORAGE:

The Monument does not have an on-site herbarium, but they do have specimens at Mount Rushmore National Memorial. Some vouchers may be stored at the University of Wyoming, Rocky Mountain Herbarium. The Monument expects future collections to be stored at Mount Rushmore National Memorial.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts felt that the plant voucher specimens need to be checked. The experts stated that someone should re-visit the Hollis Marriot report to look at rare areas. They also said that the Network should coordinate with the Black Hills National Forest rare plant inventory. The experts said that the herp data are not very good. The experts felt that the bird inventory was in pretty good shape. The experts estimated the mammal list to be 30-50% complete. They said that there is a fair database of voucher specimens, that bat coverage is very good, and that there needs to be a fair bit of documentation for secretive mammals. They said the Network should work with the South Dakota Game and Fish Department for verification of larger mammals.

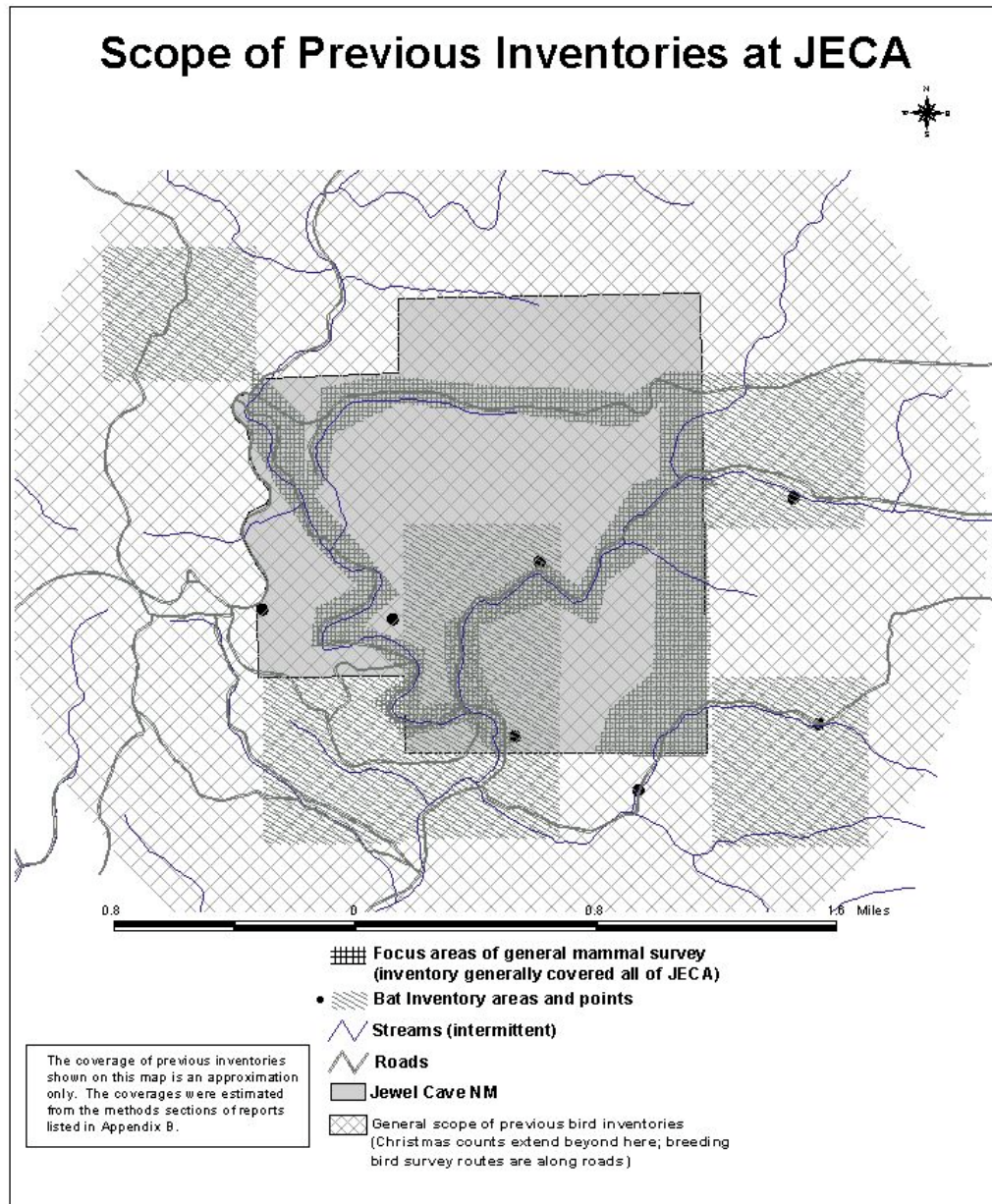


Figure 25. Scope of previous inventories at Jewel Cave National Monument

Knife River Indian Villages National Historic Site

SUMMARY STATEMENT:

Plants are well inventoried at Knife River Indian Villages NHS. In general, vertebrates are well inventoried at the park, although some additional targeted inventories may be helpful.

Knife River Indian Villages NHS

Numbers in bar are documented species, numbers above bar are undocumented species.

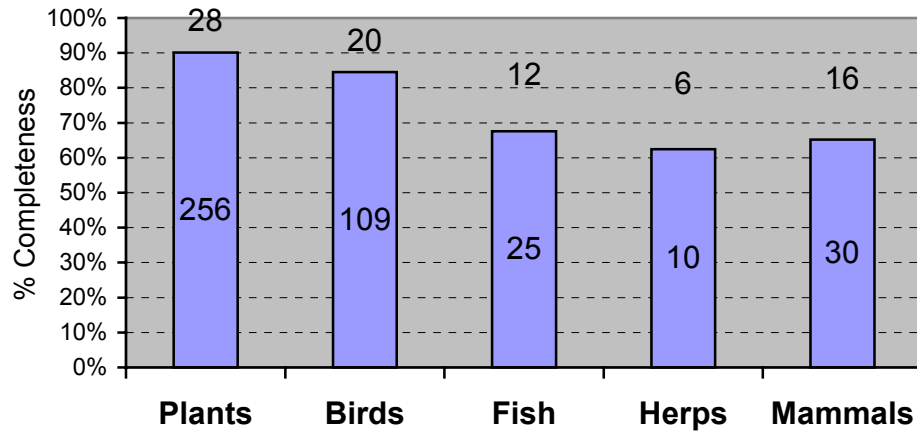


Figure 26. Completeness of inventories at Knife River Indian Villages National Historic Site

VEGETATION MAPS:

The Natural Heritage Program completed a vegetation map in 1993. The USGS-NPS Vegetation Mapping Program is working on a proposal to do a vegetation map for Knife River Indian Villages NHS starting this summer.

SPECIMEN STORAGE:

The park has a storage area primarily designed for cultural resources. The park has a herbarium. Other potential collections include North Dakota State University. It could be possible to store a limited amount of vouchers on site.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts estimated that the plant inventory is 90% complete. They noted that the park has had an exotic and rare plant inventory. The experts said that previous fish inventories of the Knife and Missouri Rivers should get the species list up around 90%. The experts said some good data on herps may be available from Moore et al., (the report was not available at meeting), and that targeted inventories for turtles and snakes may be needed. The experts stated that the Network needed to check on the status of mammal vouchers, including documenting species from Moore et al.. The experts said that very little work, if any, has been done on bats.

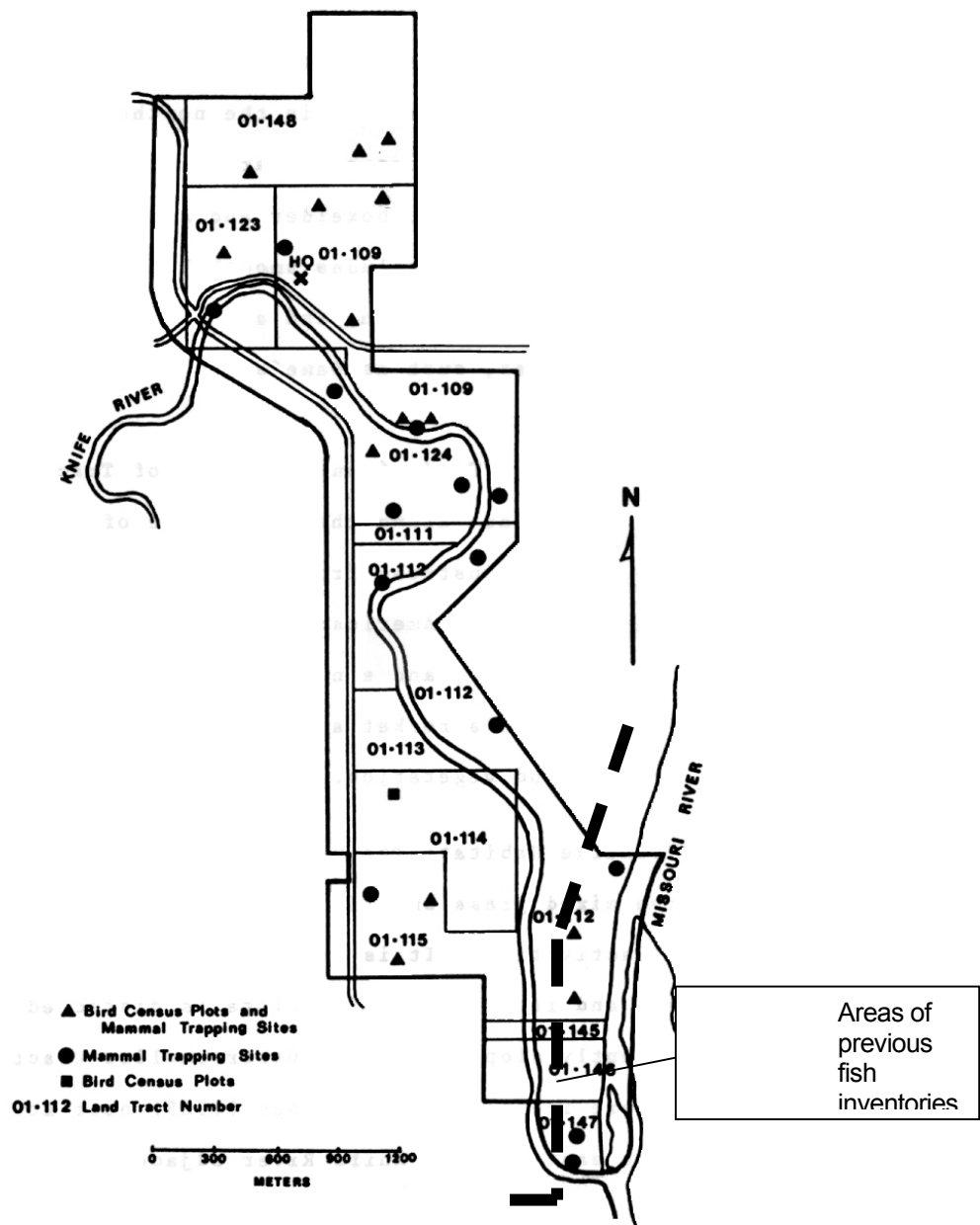


Figure 27. Location of previous inventories at Knife River Indian Villages National Historic Site

Missouri National Recreational River

SUMMARY STATEMENT:

The park is currently 0% complete for plants; however, the Nebraska Natural Heritage Program conducted a vegetation inventory at Ponca State Park in the summer of 2001. The state park site is likely representative of much of the MNRR with the possible exception of upland prairie. Fish and birds have been well inventoried. Almost no information is available for mammals and herps. Access could be a problem for field inventories since the park does not own the land within the park boundaries.

Missouri Nat. Rec. River

Numbers in bar are documented species, numbers above bar are undocumented species.

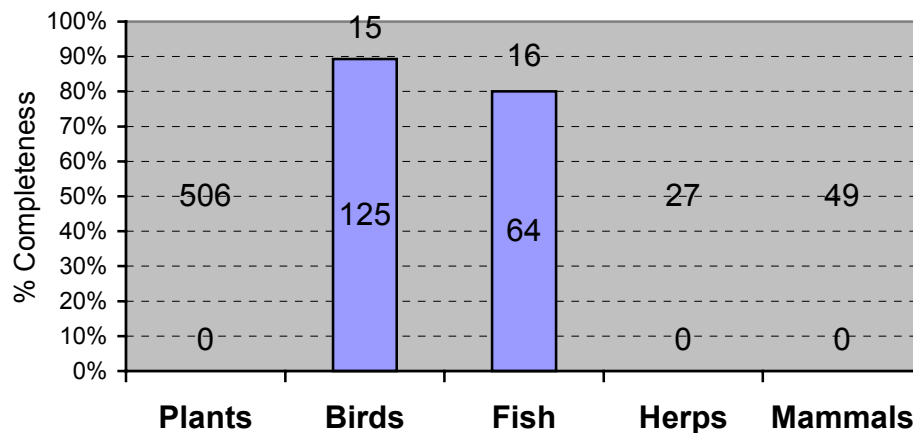


Figure 28. Completeness of inventories at the Missouri National Recreational River

VEGETATION MAPS:

The park does not have a vegetation map. Some general land-cover level GIS layers are available from the CALMIT webpage (<http://csd.unl.edu/csd/gisdata.html>).

SPECIMEN STORAGE:

The park does not currently have a storage area for vouchers nor curation capabilities.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

Since little information was available the subject-matter experts did not make many assessments of completeness at MNRR. The experts stated that an exotic plant inventory and an inventory of Goat Island would be helpful. They also felt that a rare plant inventory would be beneficial, especially if the park could get access to private lands. The experts identified a need for a complete herp inventory for all species in both stretches. The inventory should focus on islands/waterway with special attention

to northern water snakes. The experts felt that fish inventories should be complete. The experts identified a need for a mammal inventory for all species in both stretches; the inventory should focus on islands/waterway with special attention for the eastern woodrat, southern bog lemming, and river otter.

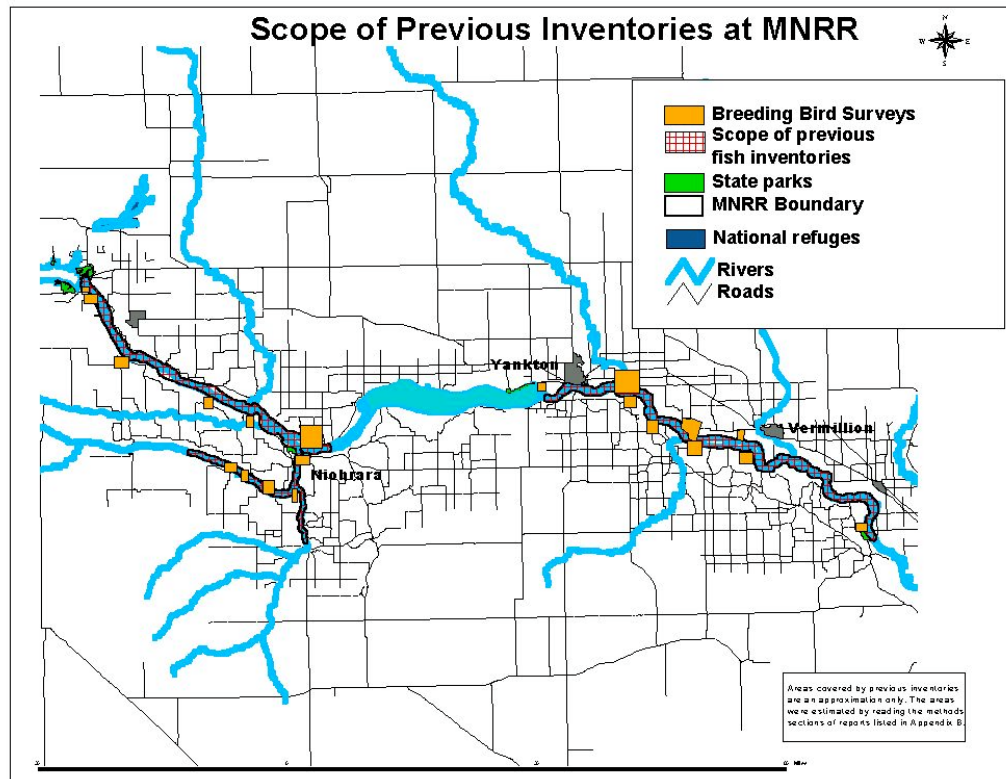


Figure 29. Scope of previous inventories at Missouri National Recreational River

Mount Rushmore National Memorial

SUMMARY STATEMENT:

The plant inventory for Mount Rushmore NMEM is near 90%. The memorial has been inventoried for birds during the South Dakota Breeding Bird Atlas project, but is short of 90% complete. Inventories are needed for the other taxa.

Mount Rushmore NM

Numbers in bar are documented species, numbers above bar are undocumented species.

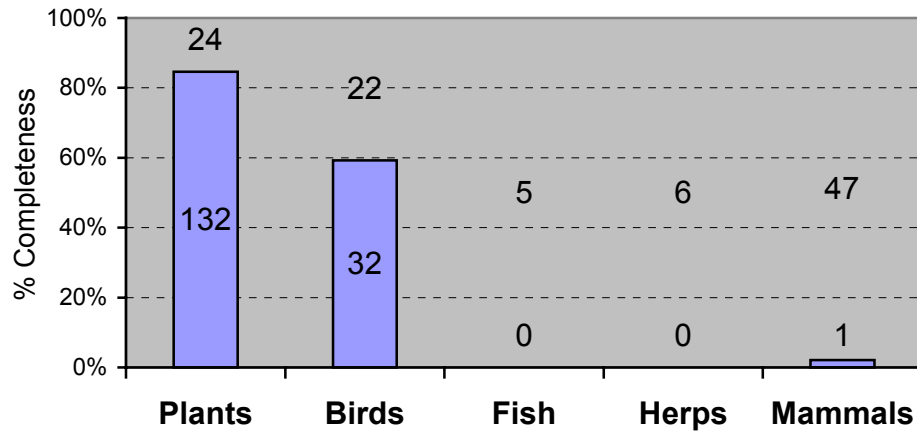


Figure 30. Completeness of inventories at Mount Rushmore National Memorial

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a vegetation map for the park.

SPECIMEN STORAGE:

The park has a voucher collection that dates back to the 1950s. The park also stores specimens from Devils Tower NM and Jewel Cave NM. The park is very interested in storing new specimens.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts stated that research is needed on the location and quality of vouchers. They stated that additional targeted plant sampling may be needed. The experts noted that no fish sampling has occurred in Grizzly Creek (this is being done in 2001). The experts stated a need for a comprehensive herp inventory. They noted that some data may be available from the surrounding area. The experts noted that there is a USFWS Breeding Bird Survey route in the vicinity of the park. The experts identified a need for a comprehensive mammal inventory including small mammals and bats. They said the Network should get large mammal information from the surrounding Black Hills National Forest.

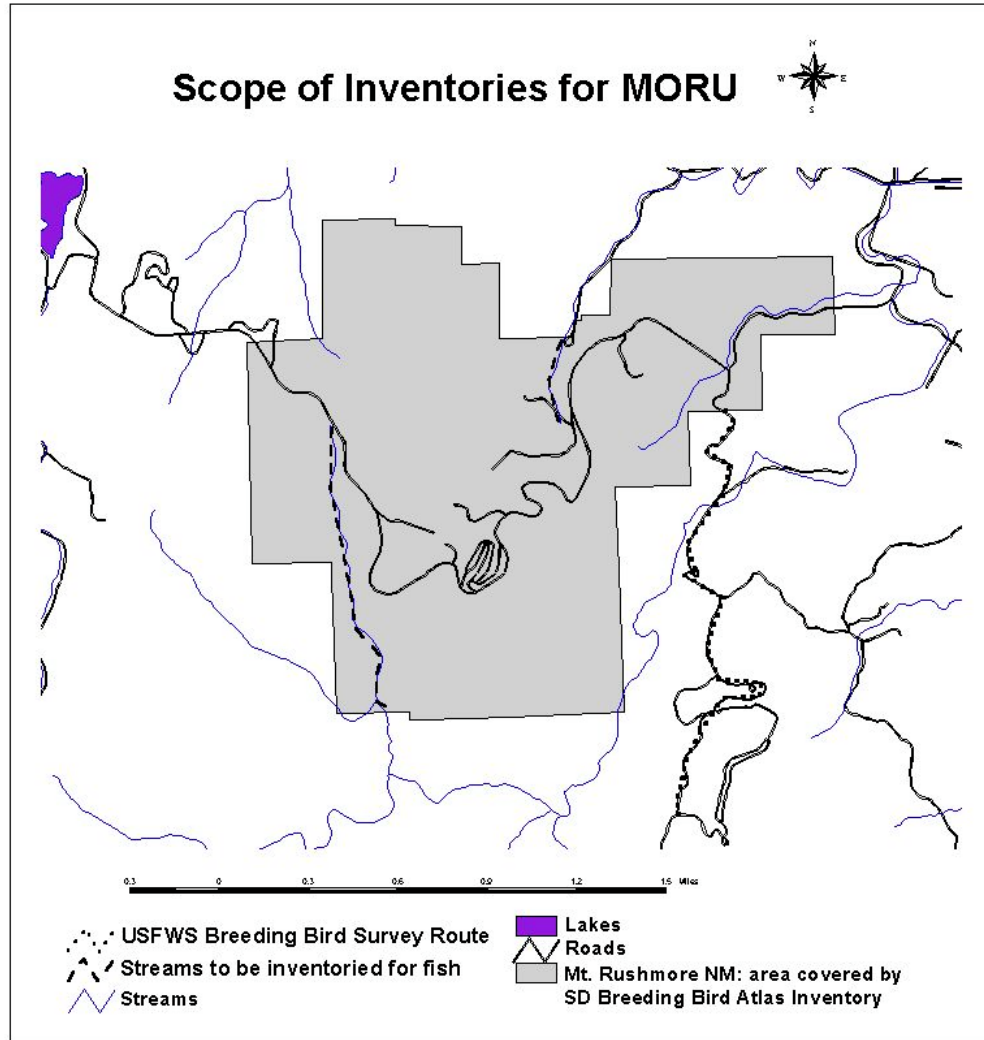


Figure 31. Location of previous inventories at Mount Rushmore National Memorial

Niobrara National Scenic River

SUMMARY STATEMENT:

There has been extensive vegetation work on the western half of the park at The Nature Conservancy preserve; however, little information is available for the eastern half. Still, the vegetation work in the west half has likely met the 90% objective. Vertebrates are well inventoried; however, once again much of the inventory work has focused on the western half of the river where The Nature Conservancy Preserve and a National Wildlife Refuge are located.

Niobrara NSR

Numbers in bar are documented species, numbers above bar are undocumented species.

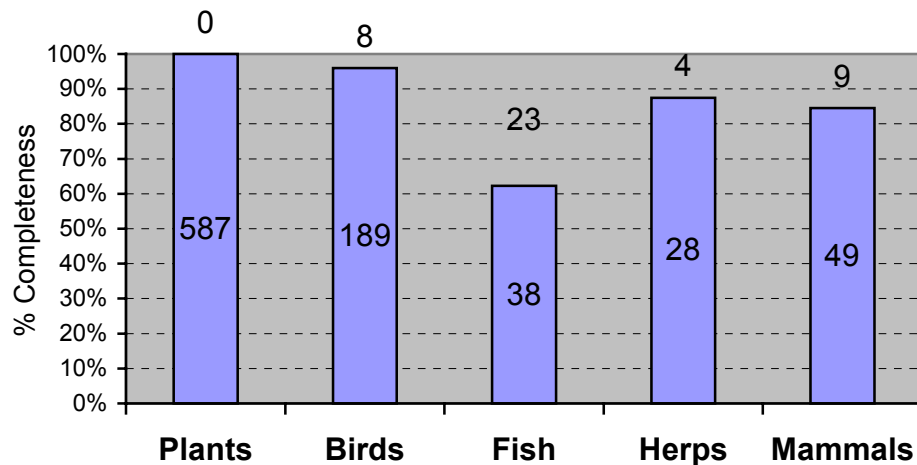


Figure 32. Completeness of inventories at the Niobrara National Scenic River

VEGETATION MAPS:

The park does not have a vegetation map. There are large scale land-use and vegetation coverage available through the CALMIT webpage (<http://csd.unl.edu/csd/gisdata.html>)

SPECIMEN STORAGE:

The park does not have a storage facility nor curation capabilities. Vouchers from The Nature Conservancy inventory are at the University of Nebraska-Lincoln.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts noted that conducting inventories may be difficult because of access to the private lands. They encouraged the Network to contact The Nature Conservancy for information (this has been done). The experts noted that for fish there are good historic data that should be available for documenting at least 90% of the species. They stated that vouchers should be available at the University of Nebraska-Lincoln; however, the data needs to be compiled. The experts said more herp inventories were needed. They identified the need to verify spring peepers and the Blanding's turtle group. The experts said there was not enough information for birds. The experts said that a mammal inventory occurred at the Fort Niobrara National Wildlife Refuge; however, inventories may still be needed for shrews, bats, and small and medium mammals. The experts said that a relict population of eastern wood rats is of particular interest.

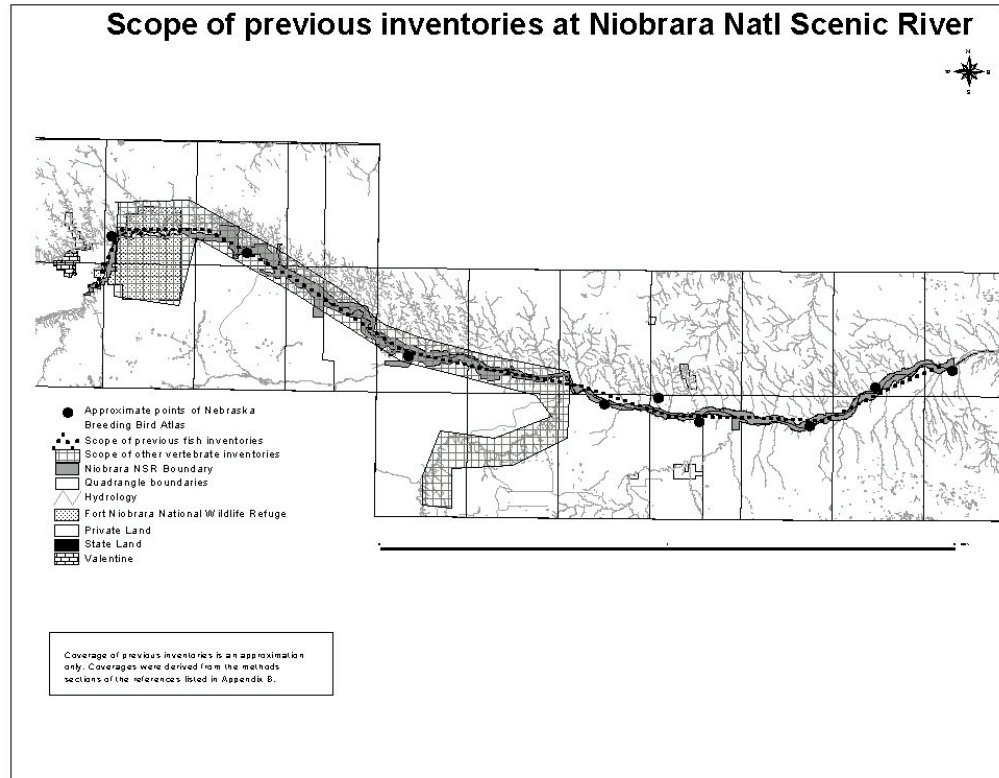


Figure 33. Scope of previous inventories at Niobrara National Scenic River

Scotts Bluff National Monument

SUMMARY STATEMENT:

The Monument is well inventoried for plants. In addition, the Prairie Cluster LTEM is conducting long-term vegetation monitoring at the park. All vertebrate taxa are fairly well inventoried except fish, which will be inventoried in the summer of 2001. Some additional targeted work may be needed.

Scotts Bluff National Monument

Numbers in bar are documented species, numbers above bar are undocumented species.

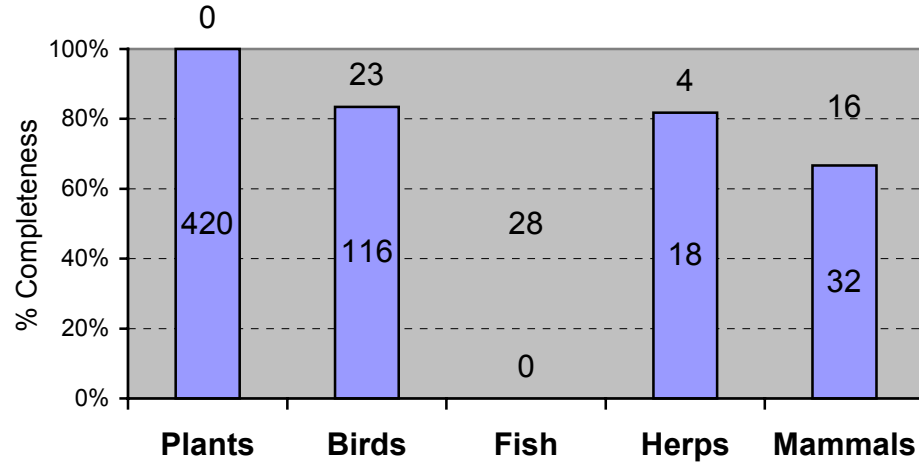


Figure 34. Completeness of inventories at Scotts Bluff National Monument

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the park.

SPECIMEN STORAGE:

The Monument has specimens stored on site. Vouchers have been verified by Steve Rolfsmeier. Additional specimens may be at Chadron State (Chadron, Nebraska) and the University of Nebraska-Lincoln. The Monument may be able to store additional specimens, depending on the quantity.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts felt that the vegetation inventory data are very complete and of high quality; however, vouchers needed to be verified (has since been completed). The experts said there is information on fish species for the North Platte River, but not necessarily for the stretch through the Monument. The experts felt that the percent of herp species documented seems low. The experts stated that the bird inventories at the Monument seem fairly complete. The experts felt that the mammal inventory is about 60-70% complete, although additional bat work is needed.

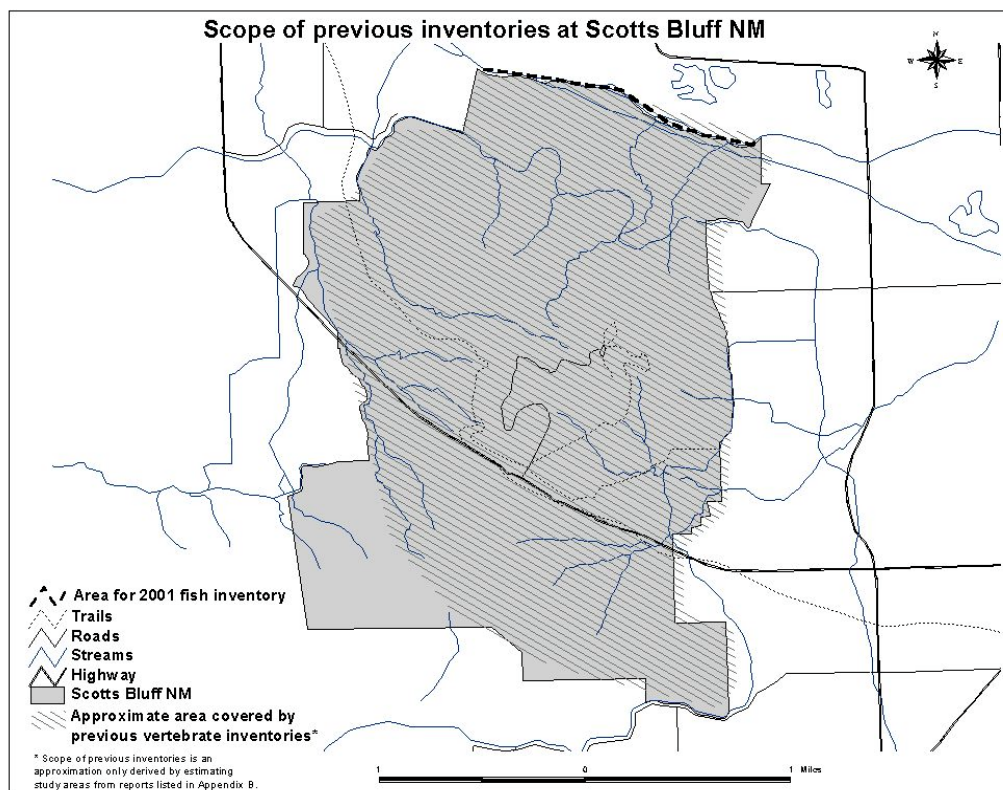


Figure 35. Location of previous inventories at Scotts Bluff National Monument

Theodore Roosevelt National Park

SUMMARY STATEMENT:

All inventories are complete in terms of the 90% objective; however, most of the work has occurred in the South Unit, with less information from the North Unit and the Elkhorn Ranch Unit. The park is included in the USGS-Biological Resources Division amphibian monitoring program.

Theodore Roosevelt National Park

Numbers in bar are documented species, numbers above bar are undocumented species.

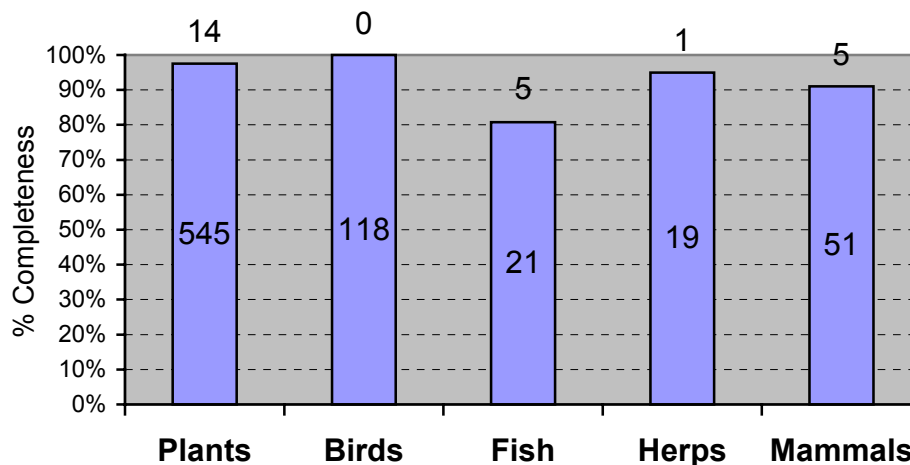


Figure 36. Completeness of inventories at Theodore Roosevelt National Park

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the Park.

SPECIMEN STORAGE:

The Park has voucher specimens stored on site. Other collections are at North Dakota State University and South Dakota State University. The Park would like to store all specimens in the Park; however, they do not currently have an adequate facility.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The plant experts noted that the South Unit is complete, however the North Unit and the Elkhorn Ranch Unit may need more work. They said a rare plant inventory would be helpful, and that voucher specimens needed to be verified. The experts noted that the USGS-Biological Resources Division exotic plant work needs to be added to system. The experts said that now that the fish inventories are complete the park needs to address sturgeon chub reintroduction. The herp experts said the data are old; they judged them as not complete. The experts said the mammal list may be "over-complete" and that verification of vouchers helpful.

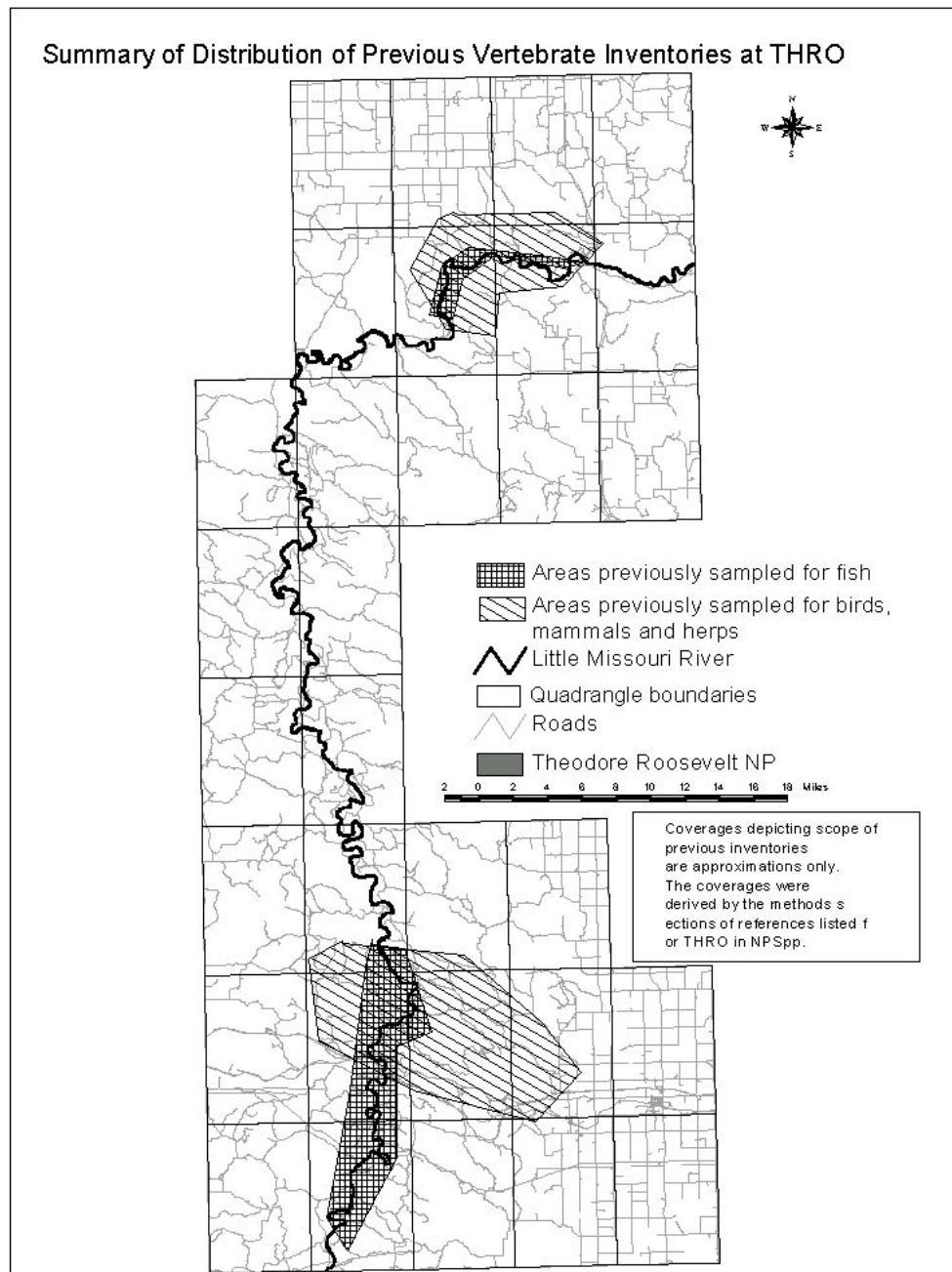


Figure 37. Location of previous inventories at Theodore Roosevelt National Park

Wind Cave National Park

SUMMARY STATEMENT:

Vegetation inventories are very complete at Wind Cave National Park. The Park is well inventoried for vertebrates, with the exception of mammals. A final report for a small mammal inventory will be available in late 2001; however, the park will still be short of 90% completion. A fish inventory will be conducted in 2001.

Wind Cave National Park

Numbers in bar are documented species, numbers above bar are undocumented species.

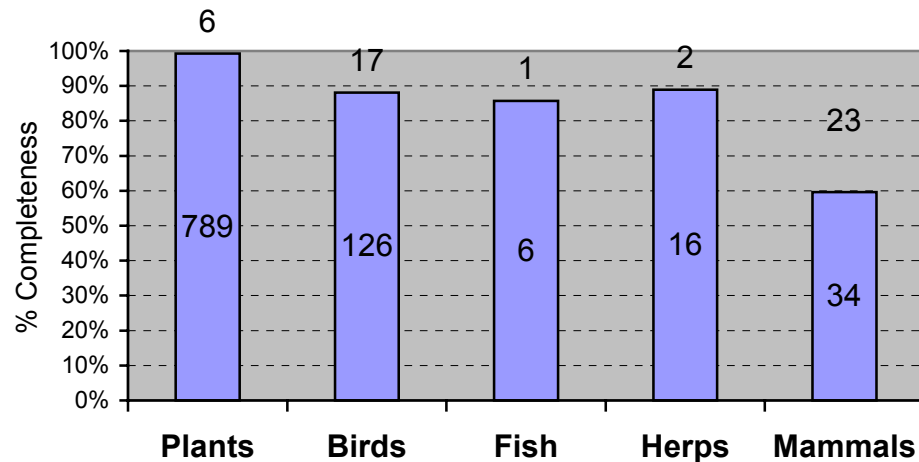


Figure 38. Completeness of inventories at Wind Cave National Park

VEGETATION MAPS:

The USGS-NPS Vegetation Mapping Program has completed a map for the Park.

SPECIMEN STORAGE:

The Park has plant specimens stored on site. The specimens have been verified by Hollis Marriott. The Park is able and willing to store all specimens collected.

SUMMARY OF COMMENTS FROM 2000 SCOPING SESSION:

The experts felt that the vegetation inventory is 90% complete. The experts said the existing fish list likely represents 90% of the species, but seining may provide a more complete list (the park was inventoried for fish in 2001). The experts felt that water quality in Beaver Creek is becoming an issue. The experts felt that the current herp data are of high quality and is 90% complete, although more work on frogs and snakes is desired. The experts said the Park is around the 90% mark for birds. The mammal experts said some attention should be paid to mammal vouchers, such as increasing the specimens collected in the ongoing inventory and an assessment of older specimens. The experts identified additional mammal needs to include the documentation of the presence of bats, and estimates of the density of prairie dogs, the distribution of flying squirrels, and the status of pronghorns.

Scope of previous inventories for Wind Cave NP

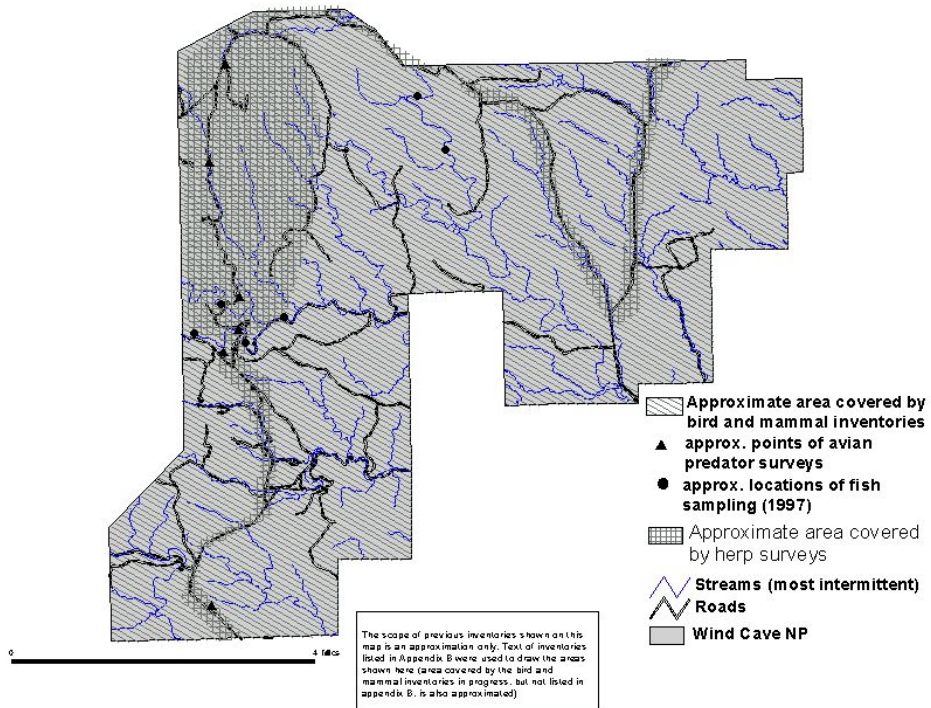


Figure 39. Location of previous inventories at Wind Cave National Park

SECTION 3. PROPOSED INVENTORIES

Depending on the completeness of existing inventory information, field inventory methods could be targeted toward a specific species or group of species within a vertebrate class or the vascular plant group, they could target the entire vertebrate class or tracheophyte group, or could cover more than one of the five taxa groups identified by the I&M Program. The highest priority for the NGP Network inventories will be to document the presence of 90% of the vertebrate and vascular plant species expected to be present in each park. Therefore, inventory methods have been designed to meet this overriding objective. Generally speaking, less structured and simpler survey designs are more conducive to determining the presence or absence of many species. The WASO I&M Program has suggested the same in memoranda stating that many inventory study plans to date have been overdesigned. However, it is recognized by the NGP Network that survey methods that can be replicated and have statistical robustness provide additional benefits such as being conducive to inferences over time and space (e.g., between-park statistical differences could more readily be identified). Therefore, sample design will be cognizant of all three of the objectives in the I&M Program, as well as park-specific objectives and issues and other questions of scientific interest.

A detailed sampling concept has been developed specifically for the NGP Network (Vieira and Sargeant 2001). The entire document is included in Appendix C. As alluded to above, the sampling concept is most applicable to those surveys where some measure of replication and statistical inference is desired. At this time it cannot be known with certainty what indicators the NGP Network will monitor in the monitoring phase of the I&M Program (i.e., the “Vital Signs” program), and therefore, where replication and statistical inference is needed. However, the distribution and composition of vascular plants is a management issue in all parks in the NGP Network. Accordingly, it seems reasonable to assume that plants may be monitored in the long-term monitoring program, and therefore, the proposed plant inventory project is more structured and statistically-based than some of the other proposed inventories. Likewise, birds may be monitored in the Vital Signs program. In addition, the U.S. Forest Service is conducting bird monitoring in close proximity to NGP Network parks. Therefore, the bird inventory project uses established and widely used monitoring methods that allow for statistical analysis of spatial and temporal trends. In other words, the bird and vascular plant inventories rely more on the sampling concept described in Appendix C than do the mammal and herp inventories.

In summary, the NGP Network sampling concept stratifies parks based on physical and ecological attributes. These strata are mapped prior to selecting sampling locations. To the degree possible, the NGP Network will stratify on fixed landscape attributes (e.g., slope, elevation, aspect), however, in some cases it may be necessary or desirable to stratify on vegetation or other less-permanent attributes. Attributes for delineating strata may vary across taxonomic groups. For example, plant inventories may be stratified on geologic substrate and bird inventories may be stratified on habitat (e.g., riparian areas). Attributes for stratification may also be chosen based on the spatial data available for a given park.

In addition to documenting the occurrence of vertebrate and vascular plant species, a secondary purpose of species inventories is to develop insight into species-habitat associations. The NGP Network will require that standard habitat attributes be collected for all vertebrate and vascular plant inventories. This will provide a common context for species inventories and will facilitate the integration of species occurrence data across habitats and taxa. It will also provide a way to link inventory data to vegetation maps.

A standard terrestrial habitat data sheet was adopted from the Heartland Network Inventory Study Plan. This data sheet is a compilation of habitat attribute data from several sources including the North Carolina Vegetation Survey, British Columbia inventory standards, and the NPS Vegetation Mapping Program. The resulting habitat data sheet (Appendix E) includes basic location data, site environmental characteristics, and vegetation attributes consistent with the National Vegetation Classification Standard (NVCS).

OVERVIEW OF INVENTORY METHODS THAT MAY BE USED

The following is a description of some commonly used methods for inventorying vertebrates and vascular plants. It is anticipated that all inventories in the NGP Network will draw on one or more of these well documented, standardized, and commonly used methods.

BIRD INVENTORY METHODS

If simple presence/absence information is needed the most efficient inventory method is often to simply have a qualified observer go out and record all birds observed. The observer should be careful to cover all potential habitats, times of the day, and seasons (if desired). However, a more structured and statistically designed survey can also provide information on species richness of an area, as well as providing information on distribution and abundance. The NGP Network will use bird inventory methods that can also provide inferences over time and space. The primary references used by the NGP Network in designing its bird inventories are Ralph et. al. (1993) and Fancy and Sauer (2000). The survey methods most likely to be used in the NGP inventory are:

Variable Circular Plot Sampling (VCP). In VCP sampling an observer stands at a sampling station and records the radial (horizontal) distance between the observer and birds heard or seen. VCP is preferred over line transect distance sampling in patchy or densely vegetated habitats and in rugged or hazardous terrain. VCP sampling is also generally more suitable for habitat use analyses. As with the line transect method, each plot should be surveyed at least 3 times during the study season (e.g., breeding season). Observations should start at 1/2 hour after sunrise and be completed by 10:00am. At each station one observer records all birds seen or heard for 5 minutes. Birds observed in the first 3 minutes are recorded separately from those in the last 2 minutes. To lessen the influence of observer disturbance on birds, counting should begin 1 minute after arriving at a station. Laser rangefinders should be used to measure distances to birds. Birds observed flying overhead should be recorded, but no estimates of distance made. Birds flushed while walking between stations should be recorded in a similar manner. The VCP has become a de facto standard in the NPS I&M Program (Fancy and Sauer 2000). It is also the method used by the U.S. Forest Service in the Northern Great Plains.

Line Transect Distance Sampling. In line transect sampling an observer walks a transect and measures the perpendicular distance to each bird heard or seen. A variation is to record the sighting angle and distance to each bird and convert these to perpendicular distances. Line transects can be very efficient in open habitat because data are collected continually as an observer walks the transect. Like the VCP method, line transect sampling can be conducted during both the breeding and non-breeding seasons. Observations are generally started at 1/2 hour after sunrise and completed by 10:00am. Line transects should be replicated at least 3 times during the study season, if possible.

Systematic Searches. For certain species systematic searches of special habitats may need to be conducted. These special habitats might include cliffs, riparian zones, and historic locations of rare species. These searches are a specialized version of the random presence/absence searches described above.

Tape Playbacks. Broadcasting tape playbacks has been effectively used to survey for certain bird species, especially when the other more passive distance sampling methods are not appropriate. For example, tape playbacks may be used for nocturnal species such as owls. Generally speaking, tape broadcasts are played for 10 minutes followed by a 5 minute listening period. Playback inventories may also detect non-target species. For example, nocturnal owl playback inventories may detect Caprimulgids.

MAMMAL INVENTORY METHODS

The preferred sampling strategy and methods for mammals may vary from park to park, depending upon the specific needs, and perhaps upon inventories for other taxa that may also incidentally sample mammals. For example, pitfall methods employed for herpetological inventories may also capture small mammals. Wilson et al. (1996) provided a comprehensive collection of papers on measuring and monitoring mammalian diversity, and is the primary reference for the NGP Network. Mammal inventory methods likely to be used in the NGP Network are:

Pitfall Traps. Small plastic buckets have proven effective traps for shrews and other small mammals. The linearity of habitat will influence whether pitfalls are set in grids or lines. Pitfall traps are typically spaced at 5-20m intervals. Where possible, drift fences should be used to steer mammals into the pitfalls. Pitfalls are generally used unbaited, kept dry, and checked frequently so animals can be released alive.

Live-traps. Small and medium-sized rodents are effectively trapped in live-traps such as those made by Sherman or Tomahawk. Following identification and data collection, animals can be released unharmed. Traps placed in a grid design are more appropriate when density information is desired, although a linear design can be used. Traps should be checked at least twice daily, and set for three nights or more. The traps are baited with rolled oats or other food. When appropriate, live-traps can be set at habitat features (e.g., logs, trees, burrows), but they should remain within 2m of the station point.

Snap Traps. Snap traps are applied in similar fashion to live-traps. In contrast to live-traps, snap traps kill the individuals. To the extent possible, snap traps (e.g., Museum Specials, Victor rat traps) will be set in a fashion similar to that described above for live-traps. Snap traps are effective for species that are reluctant to enter live-traps, are cheaper, easier to carry, and less labor intensive because they can be checked less frequently.

Mist Nets. Mist nets are often used to capture and inventory bats. All water sources should be considered as mist-net sampling sites for bats. Mist net effort should be quantified based on size and numbers of nets set each night (i.e., net-nights). Generally speaking, 6-10m nets are sufficient although longer nets (14-20m) may be needed at times. When there are no water sources over which mist nets can be deployed it is sometimes possible to net areas that intuitively appear to be flyways through which bats might travel. Experienced bat researchers are best able to identify sites for mist-netting.

Bat Detectors. In selected areas, such as those with limited roosts and water sources, it may be necessary to use an ultrasonic bat detector to determine the presence of bats. If statistical inferences are desired, sample points or transects can be randomly selected. Most North American investigators use the Australian bat detector Anabat, made by Titley.

Oftentimes, calls are recorded on the hard drives of laptop recorders and saved for subsequent analysis.

Automated Cameras and Videotaping. The use of automated systems to document the presence of certain mammal species, and to monitor their abundance and distribution, has gained in popularity in recent years. This increasing use is due in large part to the increased reliability and capacity, reduced cost, and ease of use of the technology. The method is especially useful in documenting in a non-lethal manner mid and large size animals that frequently use trails and/or are attracted to bait.

Observations and Shooting. There is a suite of medium and large mammals that are not conducive to the sampling methods mentioned above. For many of these species the most cost-effective way to document presence/absence is by observations by knowledgeable personnel. Whenever possible, these observations should be documented with photographs. In some instances, specimens may need to be collected by shooting. Investigators can also collect road mortalities and other specimens for voucher purposes.

HERP INVENTORY METHODS

A variety or combination of methods can be used to complete reptile and amphibian inventories, as outlined below. The primary references for NGP Network herp inventories are Heyer (1994) and the Ministry of Environment, Lands and Parks, Resources Inventory Branch (2001).

Visual Encounter Surveys. Time/area constrained searches (TACS) are a common method used to generate lists of reptile and amphibian species present. This technique requires that an area of known size be searched and the time recorded. The search may consist of scanning with binoculars, using mirrors to shine into cracks in search of hidden animals, and looking underneath cover. In short, trained researchers use all available means to locate and document species present. Surveys often cover 1ha and consist of 4 person-hours. Ideally, at least 2 herpetologists should conduct each search. Nocturnal TACSs may also be conducted, preferably in the same plots searched by day.

Cover Boards. The use of cover boards consists of placing 0.6 X 2.0m boards flat on the ground. Many reptiles and amphibians use the boards for shelter. Cover boards are conducive to a systematic random sampling design, however, they are more expensive and labor intensive than a TACS. Cover boards should be placed out as early as possible in the spring. While using the cover board method investigators can also employ non-systematic searches by turning over rocks, logs, and other potential cover.

Road Driving. Driving slowly on roads, especially at night, is recognized as an excellent method for surveying some species of amphibians and reptiles. Time and distance covered during a road-driving session should be standardized when possible. Road-driving is typically done with 2 people in a vehicle travelling at 20 mph. Animals found dead and in good condition can be preserved as voucher specimens.

Calling Surveys. Calling surveys are often used, especially during the spring breeding season, to detect anurans. Calling surveys can be conducted using a line or point sampling design and are conducive to statistical inferences over time and space. Many conservation agencies or groups have established long-term monitoring programs using calling surveys. Investigators need to be well qualified and familiar with the species in the area.

Egg Mass and Tadpole Surveys. These surveys can often be conducted in the same habitat used in the calling surveys. Detection of eggs or tadpoles can be used both to directly identify species' presence where this can be determined from egg mass or tadpole characteristics, and to identify locations to be targeted in subsequent surveys when metamorphs are available for identification.

FISH INVENTORY METHODS

No fish inventories are anticipated in the NGP Network in FY02-04. The fish inventories in FY01 at Devils Tower NM, Fort Laramie NHS, Mount Rushmore NM, Scotts Bluff NM, and Wind Cave NP should conclude all necessary fish inventories for the Network. For a complete description of the objectives, methods, and budget of the FY01 fish inventories see the revised Northern Great Plains Inventory Study Plan for 2001.

VASCULAR PLANT INVENTORY METHODS

The primary objective of the NGP vascular plant inventories is to document 90% of the species present in the parks. Because a probability-based sampling approach tends to over-sample common habitats and consistently misses rare and spatially-scattered habitats, documentation of 90% of the species is best accomplished in some cases with complete inventories of small habitat patches. For example, review of past vascular plant inventories within the NGP Network determined that wetland habitats were not adequately surveyed in some parks. Therefore, the deficiency in wetland species will be addressed by targeted inventories that exhaustively sample these sites.

We will use a sampling approach that incorporates probability-based sampling to allow park-wide extrapolation where data mining efforts have determined that park-wide inventories are needed. Stratified random samples will be specified using a grid overlay to provide a geographic basis for distributing sampling effort. The samples will be stratified by vegetation type using the vegetation maps produced by TNC. These strata will provide a reference frame for extrapolation of inventory results and mapping species distributions. This approach will also allow us to intensify sampling within selected strata when necessary, as determined from previous vascular plant inventories.

Although simple area searches may be adequate in attaining the goal of documenting 90% of the species present, some type of plot sampling has the additional benefit of providing some abundance and distribution information, providing the background for designing a vegetation change monitoring program. Location of plot centers or corners with GPS technology allows for repeated visits either for seasonal inventories or long-term monitoring. Several methods are detailed below. The more complex transect and modified-Whittaker plots are much more time-consuming, and are generally not recommended for general floristic inventories. We will use a combination of methods depending on individual park needs. A primary reference for plant monitoring is Elzinga et al. (1998).

Area Searches. The area around the sample point can be thoroughly searched for species presence. The amount of time expended and the number of researchers should be noted. The search can be limited to a particular community type, or if the sample point is located in a mosaic of types or on an ecotone then all types should be searched. Experienced botanists are required in order for this technique to be useful. Additionally, to sample the total flora, several visits may be necessary at different seasons. Some plants may not even germinate in drought years, requiring multi-year visits. This technique, combined with a releve type approach, may be the most efficient method for completing basic vascular plant inventories in the parks.

Transects. A vegetation transect can be used to collect quantitative data and may be a useful approach for long-term monitoring. A transect is typically either 30 or 100 meters long and is permanently located. Various kinds of data can be collected along this transect, including cover and frequency data from quadrat frames, line-intercept cover, and height-cover points. The transect method is easier and quicker to use than the modified-Whittaker plot technique (see below), but cannot easily be used for species-richness estimates by the species-area curve approach.

Plot Sampling. Plot sampling consists of temporary or permanently positioned plots. A releve is a sample quadrat based on the concept of minimal area, and is the simplest and least time consuming of plot sampling techniques; estimates of amount of time for this technique vary from 20-40 minutes per station depending on vegetation complexity and experience of the field crew. Although the minimal area may be determined by a species-area curve using nested quadrats, quadrat sizes recommended by Mueller-Dombois and Ellenberg (1974) are frequently adopted. These include: temperate forest overstory (200-500m²), temperate forest undergrowth (50-200m²), dry grassland (50-100m²), wet meadow (5-10m²), and moss and lichen communities (0.1-4m²). In the releve method, cover by species within a quadrat (frequently a circular plot of 0.1 hectare, diameter of 17.84 meters). Abundance is recorded for each species as percent cover using a ranked scale from 1-5. Estimates of canopy cover and vegetation height can also be collected. The method is detailed in Rowlands (1994). If the station is permanently fixed using GPS, then it can be incorporated into future monitoring work.

A more detailed method, based on a modified-Whittaker plot design, is frequently used for a long-term permanent plot monitoring. Although much more time-consuming than the other methods, a great deal of useful data can be collected for subsequent analysis. A modified-Whittaker plot is a rectangle 20 meters by 50 meters (1000 m² or 0.1 hectare). Various smaller plots, ranging from 1 m² to 100 m² are nested within the larger plot. Within each of these smaller plots species presence, cover, density, or other attributes, are determined. This approach allows for the construction of species-area curves using a range of nested plot sizes. Examples of this method can be found in Stohlgren et al. (1995) and Yorks and Dabydeen (1998).

PROPOSED PROJECTS

The NGP Network has invested considerable effort in identifying and prioritizing needed inventory projects. This effort has included museum, park, and literature searches and reviews, scoping meetings, coordination with subject-matter experts, development of documented and expected species lists, identification and evaluation of park issues and needs, and consideration of current and future projects and budgets. The following table identifies the inventories that the NGP Network has committed to conducting in FY01-04 by park and taxon. All of these inventories are specifically targeted toward meeting objective #1 in the NPS I&M Program (i.e., document 90% of the species at the park for the respective taxon).

Table 4. Overview of Northern Great Plains Network inventory projects.

Park	Birds	Fish	Herps	Mammals	Plants
Agate Fossil Beds NM				X	
Badlands NP					
Devils Tower NM	X	X	X	X	
Fort Laramie NHS	X	X	X	X	X

Fort Union Trading Post NHS	X		X	X	X
Jewel Cave NM	X		X	X	X
Knife River Indian Villages NHS	X		X	X	
Missouri Nat. River and Recreation Area			X	X	
Mount Rushmore NMEM	X	X	X	X	
Niobrara NSR					
Scotts Bluff NM		X	X	X	
Theodore Roosevelt NP					
Wind Cave NP		X		X	

More detailed information on the dates, methods, and costs of these projects can be found in Appendix A. The appendix presents projects in a format that is conducive to contracting. For example, it is anticipated that all mammal work will be conducted under a single contract, as presented in the project description. In other words, the NGP Network had identified five projects that need to be conducted for all parks to meet the 90% objective: a bird inventory (at the parks listed above), a fish inventory (to be completed in 2001), a herp inventory, a mammal inventory, and a plant inventory.

Minor changes may occur to the scope and design of the projects identified above and in Appendix A as new information becomes available. For example, Scotts Bluff NM is about 80% complete for its herp surveys, needing only one more documented species out of an expected-but-undocumented list of four species. Further research and data mining between now and initiation of the field work may provide documentation on one of these species, or a reduction in the expected species list, thereby saving the Network the cost of having to conduct surveys where the return is minimal.

The above table, and the projects described in Appendix A, are not a complete list of all inventory projects expected to be completed by the NGP Network in FY01-04. The NGP Network has deliberately set-aside some inventory funds, and deferred the selection of additional projects, until a later date. The reason for this strategy, and some of the potential projects that may be funded, is discussed in the next section.

POTENTIAL FUTURE PROJECTS

The NGP Network has identified and prioritized a list of additional projects (i.e., not described in the above section) that are consistent with the objectives of the inventory phase of the NPS I&M Program. These projects are solely or primarily focused at objectives #2 and #3 of the program. In addition, future developments may occur that result in projects that are of high importance to the parks, but not included in the following list. Due to these contingencies and uncertainties, the NGP Network is committing at this time only to completing projects that satisfy the 90% objective (i.e., those projects described in Appendix A). The Network is not committing to initiating specific projects that solely or primarily address objectives #2 and #3. Rather, these projects will be initiated contingent on the availability of funds after objective #1 has been met for all taxa in all parks. At this time it is anticipated that some funds will be available for projects that solely or primarily address objectives #2 or #3. The NGP Network will work closely with the MWR and WASO I&M Programs in the identification, design, and approval of these projects prior to implementation.

The following bullets describe several contingencies and/or projects that could be implemented with the inventory funds not yet committed to projects. These bulleted items are contingent on future developments and therefore, are not listed in the following table, which includes only current or certain needs.

- Acquisition of new properties. Several parks in the NGP Network may acquire new lands in the next few years. A couple of the additions may be several thousands acres. Depending on the scope of the acquisitions, and an assessment of habitats, inventories may be desired on these tracts.
- Inadequate completeness in regards to objective #1 (i.e., the 90% objective). For example, the assessment of vegetation inventory completeness for the Missouri National Recreational River assumes that inventories currently being conducted at Ponca State Park capture 90% of the species in the park boundary. If this assumption is not met, additional surveys may be needed for the park.
- Parks may need inventory work that meets specific, but currently unknown, management objectives. For example, several parks are contemplating the reintroduction of extirpated fauna. Implementation of the reintroduction efforts may depend in part on the results of field inventories (i.e., objectives #2 and #3 in the I&M Program).

The NGP Network used a quantitative model to score and rank all known and current inventory needs at the parks. Many of these needs will ultimately be addressed through projects developed to satisfy objective #1 of the I&M program (i.e., the 90% objective). Other identified needs are consistent with inventory objectives #2 and #3. Projects were scored 1 (low) to 5 (high) based on 6 criteria:

1. Will the project assist park managers with making management decisions of immediate concern?
2. Is the resource to be inventoried likely to be important for monitoring?
3. Will the inventory provide more information on Federal or State T&E species and species of concern (concern doesn't have to mean rare, it can be a public interest species or other concern such as exotic spp.)?
4. Would the inventory provide information useful in planning projects (NEPA, future actions, etc.) and for management decisions?
5. How useful is the inventory for helping park management understand the park's ecosystem?
6. Is the project cost effective or feasible?

The subscore was then multiplied by a score of 1 (over 80% complete) to 5 (20% or less complete) based on the completeness of existing inventories. For example, if after scoring the above 6 criteria the subscore was 18, that factor would then be multiplied by 5 ($18 \times 5 = 80$) if the current taxa inventories were less than 20% complete.

The ranking of the projects can serve as a guide in determining the order at which future projects are funded, however, it is not binding. Other factors and future developments may result in a project selection order that deviates from the list (e.g., the acquisition of new properties).

Table 5. Park ranking of projects important to park management.

TAXON	PARK	PROJECT	SCORE
PLANT	MNRR	vegetation map	140
PLANT	NIOB	vegetation map of entire river	140
BIRDS	DETO	comprehensive breeding bird inventory	130
PLANT	FOUS	species inventory and vegetation map	130
PLANT	BADL	rare plant inventory	125
PLANT	MNRR	species inventory of vegetated islands	125
MAMMALS,HERPS, PLANTS	NIOB	comprehensive, coarse-scale inventory on east half of river	120
PLANT	MNRR	exotic plant inventory (remote sensing/aerial photography)	120
MAMMALS	MNRR	comprehensive mammal inventory	115
HERP	MNRR	general herp inventory	110
PLANT	BADL	plant species inventories of South Unit/Palmer Creek area	110
PLANT	MNRR	rare plant community inventory	100
BIRDS	BADL	comprehensive breeding bird inventory of South Unit/Palmer Creek area	96
MAMMALS	MORU	comprehensive mammal inventory	95
PLANT	MORU	supplemental plant species inventory	95
HERPS	FOUS	general herp inventory	90
HERPS	MORU	general herp inventory (amphibians/snakes)	85
MAMMALS	FOUS	bat inventory	85
BIRDS	FOLA	supplemental breeding bird inventory	81
MAMMALS	WICA	bat inventory	81
BIRDS	FOUS	comprehensive breeding bird inventory	80
MAMMALS	FOLA	bat inventory	78
MAMMALS	FOUS	comprehensive mammal inventory	75
BIRDS	MORU	supplemental breeding bird inventory	72
HERPS	BADL	targeted survey of rare areas	66
MAMMALS	BADL	comprehensive mammal inventory in South Unit/Palmer Creek area	66
HERPS	JECA	general herp inventory	64
HERPS	DETO	inventory of amphibians and turtles	63
PLANT	THRO	rare plant inventory	56
PLANT	THRO	supplemental species inventory of Elkhorn Unit?	54
HERPS	WICA	targeted supplement of frogs and snakes	52
PLANT	FOLA	supplemental species inventory (early/late season and wetlands)	52
MAMMALS	JECA	supplemental small/medium mammal inventory	51
MAMMALS	SCBL	targeted mammal inventory	50
HERP	FOLA	general herp inventory	46
MAMMALS	FOLA	supplemental small mammal inventory	44
MAMMALS	AGFO	general inventory of bat species	40
BIRDS	JECA	supplemental breeding bird inventory	34
HERPS	KNRI	targeted herp inventory (turtles/snakes)	33
PLANT	DETO	rare plant inventory	30
BIRDS	KNRI	targeted inventory (owls)	28
MAMMALS	KNRI	bat inventory	20
MAMMALS	BADL	supplemental small mammal inventory	16
MAMMALS	AGFO	targeted supplement of medium mammal inventory	15
PLANT	KNRI	vegetation map	

VOUCHERS

Voucher collections preserve individual specimens, and contribute significantly to the preservation of a park as a whole. Specimen-based research greatly enhances our understanding of parks and their natural resources, including a region's ecology and man's role in it through time. A third use of park collections is to help interpret the park to the visitor. A natural history data bank is a necessary part of park science.

The challenge is to document the occurrence of species and their status (breeding, residential, migratory, incidental), without disrupting their populations. No specimen will be collected from NGP Network parks without considering the policies and guidelines of the NPS regarding the collection of specimens. NPS Management Policies 2001 direct that:

"The Service will: ...Define, assemble, and synthesize comprehensive baseline inventory data describing the natural resources under its stewardship, and identify the processes that influence those resources." (Chapter 4.2.1)

However, in the interest of preserving the resource for future generations, the Management Policies also specify:

"Scientific natural resource collecting activities are governed by 36CFR 2.5. A very limited number of other types of natural resource collecting are governed by 36 CFR 2.1. In most cases, only small quantities may be collected. The repeated collection of materials to ensure a continuing source of supply for research or propagation is prohibited, unless the proposed activity clearly requires repeated collections, as might be the case with a monitoring or park restoration program." (Chapter 4.2)

"Collecting animals is allowed only if it results in information that provides for increased protection of resources or scientific knowledge not otherwise available, and if the collecting cannot be done outside the park. A collecting permit is required, and the NPS procedures for accessioning and cataloging specimens must be followed." (NPS-77, Natural Resources Management Guidelines, Chapter 2, p.39)

The NGP Network voucher policy is a means of striking a balance by providing guidelines for baseline inventory collecting. Collecting accidental kills to fill gaps in the voucher collection is encouraged when the specimen can be adequately preserved, and a valid park salvage permit is on file and sufficient provenience data can be recorded. Duplicate specimens will be considered on a case-by-case basis to document gender, age, and significant species variability only when the appropriate conditions have been met and adequate space is available to allow for the planned collection.

RECORDS AND CURATION

All specimens collected on NPS property shall become NPS property at the time of collection as a condition of the collecting permit, along with original field records and a copy of all reports generated from the research. Staff responsible for the curation of the specimens should be part of the review and approval process for collecting permits. Specimens and records alike must be curated according to the standards set forth in the NPS Museum Handbook. As stated in NPS Management Policies 2001 (Chapter 4.1.2):

"Information about natural resources that is collected and developed will be maintained in perpetuity. All forms of information collected through inventorying, monitoring, research, assessment, traditional knowledge, and management actions will be managed to professional and NPS archival and library standards."

Funds to accomplish the significant task of curation must be planned into the research project, per NPS Special Directive 91-4, "Ensuring that Natural Resource Projects Fund the Curation of Collections". Investigators will be responsible for entering or providing data compatible and compliant with the NPSpecies database. The permanent storage location of NGP Network voucher collections will be determined by the NGP Network in FY02. Potential storage options include a central repository, in park facilities, or in a combined arrangement. The decision on where to store vouchers will be based in part on the custodial and curatorial needs of the expected collections, and issues such as accessibility.

VOUCHER SPECIMENS

In many NGP Network parks the majority of documented species are verified by specimens or photographs housed in non-NPS repositories. Voucher specimens document the occurrence of a species within a park. Many specimens will be needed to produce a park-specific synoptic collection for each taxon.

In order to document the occurrence of a species within a site it is not necessary to collect samples representative of the ranges of variation within a species. However, a primary objective of the I&M Program is to measure the health of the park's ecosystems and its species without harming populations. Consider, for example, a study on water quality and genetic variation in tree frogs. Water samples can be collected, as well as a single, 'normal' tree frog specimen and a photograph of each gender. If frogs with mutated appendages are found, as they have been increasingly, additional voucher specimens may be warranted. Or the park may choose only to take additional tissue samples using non-lethal means and/or the frogs photographed.

For most vertebrates a voucher collection that includes a breeding season male and female and a juvenile is desired. This assortment should cover a range of maturity changes and gender differences in both skeletal structure and coloration. Whenever possible, photographs will be used to document additional phenotypic variability.

For vascular plants a specimen of each species is needed from each park. The specimen should include all parts necessary for identification. For small species an entire plant should be collected while it is in full flower. Seeds should be collected from the same location when they become available, and added to the sheet. For larger plants, especially woody species, leaves, flowers, and seeds will be collected in the same way as for herbs. Specimens should be preserved on standard acid-free herbarium sheets, 16.5x11.5 inches.

Rare species can be documented photographically. If a rare species has been documented photographically in the park, physical specimens which are found dead within and outside park boundaries can be used as verification aids, under a valid salvage permit. Photographs of live animals can also be used, but care will be taken to not disturb the animals, particularly those which may be in a nesting or breeding phase. Locally rare species may be minimally sampled as vouchers, but only after the stability of the local population has been established.

Specimens from a park which are found to, or used to, describe a new species are controlled property and especially valuable. They will be treated with extreme care, while remaining accessible to researchers (see the NPS Museum Handbook, Part I, Q: 6-7 for specifics).

The following table describes the quantity and type of voucher specimens that may be collected and prepared in the NGP Network.

Table 6. Types and amounts of inventory vouchers

TAXON	VOUCHER TYPES, Common and Established Species	Rare and Locally Rare Species
Mammals:		
Small	1 male, 1 female, 1 juvenile prepare skin and skeletons	photographs
Mid-size	1 male, 1 female, 1 juvenile prep skin and skeletons (skeleton if road kill) photograph variability	photographs hair samples tracks
Large	1 male, 1 female, 1 juvenile of managed animals, prepare skull photograph others 1 skeleton road kill	photographs hair samples tracks
Bats	1 male, 1 female, 1 juvenile prepare as skin and skeletons photograph with associated sonogram	photograph with associated sonogram wing punch
Birds:		
Small-Mid Size	1 male, 1 female, 1 juvenile, prepare skin and skeletons photographs and sound recordings of unusual sightings complete written description following accepted AOU standards photographs of nesting activity; photos of young	photographs and sound recordings of unusual sightings complete written description following accepted AOU standards photographs of nesting activity; photos of young
Large Birds	skin and skeletons of road kills photographs and sound recordings of unusual sightings complete written description following accepted AOU standards photographs of nesting activity, photos of young	skin and skeletons of road kills photographs and sound recordings of unusual sightings complete written description following accepted AOU standards photographs of nesting activity, photos of young
Herps	1 adult, prepare as wet specimen snake shed, if complete (snout to tail) sound recordings of anurans photographs of nesting/breeding	photographs sound recordings of anurans squamate sheds (snout to tail) nesting/breeding photographs from distance
Fish	1 adult, prepare as wet specimen	photograph
Vascular Plants:		
Herbs	one entire plant, in full flower or mature seed stage mature seed or flower, to complete root, if possible prepare on archival herbarium sheet	photograph leaf sample flower sample seed sample prepare on archival herbarium sheet
Woody Plants	leaves male & female flower seed pod & mature seed	leaves male & female flower seed pod & mature seed

This guidance may be revised as new information becomes available. However, in no way will the collection of voucher specimens deviate from NPS policy and procedures.

SECTION 4. COORDINATION AND LOGISTICAL SUPPORT

From inception, the Northern Great Plains Network has had regular meetings to define priorities, review data and products, identify future tasks, and disseminate information. Each park in the Network has at least one representative that regularly participates in the I&M process (see Section 6). The Network Coordinator is responsible for communicating and coordinating with park representatives. Monthly newsletters have been issued by the Network Coordinator since October 2000. These newsletters ensure clear communication and coordination between all Network parks.

To improve efficiency and decision making, a Steering Committee has been established for the Network (see Section 6). The Steering Committee is currently comprised of the Chief of Natural Resources from Theodore Roosevelt NP, the Chief of Resource Management at Devils Tower NM, the Resource Management Specialist at Badlands NP, the Natural Resource Specialist at Wind Cave NP, the Resource Management Specialist at Scotts Bluff NM, and the Superintendents from Badlands and Theodore Roosevelt NP. The Steering Committee works closely with the Network Coordinator and, when necessary, represents all parks in the Network. A primary purpose of the Steering Committee is to assist and direct the Network Coordinator in making decisions that affect the entire network, but for which there is not sufficient time or resources to convene or include all of the park representatives. The Resource Management Specialist from Scotts Bluff NM was added to the Steering Committee in part to assist in the transition of that park and Agate Fossil Beds NM from the Prairie Cluster LTEM program to the NGP Network. The Steering Committee is also responsible for providing feedback to the Network Coordinator on areas for improvement.

The primary policy and national contact for the NGP Network Coordinator will be the Midwest Region I&M Coordinator. The NGP Coordinator will work closely with the Regional Coordinator in all facets of the I&M Program. The Regional Coordinator has expressed a desire to have regular coordination and communication between all networks in the region. This should greatly benefit the NGP Network since many other networks are further along in the I&M process.

The NGP Network plans to work closely with the newly established Northern Great Plains Cooperative Ecosystems Studies Unit (CESU) located at the University of Nebraska-Lincoln. The NPS CESU Coordinator has already assisted the Network in the design of a museum study and the transfer of funds. The CESU includes several academic institutions that

The NGP Network has coordinated and collaborated with other agencies, organizations, and individuals involved in inventorying and monitoring natural resources. A detailed record of these efforts and partnerships is presented in Appendix D. Of primary importance is the relationship with the U.S. Forest Service. Nine of the 13 parks in the NGP Network adjoin U.S. Forest Service properties. The NGP Network will work closely with the Forest Service in the selection of survey methods, identification of species of management concern, ways to reduce costs, and all other facets of inventory and monitoring. Furthermore, there is a desire among many within the NGP Network to co-locate the NGP Network I&M Program with a Forest Service facility, if possible.

The current NGP Network Coordinator is, and will continue to be, supervised by the Chief of Natural Resources, Midwest Regional Office, stationed in Omaha, Nebraska. This arrangement will continue until monitoring money is available to the Network. Until such time the Network Coordinator will continue to spend approximately 1/3rd of his time serving as the Regional Wildlife Biologist. Many of the Network Coordinator's responsibilities while serving as the Regional Wildlife Biologist benefit the NGP Network, such as his role in inter-agency teams working on the black-tailed prairie dog, black-footed ferret, and swift fox. Funding for the Network Coordinator position will be split accordingly between his two roles in proportion to the amount of time spent in each capacity. It is anticipated that decisions regarding permanent supervision and duty station of the Network Coordinator will be made well prior to entering the monitoring phase of the I&M Program.

For most of FY00 and FY01 the NGP Network Coordinator was duty stationed at Theodore Roosevelt National Park. The I&M Program provided funding to the park for administrative support. When the current Coordinator was brought on board in July of 2001, he was duty stationed at Badlands National Park. For the near future the Coordinator and data technician will be located at Badlands NP. In FY02 the Network intends to have formal discussions about a permanent location for the I&M Program. Many Network members have expressed an interest and desire to permanently locate the program in Rapid City, South Dakota, in part because of the geographical and logistical advantages of being Rapid City, in part because of space limitations at many of the parks, and in part because of the potential of co-locating with another federal agency. Specifically, the Network is very interested in co-locating with the U.S. Forest Service because many of the parks share boundaries and issues with the Forest Service, and because of their active I&M Program. Such an arrangement is consistent with the Natural Resource Challenge which encourages partnership and collaboration with other federal agencies. Therefore, the NGP Network budget accounts for such a scenario (see Section 5). However, as stated above, no formal decisions have yet been made.

SECTION 5. PROJECT BUDGET AND COMPLETION SCHEDULE

The NGP Network anticipates receiving \$782,749 for inventory-related work from FY00-FY04. Approximately \$61,000 was spent in FY00 for pre-proposal work and fish inventories. In FY01 the Network received \$128,456 and should receive \$197,764 annually in FY02-04. Funding of the NGP Network Coordinator is unique in that 0.7 of the Coordinator's time will be spent on Network issues and the remainder will be spent on and charged to Regional Wildlife Biologist duties (with the exception of FY02; see table below).

Table 7. Budget for FY01 to FY04

BUDGET	2000	2001	2002	2003	2004	TOTALS
<i>Network Coordinator</i>						
Salary+benefits. GS-9, step 1.		42,590				\$42,590
Salary+benefits. 0.7 of a GS 12, step 7/8.			52,411 ¹	65,533	67,891	\$185,835
Travel (avg 5 days/mo @ \$100/day)		50,072 ²	4,000	4,000	4,000	\$62,072
Misc. costs, equipment, and supplies	17,000	2,000	3,000	2,000	1,000	\$25,000
Office rental ³				2,500	2,500	\$5,000
Administrative support		5,000	5,000	2,000	2,000	\$14,000
<i>Data management technician</i>						
Salary + benefits (GS 5/7)		1,500 ⁴	33,346	38,509	44,334	\$117,689
Travel			2,500	2,500	2,500	\$7,500
Computers		4,000				\$4,000
Misc. costs, equipment, and supplies		2,000	4,000	1,500	1,000	\$8,500
<i>Baseline studies</i>						
Contract for vertebrate voucher searches		10,000				\$10,000
Contract for plant voucher searches			7,500			\$7,500
Contract for literature search		2,906				\$2,906
Contract for plant expected lists		2,250				\$2,250
Contract for sampling concept		2,500				\$2,500
Pre-proposal workshop and other expenses	34,140					\$34,140
<i>Field inventories</i>						
Fish inventories	9,860	2,906				\$12,766
Herpetological inventories			30,075	28,925	4,600	\$63,600
Mammal inventories			34,038	32,688	12,574	\$79,300
Bird inventories			6,374	6,374	6,614	\$19,362
Plant inventories				11,300	19,300	\$30,600
Contingency inventories					30,000	\$30,000
<i>Other Expenditures</i>						
Voucher preparation and storage			15,000			15,000
Total	\$61,000	\$127,724	\$197,244	\$197,829	\$198,313	\$782,110

¹ In FY02 two pay periods of the Coordinators time spent on Network issues will be paid by an RO account.

² PCS expenses for Network Coordinator (in return, 8 pay periods of the Network Coordinator's time in FY01 was covered by a Regional Office account).

³ The budget assumes an off-park location in FY03 and FY04 (see Section 4 for more details).

⁴ A non-Network employee who was detailed to the program for data entry work.

The NGP Network budget, and specifically the field inventory component, was developed in consultation with subject-matter experts, a review of other studies, and an understanding of the logistics involved in conducting field inventories in the NGP Network. Travel estimates were based on federal government mileage and per diem rates. Personnel costs were based on the assumption of a higher paid principle investigator and a lower paid technician working in tandem on the projects (i.e., the per-hour cost was the average of the two). The costs budgeted for the field inventories is considered liberal. This approach helps ensure that the primary objective of the NGP Network inventories—document the presence of 90% of the vascular plants and vertebrates expected to occur in the parks—is met. The NGP Network has observed that many other Networks underestimated the costs associated with field inventories.

The NGP Network will pursue options to reduce the costs involved with the proposed field inventories. Cost reductions could be realized by the Network Coordinator and data technician, park staff, and/or volunteers participating in the inventories. If the field inventories committed to in this Study Plan cost less than estimated in the budget then the unused funds will be directed to other inventories.

In addition to the funds committed to the specific projects identified in this Study Plan, the Northern Great Plains Network budget reserves funds for contingency inventories. Allocation of these funds is dependent on several potential future developments. These developments and associated projects are, in general order of priority:

- Inadequate inventory completeness in terms of meeting I&M objective #1. For example, the assessment of vegetation inventory completeness for the Missouri National Recreational River assumes that inventories being conducted by non-NPS entities at Ponca State Park will capture 90% of the species in the MNRR park boundary. Should that inventory fall short of that goal NPS-funded inventories may be needed.
- Acquisition of new properties. Several parks in the NGP Network may acquire new lands in the next few years. A couple of the additions may be in the thousands of acres. Depending on the scope of the acquisitions, and an assessment of habitats, inventories may be needed on these tracts.
- Parks may need inventory work that meets specific management objectives not yet identified. For example, several parks are contemplating the reintroduction of extirpated fauna. The reintroduction efforts may depend in part on the results of field inventories (i.e., objectives #2 and #3 in the I&M Program).

Other inventory work is needed that is not contingent on future developments. These inventories—which primarily address objectives #2 and #3 of the NPS I&M program—have been identified and rank by order of importance by park staff. See Section 3, subsection Potential Future Projects, for a list of these projects.

The NGP Network has made significant progress in collecting, analyzing, and storing the background information necessary to identify and design future inventories. Tasks completed to date include literature searches, development of expected species lists, design of a sampling scheme, and entry of data into NPSpecies, the Dataset Catalog, NPBIB, and associated I&M databases. These tasks and a schedule of future tasks are listed in the following table.

Table 8. Schedule of work activities and tasks.

	2000	2001				2002				2003				2004		
	All	W	S	S	F	W	S	S	F	W	S	S	F	W	S	S
Pre-proposal	██████████															
Expect species list		██████████	██████████	██████████												
Literature search			██████████	██████████												
Develop sampling design			██████████	██████████												
Study Plan	██████████	██████████	██████████	██████████	██████████											
Museum search						██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████			
Data entry		██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████
Fish inventory					██████████											
Herp inventory						██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████			
Mammal inventory						██████████	██████████	██████████	██████████	██████████	██████████	██████████	██████████			
Bird inventory						██████████	██████████	██████████	██████████							
Plant inventory														██████████	██████████	██████████
Contingency inventories											██████████	██████████	██████████	██████████	██████████	██████████

SECTION 6. NGP NETWORK MEMBERS AND SUBJECT MATTER EXPERTS

As of September 30, 2001, the Northern Great Plains Network Steering Committee consisted of:

Sandee Dingman	Natural Resource Specialist	BADL
Bill Supernaugh	Superintendent	BADL
Jim Cheatham	Chief of Natural Resources	DETO
Bob Manasek	Resource Management Spec.	SCBL
Russ Runge	Chief of Natural Resources	THRO
Noel Poe	Superintendent	THRO
Dan Roddy	Natural Resource Specialist	WICA

Table 9. Park representatives in the Northern Great Plains Network

CONTACT	TITLE	PARK	ADDRESS	PHONE #
Ruthann Knudson	Superintendent	AGFO	301 River Road Harrison, NE 69346	308-668-2211
Brian Kenner	Chief of Nat Resources	BADL	PO Box 6 Interior, SD 57750	605-433-5260
Sandee Dingman	Nat Res Specialist	BADL	PO Box 6 Interior, SD 57750	605-433-5262
Eddie Childers	Wildlife Biologist	BADL	PO Box 6 Interior, SD 57750	605-433-5263
Bill Supernaugh	Superintendent	BADL	PO Box 6 Interior, SD 57750	605-433-5280
Jim Cheatham EOD 6/01	Chief of Nat Resources	DETO	PO Box 10 Devils Tower, WY 82714	307-467-5283
Steve Fullmer	Ranger	FOLA	HC 72 Box 389 Ft. Laramie, WY 82212	307-837-2221
Tammy Benson	Chief Ranger	FOLA	HC 72 Box 389 Ft. Laramie, WY 82212	307-837-2221
Andy Banta	Superintendent	FOUS	15550 Hwy 1804 Williston, ND 58801	701-572-9083
Audrey Barnhart	Curator	FOUS	15550 Hwy 1804 Williston, ND 58801	701-572-9083
Mike Wiles	Chief Res Management	JECA	RR 1 Box 60AA Custer, SD 57730	605-673-2061x1226
Todd Suess	Superintendent	JECA	RR 1 Box 60AA Custer, SD 57730	605-673-2061
John Moeykens	Chief Ranger	KNRI	PO Box 9 Stanton, ND 58571	701-745-3234
Lisa Eckert	Superintendent	KNRI	PO Box 9 Stanton, ND 58571	701-745-3741x10
Wayne Werkmeister	Res Mngmt Spec	MNRR	PO Box 591 O'Neil, NE 68763	402-336-3970
Mike Pflaum	Chief Ranger	MORU	PO Box 628 Keystone, SD 57751	605-574-2523x113
Mark Davison	Ranger	MORU	PO Box 628 Keystone, SD 57751	605-574-2523x125
Bruce Weisman	Curator	MORU	PO Box 628 Keystone, SD 57751	605-574-2523x168
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Noel Poe	Superintendent	THRO	PO Box 7 Medora, ND 58645	701-623-4466
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Barb Muenchau	Bio Tech-wildlife	WICA	RR 1 Box 190 Hot Springs, SD 57747	605-745-4600
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Note - Bold text indicates representative is also on the Northern Great Plains Network Steering Committee

The NGP Network has enlisted the assistance of numerous outside experts. The involvement of these subject matter experts has ranged from attendance at scoping meetings, review of expected species list, identification of park-specific management issues, and assistance in project design, among others.

Table 10. Non-NPS subject-matter experts and others who have assisted the NGP Network

NAME	TAXON	ADDRESS	PHONE
Dr. Jack Butler	PLANTS	Denver Federal Center, Bureau of Rec., Bldg 56 Denver CO 80025	303-445-3619
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Gerry Steinauer	PLANTS	NE Natural Heritage Program	402-694-2498
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Dr. Rick Stasiak	FISH	UN-Omaha, Dept of Biol., 62 & Dodge, Omaha NE 68182	402-554-2295
Fred Rychman	FISH	ND Game & Fish Dept, 13932 W Front St, Williston ND 58801	701-774-4320
Dr. Robert White	FISH	Montana State Univ, PO Box 173460, 301B Lewis Hall, Bozeman MT 59717	406-994-4549
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Dr. Royce Ballinger	HERPS	UNL, School of Biological Sciences, Lincoln NE 68588	402-472-8946
Dr. Robert Newman	HERPS	UND, Biology Dept., Box 9019, Grand Forks ND 58202	701-777-4290
Dr. Brian Smith	HERPS	Black Hills State Univ, Dept of Biology, USB#9044, Spearfish SD 57799	605-642-6879
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Richard Peterson	BIRDS	PO Box 118, Wewela SD 57578	605-842-2017
Dr. Doug Johnson	BIRDS	USGS Northern Prairie Wildlife Res. Ctr, 5711 37th St, Jamestown ND 58401	701-253-5539
Wayne Mollhoff	BIRDS		402-441-8012
John Dinan	BIRDS	NE Game Fish and Parks, PO 30370, Lincoln NE 68503	402-471-5440
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Dr. Rick Sweitzer	MAMMALS	UND, Biology Dept. Box 9019, Grand Forks ND 58201	701-777-4676
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Dr. Glen Sargeant	MAMMALS	USGS Northern Prairie Wildlife Res. Ctr, 5711 37th St, Jamestown ND 58401	701-253-5528
Doug Backlund	MAMMALS	SD Natural Heritage Program	605-773-4345
Mark Vieira	OTHER	Colorado Division of Wildlife, 317 W. Prospect, Ft. Collins CO 80526	790-472-4452
Dr. Kathy Tonnesson	OTHER	Intermountain CESU coordinator	406-243-4449

¹ Some subject-matter experts have expertise in more than one taxon, or in areas not specific to a taxon. For example, Dr. Glen Sargeant specializes in population dynamics and assessment. In such cases, the taxon associated with the subject-matter expert is their primary area of interest or experience, the taxon group they represented at the subject-matter experts workshop, or the taxon list they reviewed.

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Wind Cave National Park

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LIST OF ACRONYMS

AGFO	Agate Fossil Beds National Monument
BADL	Badlands National Park
CE	Categorical Exclusion
CESU	Cooperative Ecosystems Studies Unit
DETO	Devils Tower National Monument
EA	Environmental Assessment
EIS	Environmental Impact Statement
FOLA	Fort Laramie National Historic Site
FONSI	Finding of No Significant Impact
FOUS	Fort Union Trading Post National Historic Site
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
I&M	Inventory and Monitoring
JECA	Jewel Cave National Monument
KNRI	Knife River Indian Villages National Historic Site
MNRR	Missouri National Recreational River
MORU	Mount Rushmore National Memorial
NEPA	National Environmental Policy Act
NGP	Northern Great Plains
NHS	National Historic Site
NIOB	Niobrara National Scenic River
NM	National Monument
NMEM	National Memorial
NP	National Park
NPS	National Park Service

NVCS	National Vegetation Classification System
ROD	Record of Decision
SCBL	Scotts Bluff National Monument
TACS	Time/area Constrained Searches
THRO	Theodore Roosevelt National Park
USGS	United States Geological Survey
VCP	Variable Circular Plots
WASO	Washington Office, National Park Service
WICA	Wind Cave National Park

APPENDIX A — PROJECT STATEMENTS

Herpetological Inventories at Devils Tower, Jewel Cave, and Scotts Bluff National Monuments, Mount Rushmore National Memorial, Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites, and the Missouri National Recreational River.

PRINCIPLE INVESTIGATOR:

To be determined.

PROJECT STATEMENT:

The Northern Great Plains (NGP) Network has determined that herpetological inventories are needed at Devils Tower, Jewel Cave, Scotts Bluff National Monuments (NM), Mount Rushmore National Memorial (NMEM), Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites (NHS), and the Missouri National Recreational River. The NGP Network made this determination based on literature reviews, documented species at the park, scoping workshops, expert opinion, and a comparison of documented species lists to expected species lists. Justification for the project is described in detail in the Northern Great Plains Inventory Study Plan (Study Plan). The Principle Investigator is required to review the Study Plan before conducting field work. The Principle Investigator is also required to contact park staff prior to conducting field work at the park (contact the Network Coordinator or see the Study Plan for a list of park contacts).

Appendix F of the Study Plan lists the reptile and amphibian species documented at each of the above parks, and the species expected to be there, but not yet documented (although this list is reasonably close to complete, the Principle Investigator is advised to contact the NGP Network Coordinator for the most recent data). The primary purpose of the proposed field inventories is to document those species not yet documented at the parks, however, it is expected that the field inventories will also verify the current presence of already-documented species, and provide additional information on relative abundance, distribution, and habitat use.

Detailed information on the parks included in this project statement, and the status of existing inventories, can be found in the Study Plan. In summary, the status of the parks in regards to reptiles and amphibian inventories is:

- Devils Tower NM - 50% documented. undocumented list is 9 species (3 turtles, 3 anurans, 1 lizard, 1 snake, 1 salamander). habitat is the Tower, ponderosa pine forest, cottonwood floodplain, river, and a prairie dog town. 1360 acres
- Fort Laramie NHS - about 35% documented. undocumented list is 16 species (6 snakes, 1 anuran, 5 lizards, 3 turtles, 1 salamander). habitat is wheatgrass, disturbed areas, and riverine. 833 acres
- Fort Union Trading Post NHS - need complete inventory. undocumented list is 19 species (7 anurans, 7 snakes, 2 turtles, 2 lizards, 1 salamander). habitat is riparian woodland, riverine, and native and restored prairie. 450 acres
- Jewel Cave NM - about 25% documented. undocumented list is 5 species (3 snakes, 1 anuran, 1 salamander). ponderosa pine forest. 1355 acres
- Knife River Indian Villages NHS - about 60% documented. undocumented list is 6 species (3 snakes, 2 turtles, 1 anuran). habitat is forested floodplain and mixed-grass prairie. 1758 acres

- Missouri National Recreational River - need complete inventory. undocumented list is 27 species (10 snakes, 9 anurans, 5 turtles, 2 lizards, 1 salamander). habitat is upland, riparian forest, and riverine. 33,839 acres
- Mount Rushmore NMEM - need complete inventory. only 6 species on expected list (4 snakes, 1 anuran, 1 salamander). ponderosa pine forest. 1238 acres
- Scotts Bluff NM - at 80% documented. undocumented list is 4 species (2 anurans, 2 lizards). habitat is badlands juniper, mixed-grass prairie, prairie dog town, riparian cottonwood forest, riverine. 3003 acres

For the eight parks as a whole, 35% of the undocumented species are snakes, 30% are anurans, 16% are turtles, 12% are lizards, and 6% are salamanders. The methods proposed are designed to take advantage of this breakdown.

OBJECTIVES:

- Document the presence of those reptile and amphibian species not yet documented at the parks so that at least 90% of the expected species at a park have been documented.
- Conduct the inventories in a way in which it is reasonably certain that those species not documented in the inventories are likely not at the park and may be removed from the expected species list.
- Conduct the sampling in a way that inferences can be made about the distribution and relative abundance of the reptile and amphibian species of the park.
- When appropriate, acquire voucher specimens for species captured in each park (following the guidance in the Study Plan).
- Document amphibian deformities, if present.
- To the extent possible, locate and map breeding, feeding, and over-wintering areas.
- Collect relevant supporting data (e.g., moisture conditions).

METHODS:

The primary method used to search for reptiles and amphibians will be time/area constrained searches (TACS). Parks will be stratified by habitat so that all appropriate habitats are searched. The habitats to stratify by for the TACS are:

- Devils Tower NM: (4) ponderosa pine, grassland, prairie dog, riparian/green ash/cottonwood
- Fort Laramie NHS: (3) riparian forest, grassland, wetland/riverine
- Fort Union Trading Post NHS: (3) riparian forest, grassland, wetland/riverine
- Jewel Cave NM: (2) ponderosa pine unburned, ponderosa pine burned
- Knife River Indian Villages NHS: (2) riparian forest, grassland
- Missouri National Recreational River: (4) riparian forest, grassland, bluffs, wetlands/riverine
- Mount Rushmore NMEM: (1) ponderosa pine forest
- Scotts Bluff NM: (3) badlands topography, grassland, riparian forest

The Principle Investigator shall contact the Network Coordinator for vegetation maps to be used for stratification.

Each strata will be searched for 12 hours in the spring, summer, and fall. It is recommended that the 12 hours be split 50:50 between diurnal and nocturnal searches (the diurnal searches should be conducted first to better familiarize oneself with the habitat). Surveyors will focus on areas and features that are most likely to contain herps (e.g., under rotting logs). Detailed metadata will be kept on the location and amount of

area searched, time of the search, weather, and other factors. Approximately 750 hours will be spent cumulatively on preparing for and conducting the TACS.

Cover boards will be used only at Fort Laramie NHS, Fort Union Trading Post NHS, and Missouri National Recreational River (these parks have expected species that can be inventoried using the method). A grid of cover boards (30 X 30 X 5cm) will be placed based on a stratified random sampling design using the habitats described for the TACS (with the exception of the wetland/riverine habitats). Adjustments to the random approach may be necessary at the Missouri National Recreational River if access is restricted. For all parks, select "hot spots" identified by trained herpetologists may be targeted for additional sampling effort if they are not adequately covered by the random sample in the opinion of the investigators. The cover boards will be placed out as early as possible in the spring. Three transects of 20 boards each, spaced 5m apart, will be placed in each habitat type. While placing and conducting cover board surveys researchers will also employ non-systematic searches including the turning over of rocks, logs, and other potential cover in suitable habitat. Cover boards will be checked twice in the spring, summer, and fall. Cover boards will be removed in the fall (following the last TACS). Approximately 180 hours will be spent preparing and monitoring cover boards. (The Principle Investigator should work closely with the Network Coordinator and park staff to coordinate assistance in monitoring cover boards. This may reduce the number of visits to a park required by the Principle Investigator.)

Calling surveys will be used to document the presence of anurans and to record information on relative abundance. Due to the linear and complex nature of the riverine habitats, the sparseness of wetlands in the parks, and the primary objective of recording presence/absence, a non-systematic survey will be used. Investigators will cover as much of the parks as possible while recording anuran calls. The exception is the Missouri National Recreational River where representative sites will be surveyed. Surveys will be conducted from dusk until three hours after dusk. Each park will be surveyed once in the spring, summer, and fall, except for the Missouri National Recreational River. That park will be surveyed twice during each period. Calling surveys will be conducted at Devils Tower NM, Fort Laramie NHS, Fort Union Trading Post NHS, and the Missouri National Recreational River. Approximately 80 hours will be spent preparing for and conducting the surveys. Audio recordings will be made for purposes of documentation.

Road driving for purposes of surveying reptiles and amphibians will be conducted only at the Missouri National Recreational River (the other parks are too small to conduct systematic road surveys). However, investigators should be cognizant of herpetofauna while traveling in all parks and the opportunities to collect species. The tiger salamander is an expected but undocumented species at many parks; this species is frequently observed crossing roads during nocturnal periods following rain events (we strongly recommend initiating the survey following a strong rain, if possible). Road surveys at the Missouri National Recreational River will be conducted starting at dusk. The route will be 50 miles long (segments of road outside the park boundary notwithstanding). The route will be surveyed twice in the spring, summer, and fall. The survey will be driven at 15 to 20 mph. All herps observed will be recorded along with their location. The location of the observations will be recorded with the use of GPS. Since the remaining parks are too small for conventional driving surveys, observers will walk roads with flashlights looking for herps. Numerous passes made be made in one night. Data collection will be the same as the road driving survey (e.g., use GPS to record locations). Although this method is similar to the TACS it may document additional species because of the unique characteristics of roads. Approximately 80 hours will be spent preparing for and conducting this survey.

For all herpetofauna surveys the location data (e.g., site of observation, site of cover board) will be recorded using GPS equipment with an accuracy of approximately 15 meters. All location data should be recorded in Universal Transverse Mercator coordinates (UTM).

The Principle Investigator is encouraged to be adaptable and flexible in the methods used. If the investigator feels that another method will better document a species then the investigator shall contact the Network Coordinator and re-evaluate the methods used. Other methods not explicitly addressed in this project statement, but which may be considered include collecting tadpoles and the use of nets for aquatic turtles. The Principle Investigator is encouraged to review the Study Plan and the references cited below.

For those parks that adjoin or are in the vicinity of U.S. Forest Service property (Jewel Cave and Devils Tower NM, Mount Rushmore NMEM), the Principle Investigator will coordinate the herpetofauna inventories with the U.S. Forest Service to the maximum extent possible (e.g., concurrent inventories). This should increase the sample size and/or allow for inferences across space and management practices.

Voucher specimens will be preserved in jars, stored, and when requested, forwarded to the Network Coordinator or other site designated by the Coordinator. The Northern Great Plains I&M Network will enter the data collected from the field inventories into NPBib, NPSpecies, and the Dataset Catalog. In addition, NPS will transform spatial data into Arcview formats. The Principle Investigator needs to work closely with the NGP Network Coordinator to ensure that data is recorded in a way that is conducive to these data sets and software applications.

The Principle Investigator shall work closely with the Network Coordinator in all facets of the study. The NPS will contribute significantly to the study. This contribution may consist of field assistance by the Network I&M Program and park staff, use of spatial data, supplies, and other assistance.

The Network I&M Coordinator will ensure that all field inventories that could effect natural or cultural resources will be preceded by a thorough assessment of potential impacts and completion of appropriate compliance documentation. The compliance process will follow guidelines described in the Study Plan and those provided by the I&M WASO office and Director's Orders-12.

PRIMARY REFERENCES:

Heyer, W. R., M. A. Donnelly, R. W. McDiarmid, L. C. Hayek, and M. S. Foster. 1994. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution Press, Washington. 364pp.

Ministry of Environment, Lands and Parks, Resources Inventory Branch. 2001. Species inventory database. Prepared for the Terrestrial Ecosystems Task Force Resources Inventory Committee. Version 2.0. Government of British Columbia.
<http://www.elp.gov.bc.ca/rib/wis/spi/>

PRODUCTS:

The Principle Investigator will provide the following products:

- Annual (where applicable) and Final reports (11 copies) for inventories in standard scientific format including an introduction, detailed methodology, results, list of

species, and discussion. Analysis of the completeness of the surveys will be included in the report. Reports should be in MS Word format.

- Original field notebooks, notes, and photographs along with accompanying documentation.
 - Raw data in MS Access format.
 - Spatial data in Arcview format including original rover files, base files and differentially corrected files (if applicable) included on diskette, zip drive or CD; FGDC compliant metadata (the Principle Investigator should work closely with the Network Coordinator on metadata needs).
 - Voucher specimens (1 wet specimens of each species caught, wet specimens of incidentals [e.g., road kills], anuran recordings, etc.: see the Study Plan for details).
- (Note – Data entry into NPSpecies, NPBIB, the Dataset Catalog, and ANCS+ will be performed by the Network Coordinator and/or the Network Data Technician.)

PROJECT SCHEDULE:

April-September 2002. All methods will be employed at all parks. Investigators will start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward.

April-September 2003. All methods will be employed at all parks. Investigators will start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward.

December 2003. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

PERSONNEL HOURS:

Activity	FY02	FY03	FY04	Total
Time area constrained searches	375	375		750
Cover boards	100	80		180
Calling surveys	40	40		80
Night road driving and walking	40	40		80
Study design	120	40		160
Travel between sites	100	100		200
Report writing		40	250	290
Miscellaneous	100	100	50	250
Total	875	815	300	1990

* In addition, the NGP Network will contribute a minimum of 80 hours of personnel time to the field inventories.

BUDGET:

Expense	FY02	FY03	FY04	Total
Principle Investigator (420 hours)	\$8,000	\$8,000	\$3,500	\$19,500
Technicians (1,570 hours)	\$8,900	\$8,900	\$0	\$17,800
Supplies	\$1,500	\$500	\$500	\$2,500
Vehicle Use (\$0.32 per mile)	\$1,752	\$1,752	\$0	\$3,504
Lodging and per diem	\$6,000	\$6,000	\$0	\$12,000
Indirect Costs (15 %)	\$3,923	\$3,773	\$600	\$8,296
Total	\$30,075	\$28,925	\$4,600	\$63,600

Mammal Inventories at Agate Fossil Beds, Devils Tower, Jewel Cave, and Scotts Bluff National Monuments, Mount Rushmore National Memorial, Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites, the Missouri National Recreational River, and Wind Cave National Park.

PRINCIPLE INVESTIGATOR:

To be determined.

PROJECT STATEMENT:

The Northern Great Plains (NGP) Network has determined that mammal inventories are needed at Agate Fossil Beds, Devils Tower, Jewel Cave, and Scotts Bluff National Monuments (NM), Mount Rushmore National Memorial (NMEM), Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites (NHS), the Missouri National Recreational River, and Wind Cave National Park (NP). The NGP Network made this determination based on literature reviews, documented species at the park, scoping workshops, expert opinion, and a comparison of documented species lists to expected species lists. Justification for the project is described in detail in the Northern Great Plains Inventory Study Plan (Study Plan). The Principle Investigator is required to review the Study Plan before conducting field work. The Principle Investigator is also required to contact park staff prior to conducting field work at the park (contact the Network Coordinator or see the Study Plan for a list of park contacts).

Appendix F of the Study Plan lists the mammal species documented at each of the above parks, and the species expected to be there but not yet documented. The primary purpose of the proposed field inventories is to document those species not yet documented at the parks, however, it is expected that the field inventories will also verify the current presence of already-documented species, and provide additional information on relative abundance, distribution, and habitat use.

Detailed information on the parks included in this project statement, and the status of existing inventories, can be found in the Study Plan. In summary, the status of the parks in regards to mammal inventories is:

- Agate Fossil Beds NM - about 70% documented. undocumented list is 15 species (6 bats, 6 small mammals, 3 medium sized mammals). habitat is prairie and riparian willows. 3055 acres (however, only 2,270 acres of fee land)
- Devils Tower NM - about 50% documented. undocumented list is 26 species (11 small mammals, 7 bats, 7 medium sized mammals, 1 large mammal). habitat is the Tower, ponderosa pine forest, cottonwood floodplain, river, and a prairie dog town. 1360 acres
- Fort Laramie NHS - about 50% documented. undocumented list is 28 species (10 bats, 10 small mammals, 7 medium sized mammals, 1 large mammal). habitat is wheatgrass, disturbed areas, and riverine. 833 acres
- Fort Union Trading Post NHS – about 68% documented. undocumented list is 17 species (8 small mammals, 5 medium size mammals, 3 bats, 1 large mammal). habitat is riparian woodland, riverine, and native and restored prairie. 450 acres
- Jewel Cave NM - about 50% documented. undocumented list is 26 species (11 small mammals, 9 medium sized mammals, 4 large mammals, 2 bats). ponderosa pine forest. 1355 acres
- Knife River Indian Villages NHS - about 65% documented. undocumented list is 16 species (8 bats, 5 small mammals, 3 medium sized mammals). habitat is forested floodplain and mixed-grass prairie. 1758 acres

- Missouri National Recreational River - need complete inventory. undocumented list is 49 species (21 small mammals, 19 medium sized mammals, 8 bats, 1 large mammal). habitat is upland, riparian forest, and riverine. 33,839 acres
- Mount Rushmore NMEM - need complete inventory. undocumented list is 47 species (17 small mammals, 16 medium sized mammals, 10 bats, 4 large mammals). ponderosa pine forest. 1238 acres
- Scotts Bluff NM - about 67% documented. undocumented list is 16 species (6 small mammals, 6 medium sized mammals, 4 bats). habitat is badlands juniper, mixed-grass prairie, prairie dog town, riparian cottonwood forest, riverine. 3003 acres
- Wind Cave NP – about 60% documented. undocumented list is 23 species (10 bats, 7 small mammals, 6 medium size mammals). habitat is ponderosa pine forest, mixed-grass prairie, prairie dog town. 28,295 acres

For the nine parks as a whole, 37% of the undocumented species were small mammals, 32% were medium sized mammals, 25% were bats, and 5% were large mammals. The methods proposed are designed to take advantage of this breakdown.

OBJECTIVES:

- Document the presence of those mammal species not yet documented at the parks so that at least 90% of the expected species at a park of been documented.
- Conduct the inventories in a way in which it is reasonably certain that those species not documented in the inventories are likely not at the park and may be removed from the expected species list.
- Conduct the sampling in a way that inferences can be made about the distribution and relative abundance of the mammal species of the park.
- When appropriate, acquire voucher specimens for species captured in each park (following the guidance in the Study Plan).
- To the extent possible, locate and map habitats and features of special interest to mammals (e.g., dens).
- Collect relevant supporting data (e.g., temperature).

METHODS:

Pitfall traps, live-traps, and snap traps are all commonly used for inventorying small mammals (see Wilson et al. 1996). All methods are conducive to a systematic random design (refer to the Study Plan, specifically Appendix C). A grid will be overlaid on park maps with points stratified by habitat. The Principle Investigator shall contact the Network Coordinator for vegetation maps to be used for stratification. The small size of the parks to be surveyed allow for complete grid coverage and randomization, i.e., adjustments to randomness due to accessibility will not be necessary except for the Missouri National Recreational River where access could be severely limited in some areas. Stratification for that park will need to consider accessibility and the need to make inferences across the entire park. For all parks except Wind Cave NP (only bats will be inventoried at Wind Cave NP), select “hot spots” identified by the Principle Investigator may be targeted for additional sampling effort if they are not adequately covered by the stratified random sample. The habitats to stratify by for trapping are:

- Agate Fossil Beds NM: (2) grassland, riparian/willow
- Devils Tower NM: (4) ponderosa pine, grassland, prairie dog, riparian/green ash/cottonwood
- Fort Laramie NHS: (3) riparian forest, grassland, wetland/riverine
- Fort Union Trading Post NHS: (3) riparian forest, grassland, wetland/riverine
- Jewel Cave NM: (2) ponderosa pine unburned, ponderosa pine burned

- Knife River Indian Villages NHS: (2) riparian forest, grassland
- Missouri National Recreational River: (4) riparian forest, grassland, bluffs, wetlands/riverine
- Mount Rushmore NMEM: (1) ponderosa pine forest
- Scotts Bluff NM: (3) badlands topography, grassland, riparian forest
- Wind Cave NP: (0) Wind Cave will be surveyed only for bats which will use methods note requiring stratification

Pitfall traps will be used to inventory small mammals at Devils Tower and Scotts Bluff NM, Fort Laramie and Fort Union Trading Post NHS, Missouri National Recreational River, and Mount Rushmore NMEM. Pitfall traps are especially effective at capturing shrews as well as herpetofauna (the parks listed above all have expected but undocumented shrews and herpetofauna). The Principle Investigator of the mammal study will be required to document all herpetofauna caught. Transects of pitfall traps will be randomly located on a grid stratified by the habitats listed above with the exception of the wet habitats, the prairie dog town at Devils Tower (which receives high visitor use), and the badlands topography at Scotts Bluff NM and the bluffs at the Missouri National Recreational River (which are not conducive to the pitfall method). There will be 3 transects per habitat strata. Each transect will be at least 20m in length. Individual pitfalls will typically be spaced at 5m intervals. Drift fences at least 20cm high will be used to steer mammals into the pitfalls. Pitfalls will be unbaited, kept dry, and checked at least twice a day so animals can be released alive. Pitfalls will be used a minimum of 60 trap-nights per strata. When the study is completed the pitfall stations will be restored to their natural condition to the maximum extent possible (it is recommended that excavated material be used to refill holes). Approximately 300 hours will be spent preparing, monitoring, and restoring pitfall traps.

Live-traps and snap traps will be used at all parks except Wind Cave NP (which is conducting only a bat inventory). Recommended snap traps are Museum Specials, Victor traps, or similar. Recommended live-traps are those made by Sherman or Tomahawk. The Principle Investigator is responsible for procurement of traps and all other supplies (e.g., GPS units). The decision as to which type of trap to use will be left to the individual park and the preference of the Principle Investigator (snap traps may be used initially when voucher needs are high and live traps later as the percentage of specimens kept for vouchers declines: if density estimates are desired then live traps should be used along with mark-recapture). Linear transects of live-traps or snap traps will be randomly located on a grid that is stratified by habitat type (see above) with the exception of the wet habitats and the prairie dog town at Devils Tower (which receives high visitor use). The Principle Investigator may also trap areas that they identify as potentially adding species to the park list, however, these trap sites need to be noted as being non-random. There will be a minimum of 3 transects per strata. Both types of traps will be baited with rolled oats. When appropriate, traps can be set at habitat features (e.g., logs, trees, burrows), but they should remain within 2m of the station point. Transects will be 150m long. Trap stations will be spaced approximately 15m apart. Traps will be placed in pairs (i.e., two traps per station) to avoid saturation by "trap happy" individuals or species. Following identification and data collection, animals will be released unharmed from live-traps except for those needed for voucher purposes. Live-traps should be checked at least twice daily. Traps will be left out for a minimum of 500 trap-nights per habitat. If after 500 nights per habitat the documented species list is still short of 90% of the expected species list the Principle Investigator shall confer with the Network I&M Coordinator as to whether to continue trapping. Approximately 400 hours will be spent on this task.

The NGP Network will use a combination of mist nets and ultrasonic bat detectors to inventory bats. All of the parks listed above will have bat inventories except for Jewel

Cave NM (that park has had prior bat surveys conducted by Bogan [1994] and regularly monitors bat use in the park). Placement of nets will not be randomized or stratified by habitat, rather, expert opinion will be used to identify the sites most likely to capture the species expected to be in the area. Generally speaking, aquatic habitats should be targeted for mist-netting. Nets at riverine sites should be set perpendicular to the shoreline. However, some species are less dependent on aquatic habitats so a variety of other habitats may also be targeted (e.g., openings in the forest). Mist net effort should be quantified based on size and number of nets set and unit effort (i.e., net-nights). At least 4 evenings, with a minimum of 4 hours per event, should be surveyed per strata/park. Approximately 270 hours will be spent preparing for and conducting the surveys.

The use of ultrasonic bat detectors to record bats is becoming more common as the cost of the equipment decreases and the ability to identify species improves. Investigators will use an ultrasonic system to identify bats: the recordings will become the property of the NPS. The Principle Investigator will conduct recordings at sites most likely to support flying bats. The recordings may occur concurrently with the mist net monitoring. At least 4 evenings, with a minimum of 4 hours per event, will be surveyed per strata/park. It is assumed that much of the work will occur concurrently with mist net monitoring, therefore, this task adds only about 80 hours for preparing for the surveys, analyzing the data, and other tasks.

The collection of medium and large mammals for purposes of specimen vouchers, although desirable from a scientific perspective, is often not allowed in national parks for a variety of reasons. The decision of whether to deliberately collect medium and large size mammals for vouchers will be made on a park-by-park basis, and may vary by the species in question. The preferred method of voucher collection for medium and large size mammals is shooting; however, it is anticipated that this method will not be allowed. Therefore, an acceptable means of documenting species presence is the use of photographs, or the collection of other evidence such as tracks, hair, or fecal material. For all parks, some of this documentation may be collected opportunistically (e.g., road kills). It is anticipated that approximately 10 hours will be spent per park by the investigator to document mid and large size mammals observed incidental to other work. Approximately 100 hours will be spent on this task.

The Northern Great Plains Network has access to 12 automated camera units designed for documenting animal presence and behavior. These will be provided to the Principle Investigator who will use them in a way most appropriate for documenting species not likely to be recorded by the methods listed above. It is expected that they will typically be used with bait and/or lure (depending on the preference of the individual parks) to attract and photograph secretive carnivores and omnivores. Stations will be placed where they are most likely to document the species of interest (i.e., randomization and stratification by habitat will not be used). A minimum of 100 station/nights per park will be invested in this effort. Park and/or NGP Network staff can assist in monitoring the equipment and stations. It is expected that the Principle Investigator will spend 20 hours per park preparing and monitoring the stations, for a cumulative total of 200 hours.

Mammal specimens collected will be frozen, stored, and when requested, shipped directly to the NGP Network Coordinator or other repository identified by the Coordinator. All other materials (see products below) will be shipped to the Network Coordinator. The Network Coordinator will document all data in NRBib, NPSpecies, and the Dataset Catalog. The NGP Network will transform spatial data into GIS formats. The Principle Investigator needs to work closely with the NGP Network Coordinator to ensure that data is recorded in a way that is conducive to these data sets and software applications.

The NGP Network Coordinator will ensure that all field inventories that could affect natural or cultural resources will be preceded by a thorough assessment of potential impacts and completion of appropriate compliance documentation. The compliance process will follow guidelines described in the Study Plan and those provided by the WASO office and Director's Orders-12.

PRIMARY REFERENCES:

Ministry of Environment, Lands and Parks, Resources Inventory Branch. 2001. Species inventory database. Prepared for the Terrestrial Ecosystems Task Force Resources Inventory Committee. Version 2.0. Government of British Columbia.
<http://www.elp.gov.bc.ca/rib/wis/spi/>

Wilson, D. E., F. R. Cole, J. D. Nichols, R. Rudran, and M. S. Foster. 1996. Measuring and monitoring biological diversity: standard methods for mammals. Smithsonian Institution Press, Washington. 409pp.

PRODUCTS:

The Principle Investigator will provide the following products:

- Annual (where applicable) and Final reports (13 copies) for inventories in standard scientific format including an introduction, detailed methodology, results, list of species, and discussion. Analysis of the completeness of the surveys will be included in the report. Reports should be in MS Word format.
- Original field notebooks, notes, and photographs along with accompanying documentation.
- Raw data in MS Access format.
- Spatial data including original rover files, base files and differentially corrected files (if applicable) included on diskette, zip drive or CD, and FGDC compliant metadata (the Principle Investigator should work closely with the Network Coordinator on metadata needs).
- Voucher specimens (3 frozen specimens of each species caught in traps [male, female, juvenile], incidentals [e.g., road kills], photographs, etc.: see the Study Plan for details).

(Note – Data entry into NPSpecies, NP BIB, the Dataset Catalog, and ANCS+ will be performed by the Network Coordinator and/or the Network Data Technician.)

PROJECT SCHEDULE:

May-September 2002. Field inventories will be conducted. The Principle Investigator will work with the Network Coordinator to determine the sequence of parks and inventories conducted. Investigators are encouraged to start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward

May-September 2003. Balance of field work will be conducted. The Principle Investigator will work with the Network Coordinator to determine the sequence of parks and inventories conducted. Investigators are encouraged to start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward

December 2003. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

PERSONNEL HOURS:

Activity*	FY02	FY03	FY04	Total
Pitfall traps	200	100		300
Snap or live-traps	200	200		400
Mist nets	135	135		270
Ultrasonic bat detectors	40	40		80
Document medium and large mammals	50	50		100
Automated cameras	100	100		200
Study design	120	90		210
Travel between sites	40	40		80
Report writing	40	40	220	300
Miscellaneous	150	150	10	310
Total	1075	945	260	2250

* In addition, the NGP Network will contribute a minimum of 80 hours of personnel time to the field inventories.

BUDGET:

Expense	FY02	FY03	FY04	Total
Principle Investigator	\$25,552	\$24,202	10,350	\$60,104
Supplies*	\$500	\$500	\$100	\$1,100
Vehicle Use (\$0.32 per mile)	\$1,000	\$1,000	\$0	\$2,000
Lodging and per diem	\$2,000	\$2,000	\$0	\$4,000
Indirect Costs (18 %)	\$5,229	\$4,986	\$1,881	\$12,096
Total	\$34,038	\$32,688	\$12,574	\$79,300

* The Principle Investigator is responsible for all supplies (e.g., mist nets, bat detectors, traps, computers, GPS equipment, etc.) except for the automated cameras.

Bird Inventories at Devils Tower and Jewel Cave National Monuments, Mount Rushmore National Memorial, Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites, and Wind Cave National Park.

PRINCIPLE INVESTIGATOR:

To be determined.

PROJECT STATEMENT:

The Northern Great Plains (NGP) Network has determined that bird inventories are needed at Devils Tower and Jewel Cave National Monuments (NM), Mount Rushmore National Memorial (NMEM), Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites (NHS), and Wind Cave National Park (NP). The NGP Network made this determination based on literature reviews, documented species at the park, scoping workshops, expert opinion, and a comparison of documented species lists to expected species lists. Justification for the project is described in detail in the Northern Great Plains Inventory Study Plan (Study Plan). The Principle Investigator is required to review the Study Plan before conducting fieldwork. The Principle Investigator is also required to contact park staff prior to conducting fieldwork at the park (contact the Network Coordinator or see the Study Plan for a list of park contacts).

Appendix F of the Study Plan lists the bird species documented at each of the above parks, and the species expected to be there, but not yet documented. The primary purpose of the proposed field inventories is to document those species not yet documented at the parks, however, it is expected that the field inventories will also verify the current presence of already-documented species, and provide additional information on relative abundance, distribution, and habitat use.

Detailed information on the parks included in this project statement, and the status of existing inventories, can be found in the Study Plan. In summary, the status of the parks in regards to bird inventories is (birds are categorized by the habitat or time of day when they are most likely to be detected):

- Devils Tower NM – about 75% documented. undocumented list is 26 species (22 upland birds, 3 nocturnal, 1 waterbird). habitat is Tower, ponderosa pine forest, cottonwood floodplain, river, and a prairie dog town. 1360 acres
- Fort Laramie NHS - about 40% documented. undocumented list is 99 species (69 upland birds, 24 waterbirds, 5 nocturnal birds). habitat is wheatgrass, disturbed areas, and riverine. 833 acres
- Fort Union Trading Post NHS – about 70% documented. undocumented list is 47 species (35 upland birds, 9 waterbirds, 3 nocturnal birds). habitat is riparian woodland, riverine, and native and restored prairie. 450 acres
- Jewel Cave NM - about 67% documented. undocumented list is 20 species (19 upland birds, 1 nocturnal bird). ponderosa pine forest. 1355 acres
- Knife River Indian Villages NHS - about 85% documented. undocumented list is 20 species (18 upland birds, 1 waterbird, 1 nocturnal bird). habitat is forested floodplain and mixed-grass prairie. 1758 acres
- Mount Rushmore NMEM – about 60% documented. undocumented list is 22 species (18 upland birds, 4 nocturnal birds). ponderosa pine forest. 1238 acres
- Wind Cave NP – about 85% documented. undocumented list is 17 species (15 upland birds, 2 nocturnal birds). ponderosa pine forest, riparian areas, mixed-grass prairie. 28,295 acres

For the nine parks as a whole, 83% of the undocumented species are birds typically found in the uplands and detectable during the day, 10% are associated with aquatic habitats, and 7% are best detected during nocturnal periods..

OBJECTIVES:

- Document the presence of those bird species not yet documented at the parks so that at least 90% of the expected breeding species at a park have been documented.
- Conduct the inventories in a way in which it is reasonably certain that those species not documented in the inventories are likely not breeding at the park and may be removed from the expected breeding species list.
- Conduct the sampling in a way that inferences can be made about the distribution and relative abundance of the breeding bird species of the park.
- Opportunistically acquire voucher specimens of dead individuals found in each park (following the guidance in the Study Plan).
- To the extent possible, locate and map significant features such as nest sites.
- Collect relevant supporting data (e.g., weather conditions).

METHODS:

The number and variety of species that need documentation in many of the parks in the NGP Network is great. Variable circular point (VCP) counts (i.e., distance sampling) allow for the detection of a wide variety and great number of species. Furthermore, the method allows for statistical analyses such as comparisons over time and space and estimates of precision. It is anticipated that many of the parks identified for inventories will also include bird monitoring as part of their long-term monitoring program. Therefore, VCP counts will be used in all of the above named parks except for Fort Union Trading Post NHS. The area of that park is too small to conduct the VCP transects described here.

VCP transects will be stratified across habitat types. One to two transects will be established in each park (except Fort Union Trading Post NHS) using a stratified random grid. Each transect will consist of 15 points spaced 250 meters apart. If necessary, the transects may bend to include the necessary 15 points. Transects will be counted once during the breeding season (approximately mid-May to June) for each of 3 years (see below). Birds will be recorded for 5 minutes: birds observed in the first 3 minutes will be recorded separately from those recorded in the final 2 minutes (see the Study Plan, Fancy and Sauer 2000, and Ralph et al. 1993, for additional guidance). For those parks that adjoin or are in the vicinity of U.S. Forest Service property (Jewel Cave and Devils Tower NM, Mount Rushmore NMEM, Wind Cave NP), the grid and sampling design will be established consistent with and in collaboration with U.S. Forest Service inventory efforts to the maximum extent possible. For all parks the data will be collected in a manner that allows analysis of and comparison to counts that use fixed radius methods. This is especially important in the prairie parks because of the large number of past and ongoing bird studies that make use of the methodology.

VCP counts are expected to document a large number of the expected species. However, it is expected that incidental observations will occur while traveling to points, before or after the counting periods, or otherwise. Observers will document all these species separately.

A second component of the bird inventory will consist of special species/habitat inventories. These essentially consist of non-systematic and non-random searches by experienced ornithologists. Observers are encouraged to explore habitats not covered by the transects. For example, Fort Laramie and Fort Union Trading Post NHS have several

expected, but not yet documented, species associated with aquatic habitats. In these parks a concerted effort will be made to document birds associated with aquatic habitats. Observers will record all birds observed using a "microatlas" approach. Other habitats that warrant a special search include the prairie dog town, riparian area, and tower at Devils Tower NM; aquatic species at Knife River Indian Villages NHS; and the granite outcroppings at Mount Rushmore NMEM. The special species/habitat searches may also include tape callback methods, nocturnal surveys, and other specialized methods. The use of the methods is dependent of the park's expected but not documented list, which will vary from park to park and between years. The Principle Investigator shall coordinate with the Network Coordinator to identify the park-specific needs for specialize inventory methods.

All parks will have the surveys replicated for all three years. The following list the annual inventories by park (1 day of specialized searches is equivalent to 8 person-hours):

- Devils Tower NM – 1 transect in ponderosa pine, 1 day of specialized searches
- Fort Laramie NHS – 1 transect in grassland, 1 day of specialized searches
- Fort Union Trading Post NHS – 1 day of specialized searches
- Jewel Cave NM – 1 transect in unburned ponderosa pine, 1 transect in burned ponderosa pine, 1 day of specialized searches
- Knife River Indian Villages NHS – 1 transect in riparian forest, 1 transect in grassland, 1 day of specialized searches
- Mount Rushmore NMEM – 1 transect in ponderosa pine, 1 day of specialized searches
- Wind Cave NP – 1 transect in mixed-grass prairie, 1 transect in riparian

(Annual cumulative total is 9 transects and 6 days of specialized searches: project totals are 27 transects and 18 days of specialized searches.)

All spatial data will be recorded using GPS technology, accurate to within about 15 meters. This includes the location of survey points, observations during the specialized searches, locations of nests, incidental sightings, etc.. Observers are expected to make detailed notes and maps of all areas searched during the specialized searches.

The National Park Service will assist the field inventories to the maximum extent possible. This assistance may take the form of personnel hours, lodging, additional data, etc.. The Principle Investigator should work closely with the Network Coordinator to save costs wherever possible.

The National Park Service will enter the data into NRBib, NPSpecies, and the Dataset Catalog. In addition, NPS will transform spatial data into GIS formats. The Principle Investigator needs to work closely with the NGP Network Coordinator to ensure that data is recorded in a way that is conducive to these data sets and software applications.

The NGP network will ensure that all field inventories that could effect natural or cultural resources will be preceded by a thorough assessment of potential impacts and completion of appropriate compliance documentation. The compliance process will follow guidelines described in the Study Plan and those provided by the I&M WASO office and Director's Orders-12.

PRIMARY REFERENCES:

Britten, M. W. 1992. Avifauna and climbing at Devils Tower National Monument: Results of 1992 survey and literature search. Progress Report: March, 1993. Unpublished.

Fancy, S. G., and J. R. Sauer. 2000. Recommended methods for inventorying and monitoring landbirds in National Parks. Unpub. Rept. May 5, 2000.

Ministry of Environment, Lands and Parks, Resources Inventory Branch. 2001. Species inventory database. Prepared for the Terrestrial Ecosystems Task Force Resources Inventory Committee. Version 2.0. Government of British Columbia.
<http://www.elp.gov.bc.ca/rib/wis/spi/>

Ralph, C., G. Geupel, P. Pyle, T. Martin, and D. DeSante. 1993. Handbook of field methods for monitoring landbirds. Forest Service Report PSW-GTR-144.

PRODUCTS:

The Principle Investigator will provide the following products:

- Annual and Final reports (9 copies) for inventories in standard scientific format including an introduction, detailed methodology, results, list of species, and discussion. Analysis of the completeness of the surveys will be included in the reports. Reports should be in MS Word format.
- Original field notebooks, notes, and photographs along with accompanying documentation.
- Raw data in MS Access format.
- Spatial data in Arcview format including original rover files, base files and differentially corrected files (if applicable) included on diskette, zip drive or CD; FGDC compliant metadata (the Principle Investigator should work closely with the Network Coordinator on metadata needs).
- Voucher specimens.

(Note – Data entry into NPSpecies, NPBIB, the Dataset Catalog, and ANCS+ will be performed by the Network Coordinator and/or the Network Data Technician.)

PROJECT SCHEDULE:

April-September 2002. Conduct field studies.

December 2002. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

April-September 2003. Conduct field studies.

December 2003. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

April-September 2004. Conduct field studies.

December 2004. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

PERSONNEL HOURS:

Activity*	FY02	FY03	FY04	Total
Variable Circular Plot Transects	36	36	36	108
Special species and habitat searches	48	48	48	144
Study design	24	8	8	40
Travel between sites	40	40	40	120
Report writing		16	40	56
Miscellaneous	16	16	16	48
Total	164	164	188	516

* In addition, the NGP Network will contribute a minimum of 40 hours annually of personnel time to the field inventories.

BUDGET:

Expense	FY02	FY03	FY04	Total
Principle Investigator (184 hours @ \$30/hr)	\$1,846	\$1,846	\$1,846	\$5,538
Technician (332 hours @ \$19.5/hr)	\$2,166	\$2,166	\$2,166	\$6,498
Supplies	\$50	\$50	\$250	\$ 350
Vehicle Use (\$0.32 per mile)	\$350	\$350	\$350	\$1,050
Lodging and per diem	\$900	\$900	\$900	\$2,700
Indirect Costs (20%)	\$1,062	\$1,062	\$1,102	\$3,226
Total	\$6,374	\$6,374	\$6,614	\$19,362

Plant Inventories at Jewel Cave National Monument, Mount Rushmore National Memorial, Fort Laramie and Fort Union Trading Post National Historic Sites.

PRINCIPLE INVESTIGATOR:

To be determined

PROJECT STATEMENT:

The Northern Great Plains (NGP) Network has determined that vascular plant inventories are needed at Fort Laramie and Fort Union Trading Post National Historic Sites (NHS), Jewel Cave National Monument (NM), and Mount Rushmore National Memorial (NMEM). At the scoping workshop held in April 2000, plant experts and park staff reviewed the plant inventories, vegetation maps, and species lists that had been compiled up to that point. Data compilation and verification of species records during FY01 have contributed additional information about the status of plant inventories within the 13 parks of the NGP Network. Park representatives at a Network meeting in May of 2001 reviewed the updated vegetation inventory status of the Network parks and prioritized the inventories to be conducted, including some inventories important to management issues. The above mentioned parks need additional inventories for purposes of documenting the presence of 90% of the vascular plant species expected to be in the parks. Complete justification for the project is described in detail in the Northern Great Plains Inventory Study Plan (Study Plan). The Principle Investigator is required to review the Study Plan before conducting field work. The Principle Investigator is also required to contact park staff prior to conducting field work at the park (contact the Network Coordinator or see the Study Plan for a list of park contacts).

Appendix F of the Study Plan lists the vascular plant species documented at each of the above parks, and the species expected to be there but not yet documented. The primary purpose of the proposed field inventories is to document those species not yet documented at the parks, however, it is expected that the field inventories will also verify the current presence of already-documented species, and provide additional information on relative abundance, distribution, and habitat use.

Additional information about the parks included in this project statement, the status of existing inventories, and the sampling concept for the NGP Network can be found in the Study Plan. A summary of the ecosystems of each park and past vascular plant studies is presented here.

Fort Laramie National Historic Site (FOLA): Fort Laramie, near the western edge of the Great Plains, consists of grasslands associated with the high plains and floodplain forests along the Laramie River near its confluence with the North Platte River. A current species list for plants documented at FOLA has been compiled by the Wyoming Natural Heritage Program (Fertig 2000). Only 179 species are on the list (approximately 60% of the expected species); experts at the scoping workshop indicated that key species may have been missed from early and late in the growing season and that past studies may have had insufficient sampling in wetland areas. To rectify these deficiencies, early and late growing season vascular plants will be inventoried throughout the park over the spring (early May) and fall (early September) of one year, and wetland areas will be identified for complete inventories. A vegetation map produced for the park (TNC 1997 <http://biology.usgs.gov/npsveg/fola/folaveg.gif>) lists 16 vegetation types.

Fort Union Trading Post National Historic Site (FOUS): The land within the Fort Union Trading Post NHS boundary is comprised of two distinctive vegetative zones: the ancient floodplain on which the fort site is located, and the active floodplain along the Missouri River. An aerial photograph of the park reveals riparian vegetation (likely dwarf sagebrush

and cottonwood or aspen), floodplain (sandbar) areas, fields identified as prairie restoration plots, fields that appear to have been planted (perhaps to hay), and approximately a quarter of the site appears to be hilly and likely contains native vegetation. Fort Union has had two vegetation studies. One, an overview of the vegetation types at FOUS, was part of a study to identify native prairie in national parks, but did not result in a specific plant inventory (Stubbendieck 1986). The second study did provide a species list, however, no specimens were collected (Weist *et al.* 1980) and the species list is incomplete. A complete inventory at FOUS would provide voucher specimens of at least 90% of the plant species expected to occur at FOUS.

Jewel Cave National Monument (JECA): Jewel Cave NM consists primarily of ponderosa pine forest, much of which burned in 2000. Thirteen vegetation types were defined at Jewel Cave as part of the development of the vegetation map. These included four forest types, three woodland types, one shrub type, and five herbaceous types. However, in ponderosa pine forests two or more plant communities distinguishable on the ground may not be distinguished in aerial photographs and are lumped into single map units. Also, multiple communities may occur as mosaics of small distinct stands which vary over too fine a scale to be mapped individually. The vegetation map (TNC 1997 <http://biology.usgs.gov/npsveg/jeca/vegmap.gif>) lists 12 vegetation types that have been consolidated to five mapping units. Although several vegetation reports and check lists have been developed (Marriott and Hartment 1986, McDonald 1985, Shives *et al.* 1970-75), verification is still incomplete. A search of the literature has established verification of 66% of the vascular plant species expected to be at the park; however, the inventories were accomplished prior to the extensive fire in the summer of 2000. Therefore, a complete new inventory is needed.

Mount Rushmore National Memorial (MORU): The vegetation of MORU is composed primarily of ponderosa pine forest. A vegetation baseline study was completed in 1986 (Hoffman and Hansen 1986). The classification of the vegetation of Mount Rushmore NM completed for the vegetation map resulted in nine types being defined, including two forest types, four woodland types, two herbaceous types, and one sparsely vegetated type condensed into four mapping units (TNC 1997 <http://biology.usgs.gov/npsveg/moru/vegmap.gif>).

OBJECTIVES:

- Identify and record at least 90% of vascular plant species occurring within Fort Laramie and Fort Union Trading Post NHS, Jewel Cave NM, and Mount Rushmore NM.
- Within plots collect cover data by strata and accompanying habitat information in a manner compatible with the NBII plot data standards.
- Implement a random sampling method that allows for inference to nonsampled areas.
- Record GPS locations for plot locations and rare species.
- Collect voucher specimens for each species not currently in park collections.

METHODS:

FOLA, JECA, and MORU will be stratified based on vegetation type using the digital vegetation maps developed through the USGS-NPS vegetation mapping program, or by digital aerial photograph. Geologic or topographic maps and features may be used for the stratification at FOUS. The minimum mapping unit for the USGS-NPS vegetation maps is 0.5 ha; this will be the minimum polygon size for vegetation classes. The polygons will be ground-truthed prior to sampling. Polygon stratification may be further refined based on

the partial list of species and voucher specimens that have already been collected at each park.

A grid of cells based on UTM coordinates will be overlaid on the maps and photographs. The size of the cells will be determined by the vegetation type that requires the finest scale to sample. A list of random locations (at the center/corner of grid cells) will be generated for each stratum or vegetation polygon. These random points will be located in the field using a GPS unit and marked so that the plots can be relocated for subsequent sampling. Due to the small size of the parks to be sampled, logistical and accessibility constraints should not need consideration in selecting plot locations. At each random location, a plot will be placed on the ground and the enclosed area thoroughly searched and each species encountered recorded. Cover estimates will also be made for each species by strata.

A form of a releve plot method, such as a standard 0.1 hectare circular plot (diameter of 17.84 meters), allows for a species richness determination as well as providing a rapid assessment of abundance. Species encountered will be recorded by an investigator familiar with the flora of the region. Plants will be identified to the species level at a minimum and sub-species where appropriate. Nomenclature will follow ITIS standards. Estimates of canopy cover and vegetation height by strata, and information about the habitat of the area will also be recorded. Voucher specimens will be collected where appropriate and processed according to accepted herbaria practices (see the Study Plan). The principle investigator is required to contact the NGP Network Coordinator in regards to specimen storage.

In addition to grid-based randomized sampling, small habitat patches that may be unique, but not displayed on the vegetation map, will be sampled as detected if they are not part of the random sample. The location of any such areas will be recorded with a GPS unit. Purposive sampling of these sites will assist in efficiently reaching the goal of documenting 90% of the species. However, since this type of sampling will not conform to assumptions implicit to the grid-based randomized design, they will not be used for statistical inference. Only plots from the grid-based sample will be used in models to estimate species richness. Species detected during purposive sampling will only be included in the total species list and counted in the tally towards attainment of the goal.

NPS or university botanists will review a sub-sample of vouchers to assess identification accuracy. A minimum of 95% accuracy is expected. A subset of raw data forms will also be cross-checked against database records; 95% accuracy is expected in data transcription and reporting. The principle investigator is expected to participate in 75% of the fieldwork.

PRIMARY REFERENCES:

Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and monitoring plant populations. Bureau of Land Management, Denver CO. 492 pp.

Fertig, W. 2000. Rare plants of Fort Laramie NHS. Wyoming Natural Diversity Database. Report prepared for the 2000 scoping session.

Hoffman, George R. and P. L. Hansen. 1986. Vegetation Baseline Study of Mount Rushmore National Monument.

Marriott, H., and R. L. Hartment. 1986. Completion report: A survey of the vegetation of Jewel Cave National Monument. Department of Botany, University of Wyoming.

Marriot, H. 1999. The Black Hills Community Inventory. The Nature Conservancy.

Marriott, H. Vegetation mapping, Mount Rushmore National Memorial. The Nature Conservancy.

McDonald, D. L. 1985. Ecological associations of ponderosa pine inside Jewel Cave National Monument, Custer, SD. Cooperative Park Studies Unit, Texas A & M University, Technical Report No. 1., July 15, 1985.

Shives, J., P. Knuckles and J. Roth. 1970-75 vascular plants of Jewel Cave National Monument.

Stubbendieck, J. An Identification of prairie in National Park Units in the Great Plains.

The Nature Conservancy, Midwest Conservation Science, Minneapolis Satellite Office. 1999. Final Report, The Black Hills Community Inventory.

Weist, K. M., J. S. Lowe, P. B. Willard and P. B. Wilson. Current and historic natural resources of the Fort Union Trading Post National Historic Site.

PRODUCTS:

- Annual and Final reports (7 copies) for inventories in standard scientific format including an introduction, detailed methodology, results, and discussion. Analysis of the completeness of the surveys will be included in the reports. Reports should be in MS Word format.
- Original field notebooks, notes, and photographs along with accompanying documentation.
- Raw data in MS Access format.
- Spatial data in Arcview format including original rover files, base files and differentially corrected files (if applicable) included on diskette, zip drive or CD; FGDC compliant metadata (the Principle Investigator should work closely with the Network Coordinator on metadata needs).
- Voucher specimens.

(Note – Data entry into NPSpecies, NPBIB, the Dataset Catalog, and ANCS+ will be performed by the Network Coordinator and/or the Network Data Technician.)

PROJECT SCHEDULE:

May-September 2003. Conduct field studies.

December 2003. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

BUDGET:

Expense	FY02	FY03	FY04	Total
Personnel (100 days @ \$30.00/hr)	\$0	\$8,300	\$16,300	\$24,600
Supplies	\$0	\$500	\$500	\$1,000
Transportation (\$0.32 per mile)	\$0	\$500	\$500	\$1,000
Lodging and per diem	\$0	\$2,000	\$2,000	\$4,000
Total	\$ 0	\$11,300	\$19,300	\$30,600

APPENDIX B — PLANNING AND COMPLIANCE

The parks in the Northern Great Plains Network and the Network Coordinator will ensure that all inventory-related projects meet the intent and requirements of the National Environmental Policy Act, other federal and state laws, and the NPS mission, policies, orders, and other guidance. The following outlines the steps to be taken in meeting these planning and compliance needs.

Step 1. Describe the Project

The project descriptions will include:

- clear project goals and objectives and a description of how they were derived (a reference to the Inventory Study Plan may suffice for this need);
- a complete description with figures (e.g., maps and drawings) of where the work will take place and the methods that will be used;
- a detailed description of which resources may be affected, either directly (e.g., voucher specimen collection) or indirectly (e.g., travel to study areas); and,
- assignment of responsibilities for general project oversight, compliance process documentation, and actual work.

Step 2. Obtain Concept Approval

The superintendent of each park in the NGP Network should approve or reject the concepts presented in the general project description. Each superintendent may indicate that certain revisions are needed and/or request more detailed information. The concept approval process and changes made as a result thereof should be documented in the project description.

Step 3. Conduct Internal Scoping

An in-house team for each park will review and evaluate the proposed project and alternatives, if any. This team determines whether additional information, project definition, or planning details are needed.

The in-house review team is usually interdisciplinary and includes at a minimum:

- the park compliance coordinator,
- cultural and natural resource technical specialists (involvement depends on the types of resources potentially affected).

It is advisable for the in-house team to conduct one or more site visits with the Network Coordinator and principle investigator(s) to fully understand the potential impacts on park resources, visitors, and operations. The environmental compliance screening form (see example below) is usually completed at this step.

Step 4. Create a Complete Project Plan

The project plan will be completed consistent with the previous steps. The plan will be forwarded to the compliance coordinator for the park. The project planner is responsible for facilitating assistance from outside the NPS, possibly including consultation with the U.S. Fish and Wildlife Service and the State Historic Preservation Officer.

Step 5. Prepare Required Compliance Documents

NEPA is the nation's primary environmental planning and compliance law. Other compliance laws are typically addressed through the NEPA process. The NPS Director's Order #12 specifically addresses how the agency complies with NEPA.

It's anticipated that most inventory projects may be categorically excluded from detailed analysis (dependent on issues and impacts identified in the previous steps). NPS categorical exclusions are detailed in 516 DM 6 App. 7.4 C(20) and E(1-3). If a project does not meet the categorical exclusions, the project will likely require a detailed environmental assessment (EA). It is unlikely that any inventory projects will require an environmental impact statement (EIS). The Network Coordinator will insure that the appropriate level of compliance documentation is completed in accordance with the procedures established in each park.

Generally speaking, compliance issues and documentation is expected to be minor or negligible. However, parks and principle investigators will be advised that inventory projects that involve ground-disturbing activities, such as using pitfall traps to inventory reptiles, amphibians, and shrews may require detailed review under Section 106 of the National Historic Preservation Act.

Step 6. Obtain Approval to Start Project

The superintendent for each park has the authority to approve the use of categorical exclusions. EAs and EISs need to be approved by the Regional Director of the Midwest Region.

ENVIRONMENTAL SCREENING FORM

This form must be attached to all documents sent to the Regional Director's office for signature. Sections A and B should be filled out by the project initiator (e.g., Network Coordinator). Sections C, D, E, and F are to be completed by the park compliance-review teams. Sections A-F and J must remain in this format; sections G-I may be modified to meet individual park needs (or compliance procedures and forms developed by the park may be used in lieu of that section).

A. PARK NAME _____ Project Number _____

Project Type (Circle): Cyclic, Cultural Cyclic, Repair/Rehab, Park ONPS, NRPP, CRPP, PRAM, FLHP, Line Item, Fee Demo, Concession Reimbursable, Other (specify) _____

Project Location _____ Project Originator/Coordinator _____

Project Title _____

Contract # _____ Contractor Name _____

B. PROJECT DESCRIPTION/LOCATION *(Attach maps, notes of site visits, agency consultation, relevant data or reports, and the categorical exclusion form [if relevant] .)*

Preliminary drawings attached? ____ Yes ____ No Background info attached? ____ Yes ____ No
Date form initiated _____ Anticipated date compliance should be complete _____
Projected advertisement/day labor start _____ Construction start _____

C. MANDATORY CRITERIA CHECKLIST *If you have completed a site visit (if necessary), consulted with affected agencies and/or tribes, can answer all the lines in the checklist below with "no", and the project is described in Director's Order #12 sections 3-4, you may proceed to the categorical exclusion form. If any of the answers in the checklist below are "yes" or "data needed to determine", or the action is not described in Director's Order #12 sections 3-4, you may need to redefine the project or prepare an EA or EIS.*

Would the proposal, if implemented:	Yes	No	Information needed
A. Have significant adverse effects on public health or safety?			
B. Have adverse effects on such unique characteristics as historic or cultural resources, park, recreation or refuge lands, wilderness areas, wild or scenic rivers, sole or principal drinking water aquifers, prime farmlands, wetlands, floodplains, or ecological significant or critical areas, including those listed in the National Register of Natural Landmarks?			
C. Have highly controversial environmental effects?			
D. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?			
E. Establish a precedent for future action or represent a decision			

in principle about future actions with potentially significant environmental effects?			
F. Be directly related to other actions with individually insignificant, but cumulatively significant environmental effects?			
G. Have adverse effects on properties listed or eligible for listing on the National Register of Historic Places?			
H. Have adverse effects on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have adverse effects on designated Critical Habitat for these species?			
I. Require compliance with Executive Order 11988 (Floodplain Management), Executive Order 11900 (Protection of Wetlands), or the Fish and Wildlife Coordination Act?			
J. Threaten to violate a federal, state, local or tribal law or requirement imposed for the protection of the environment?			
K. Require a permit from a federal, state, or local agency to proceed, unless the agency from whom the permit is required agrees a CE is appropriate?			
L. Have the potential for significant impact as indicated by a federal, state or local agency or Indian Tribe?			
M. Have the potential to be controversial regardless of its impact?			

D. CHECKLIST OF IMPACTS TO NATURAL OR CULTURAL RESOURCES *(May be tailored to meet individual park/unit project needs.)*

Are there significant impacts on:	Yes	No	Information needed
A. Geological resources – soils, bedrock, streambeds etc.			
B. From geohazards?			
C. Air quality, traffic, or from noise			
D. Water quality or quantity			
E. Streamflow characteristics			
F. Marine or estuarine resources			
G. Floodplains or wetlands			
H. Land use, including occupancy, income, values, ownership, type of use			
I. Rare or unusual vegetation – old growth timber, riparian, alpine			
J. Species of special concern (plant or animal; state or federal listed or proposed for listing) or their habitat			
K. Unique ecosystems, biosphere reserves, World Heritage sites			
L. Unique or important wildlife or wildlife habitat			
M. Unique or important fish or fish habitat			
N. Introduce or promote non-native species (plant or animal)			
O. Recreation resources, including supply, demand, visitation, activities, etc.			
P. Visitor experience, aesthetic resources			
Q. Cultural resources including cultural landscapes, ethnographic resources			
R. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure			
S. Minority and low income populations, ethnography, size, migration patterns, etc.			
T. Energy resources			
U. Other agency or tribal land use plans or policies			
V. Resource, including energy, conservation potential			
W. Urban quality, gateway communities, etc.			
X. Long-term management of resources or land/resource productivity			
Y. Pollution prevention (greening the parks)			

Z. Other important environment resources?			
---	--	--	--

E. PLANNING AND COORDINATION

Check one or both boxes as appropriate

Personnel preparing this form are familiar with the site _____
and/or a site visit was conducted _____

(Attach meeting notes or additional pages noting when site visit took place, staff attending, etc.)

Is the project in an approved plan with accompanying environmental document? ☐ Yes ☐ No

If so, plan name _____

FONSI/ROD (Circle one) Date approved _____

Is the project consistent with the approved plan? ☐ Yes ☐ No *(If no, prepare plan, EA, or EIS)*

Are there any interested or affected agencies or public? ☐ Yes ☐ No

Did you make a diligent effort to contact them? ☐ Yes ☐ No

Has consultation with all affected agencies or tribes been completed? ☐ Yes ☐ No *(Attach additional pages detailing the consultation, including the name, date and summary of comments from other agency or tribal contacts.)*

F. TECHNICAL REVIEW SIGNATURES *(All park interdisciplinary team members need to sign)*

In signing this form, you are saying you have completed a site visit or are familiar with the specifics of the site, have consulted with affected agencies and tribes, and that the answers to the questions posed in the checklist are, to the best of your knowledge, correct.

Interdisciplinary Team Leader Date

Technical Specialist Field of Expertise

Technical Specialist Field of Expertise

Technical Specialist Field of Expertise

G. COMPLIANCE DOCUMENTATION

The following NEPA information entered by: _____

(Choose one and fill in blanks)

___CE CE Citation 516DM__ Appendix _____
Excepted actions apply? ☐ Yes ☐ No *(If yes, do EA or EIS)*

(Attach signed CE form)

___EA EA released to public? ☐ Yes ☐ No
FONSI date _____

___EIS ROD date _____

The following National Historic Preservation Act information entered by: _____

Ground disturbance involved? ☐ Yes ☐ No

Historic structures involved? ☐ Yes ☐ No

Cultural landscapes involved? ☐ Yes ☐ No

Ethnographic concerns involved? ☐ Yes ☐ No

If yes, interested parties contacted? ☐ Yes ☐ No

(Choose one and fill in blanks)

☐ No historic properties affected

☐ Programmatic exclusion Citation _____ Date AEF to SHPO/THPO _____

☐ Determination of effect ☐ No adverse effect ☐ Adverse effect

Date to SHPO/THPO _____ Date to ACHP _____

Date consultation completed _____

The following Endangered Species Act information entered by: _____

Any threatened/endangered species in area? ☐ Yes ☐ No

If species in area: ☐ No effect ☐ Not Likely to Adversely Affect ☐ Likely to Adversely Affect

Date of memo to FWS _____ Date FWS responded _____

The following floodplains/wetlands/§404 permits information entered by: _____

Is project in 100- or 500-year floodplain? ☐ Yes ☐ No If yes, statement of findings

Is project in wetlands? ☐ Yes ☐ No Date _____

404 permit needed? ☐ Yes ☐ No Date _____

State 401 certification? ☐ Yes ☐ No Date _____

State Water Quality permit? ☐ Yes ☐ No Date _____

Tribal Water Quality permit? ☐ Yes ☐ No Date _____

CZM Consistency determination? ☐ Yes ☐ No Date _____

The following other permits/laws information entered by: _____

Wilderness minimum tool decision needed? ☐ Yes ☐ No Date _____

Wild and Scenic River concerns? ☐ Yes ☐ No Date _____

National Trails concerns? ☐ Yes ☐ No Date _____

Air Quality consultation with State? ☐ Yes ☐ No Date _____

Other _____ ☐ Yes ☐ No Date _____

Consistent with Architectural Barriers, Rehabilitation, and Americans with Disabilities Acts?

☐ Yes ☐ No

H. MITIGATING MEASURES TO BE INCLUDED IN PROJECT

(Specify here or attach appropriate pages from EA, EIS, FONSI, or ROD)

I. LOCATION OF ADMINISTRATIVE RECORD

Park or location name _____

Contact _____

J. APPROVAL SIGNATURES Based on the information provided in this environmental screening form, environmental documentation for the subject project is complete.

Recommended:

Park Compliance Specialist

Date

Approved:

Superintendent

Date

**GENERAL GUIDELINES FOR SAMPLE SURVEYS OF
VASCULAR PLANTS AND VERTEBRATES
NATIONAL PARK SERVICE
NORTHERN GREAT PLAINS NETWORK**

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OVERVIEW

Properties managed by the National Park Service (NPS) play an important role in the conservation of national biological resources. The NPS has thus initiated an Inventory and Monitoring (I&M) Program with the following objectives:

- Document through existing, verifiable data and targeted field investigations the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently estimated to occur in the park.
- Describe the distribution and relative abundance of species of special concern, such as threatened and endangered species, exotics, and other species of special management interest occurring within park boundaries.
- Provide the baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resource issues.

The purpose of this document is to provide guidance for implementing sample surveys to meet objectives #2 and #3 above for the Northern Great Plains (NGP) Network. The NGP includes 13 properties in North and South Dakota, Nebraska, and Wyoming (Table 1).

Table 1. Parks in the Northern Great Plains Network.

Property	Area (ha)	Acronym
Badlands National Park, SD	98,868	BADL
Theodore Roosevelt National Park, ND	28,509	THRO
Missouri National Recreational River, NE	13,695	MNRR
Wind Cave National Park, SD	11,451	WICA
Niobrara National Scenic River, NE	8,513	NIOB
Agate Fossil Beds National Monument, NE	1,236*	AGFO
Scott's Bluff National Monument, NE	1,215	SCBL
Knife River Indian Villages Nat. Historic Site, ND	711	KNRI
Devil's Tower National Monument, WY	550	DETO
Jewel Cave National Monument, SD	548	JECA
Mount Rushmore National Memorial, SD	501	MORU
Fort Laramie National Historic Site, WY	336	FOLA
Fort Union Trading Post National Historic Site, ND	182	FOUS

* Only 919 ha are federally owned in fee

NPS properties within the Northern Great Plains Network vary with respect to size, accessibility, landscape diversity, and management goals. Moreover, numerous taxa may be sampled for a variety of parameters. These considerations dictate very general prescriptions. Approaches described herein were selected for consistency with overall NPS I&M guidelines (Fancy 2000), which emphasize the rigorous use of sample survey methodology and the

sampling of multiple taxa and landscape variables at the same sites, but are intended to allow managers the flexibility to accommodate important park-specific considerations.

Notwithstanding differences among properties, stratified random sampling figures prominently in this document because it is likely to be appropriate in most cases. Under circumstances that typify environmental monitoring programs, stratified random sampling facilitates precise estimates, efficient data collection, and separate estimates for areas of special interest. However, all probability-based sampling designs—including stratified random sampling—can be viewed very generally as rules for assigning selection probabilities to elements of sampling frames. This unified conceptual framework leads naturally to methods of analysis (Horvitz-Thompson estimators; Thompson 1992) that can be used for any design if selection probabilities are known. Horvitz-Thompson estimators permit great latitude for addressing park-specific concerns without sacrificing a consistent approach to data analysis; hence, we describe not only estimators for stratified random sampling, but Horvitz-Thompson estimators as well.

PRINCIPLES OF SAMPLING

Plant and vertebrate surveys proposed by the NPS belong to the class of environmental studies characterized as “sampling for description” (Eberhardt and Thomas 1991). Accordingly, this document draws heavily on principles and terminology of survey sampling, which are introduced below to serve as a reference for subsequent sections. Additional technical details may be found in texts on sampling (Cochran 1977, Scheaffer et al. 1986, Thompson 1992). Scheaffer et al. (1986) includes an especially readable introduction to stratified random sampling.

The purpose of a sample survey is to provide insight about a *target population* when observing the entire population is impossible or impractical. The first step in a sample survey is the construction of a *sampling frame*, which consists of *elements*, or components of the target population, that may be selected for measurement. Measurements on a sample of elements drawn from the sampling frame are used to estimate *parameters* of the sampling frame, or values that would result if every element were actually measured. Estimates of *precision* reflect uncertainty that results from sampling instead of measuring every element. Valid estimates of precision are possible only when samples are selected at random with known probability (*probability based sampling*). The *selection probability* for an element is the probability that it will be included in a random sample of specified size.

In some cases, it may be impossible to construct a sampling frame that coincides exactly with a target population. Estimates of target population parameters may be *biased* (routinely too high or too low) if the sampling frame and target population differ; consequently, *inferences* drawn from samples pertain, strictly speaking, only to the sampling frame. Inferences should only be extended from a sampling frame to a target population when the sampling frame has been defined to have properties that closely approximate those of the target population.

Example: Statistical Terms and Concepts

Suppose managers wish to know the number of prairie fringed orchids growing in a park that is too large to census completely. In statistical terms, the orchids constitute a target population and the actual population total is the parameter to be estimated.

A suitable sampling frame could consist of points formed by intersections of a grid overlaid on the park. Note that such a sampling frame would not encompass the entire target population because only points at intersections would be candidates for selection; however, a dense grid that defines many, many points should be representative of the target population.

Say we select a simple random sample of points (i.e., every point in the sampling frame has an equal probability of selection) and count orchids in plots centered on the sample points. The mean orchid density (average across plots) multiplied by the park area gives an estimate of the park total. However, the estimate is plagued by uncertainty: a second estimate based on a new sample of plots would almost surely differ because orchid numbers vary from plot to plot. We would thus present standard errors or confidence intervals to depict the uncertainty in our estimates that results from sampling variation.

SAMPLE SELECTION

Terrestrial habitats

A GIS will be used to generate a fine-grained grid overlay for each park, which will serve as the basis for constructing a sampling frame. Grid dimensions will vary with park size so that grid intersections define a manageable number of points but approximate complete coverage: for example, a grid spacing of approximately 100 m will be appropriate for large parks (e.g., THRO). Grid intersections will be excluded from consideration if they cannot be accessed safely, if they fall on non-federal lands and access is prohibited (e.g., some lands encompassed by NIOB and MNRR river parks), or if they fall in non-habitat (e.g., parking lots): remaining intersections will constitute the elements of the sampling frame.

When sample sizes permit, the sampling frame for each park will be divided into strata by park staff. Stratification is likely to be beneficial in most cases,

though primary benefits—hence criteria for defining strata—will vary from park to park. Strata will be defined to achieve the following objectives:

- *Improved precision*—Differences among strata do not contribute to sampling variation when stratified random sampling is used. Consequently, stratification greatly improves the precision of estimates when differences among elements within strata are less than differences among strata. Stratification will be most useful for controlling variation among strata in parks that include distinct landforms or plant associations. Stratification can improve the precision of estimates even in landscapes that seem homogeneous because spatial trends and spatial dependencies are common features of ecological data. Consequently, samples that happen by chance to be clustered may not be representative and may produce partially redundant data (i.e., closely spaced observations are often similar). Dividing properties into strata and distributing sampling effort among strata can help assure representative sampling and increase the information contained in samples, even when strata do not differ in obvious ways.
- *Efficient data collection*—Data collection is often more difficult or expensive at some sites than at others. By defining strata to reflect differences in costs of data collection and distributing sampling effort appropriately, the efficiency of sample surveys can be greatly enhanced, increasing the amount of information that can be gathered with available resources. Stratification will be most useful for improving the efficiency of data collection in large parks containing areas with limited access because costs per sample are most likely to vary in such cases. Stratification can also facilitate flexible approaches to data collection. For example, elements could be randomly selected from easily accessible areas and chosen with probability proportional to distances from roads in areas with limited access. Horvitz-Thompson estimators (Appendix II) accommodate any probability-based method of sampling within strata and do not require that the same approach be used for sampling in every stratum.
- *Estimates for subsets of the sampling frame*—Stratification permits estimates for subsets of sampling frames, and can be used to allocate a specified number of samples to small areas that might otherwise be inadequately represented. This feature will be of particular value for defining strata in parks that include relatively small areas that are of special interest. Whenever possible and appropriate, stratum boundaries will be based on persistent features (e.g., large-scale discontinuities in landform, soil, aspect, slope, or elevation) so that classifications of sample points do not change over time. However, stratification may also be based on characteristics of current vegetation if necessary to assure appropriate levels of sampling in species-rich or sensitive areas.

After strata are defined, selection probabilities will be assigned to elements (points) of each sampling frame and used to select sample sites. Selection probabilities will be assigned so that sites chosen for sampling have desired characteristics but nevertheless support valid inferences about the sampling frame. Criteria for assigning element selection probabilities will depend on stratum-specific considerations and may vary within parks. Selection probabilities will be needed for data analysis: each time a new sample is selected a record of the selection probability for each element in the sampling frame will be created

and maintained. If boundaries of strata change, selection probabilities will be revised and a new sample will be selected.

Waterways

Considerations for sampling permanent waterways are the same as for terrestrial habitats, except that the goal of sampling is to distribute samples in 1 dimension along waterways and in 2 dimensions throughout terrestrial habitats. Methods will thus vary only with respect to the construction of sampling frames, which will be created by distributing points along waterways at equal intervals, rather than by overlaying a grid of points. Interval lengths will vary among parks so that sampling frames can reasonably be treated as infinite populations but are still of manageable size. Sampling frames will be divided into strata to reduce sampling variation, facilitate efficient sampling, and/or permit estimates for areas of special interest. Each element will be assigned a selection probability, chosen to produce a sample with desired features and a sample of elements will be randomly selected. Selection probabilities will be recorded for each element for use in subsequent analyses.

Intermittent waterways will be considered separately because they pose special challenges for probability-based sampling. Randomly selected points may not fall within habitats of interest. For example, standing water may consist of a few pools scattered widely along the length of a predominantly dry streambed. An approach based strictly on point sampling is still possible, however, but requires 1) defining a very large sampling frame by methods described for permanent waterways, 2) choosing a large number of sample sites, 3) classifying each sample site in a cursory fashion, and 4) restricting intensive sampling to sites that meet some criterion (e.g., standing water present). The cursory classification of a large number of points may be practical because observers will ordinarily travel along waterways to visit a number of sample sites in succession. However, constructing sample frames of stream segments, rather than points, may be more efficient. Preliminary data will be used to guide sampling methods for intermittent and ephemeral waterways.

SAMPLE SIZE REQUIREMENTS

Future conclusions about trends in biological resources will depend on the precision of estimates obtained from vascular plant and vertebrate surveys. Primary influences on the precision of estimates will include numbers of samples taken, variation among elements of sampling frames, and variation resulting from measurement error. Stratifying, increasing the number of samples taken, or

measuring sample units more precisely will all improve the precision of estimates. However, the latter 2 approaches are also likely to increase survey costs. Sample sizes must thus be chosen to achieve a balance between cost and desired precision.

Preliminary estimates of necessary sample sizes will be computed after specific variables have been selected for measurement. Preliminary estimates of sampling variability will be obtained from published reports, from subject-matter experts, and from results obtained in other parks. Many such estimates for bird, plant, mammal, amphibian, fish, and reptile species have been summarized on the internet at <http://www.im.nbs.gov/powcase/powvariation.html>.

DATA COLLECTION

Quantities of interest and methods of data collection will be developed in consultation with experts on taxa of interest. However, general considerations for data collection include the following:

Co-location of samples

To the maximum extent practical, various taxa will be sampled at the same locations. Sampling at the same sites for birds, mammals, and vascular plants, for example, will permit detailed assessments of species associations and habitat preferences. Further, the time required for data collection will be much reduced if field crews can accomplish a number of tasks at each site they visit, reducing the number of sites that must be visited.

Nevertheless, sampling for every taxa at every location will not be practical because 1) some samples may fall in sites where certain taxa obviously cannot occur, 2) estimates of desired precision may not require equal numbers of samples for all taxa, and 3) measurements will differ in cost and effort. Sampling small mammals, for example, could require a considerable investment in sampling equipment (e.g., live traps) and at least 2 visits to each site (once to set, and again to check traps). In contrast, compiling a list of plant species for a plot might take only a few minutes and require no specialized equipment. In such case the prudent approach would be to sample plants at every site where mammals were trapped, but sample additional sites only for plants.

Habitat classification

As a result of local variation, a small plot may not reflect the characteristics of a larger area. Moreover, habitats may share many of the same plant species and yet be structurally and functionally dissimilar. Consequently, detailed

measurements of vegetation may not permit the unambiguous assignment of sample sites to distinct habitat classes. To facilitate assessments of species-habitat associations each sample site will be assigned to a habitat class when it is visited, even if more detailed measurements of vegetation are also taken. The "standard terrestrial habitat data sheet" developed by the Heartland Network (Boetsch et al. 2000; Appendix III) is an example of a system for quickly classifying terrestrial sample sites. The datasheet includes entries for plot location data, physical characteristics, and vegetation attributes consistent with the National Vegetation Classification Standard. A similar system could be developed for classifying habitats in the Northern Great Plains Network.

Temporal constraints on sampling

Many taxa exhibit temporal patterns in detectability. For example, some taxa are completely unobservable during certain seasons (e.g., birds that migrate; mammals that hibernate), at certain times of day (e.g., bats and other nocturnal species), or under specific weather conditions (e.g., amphibians that emerge only after rains). Some animals (e.g., small mammals) may undergo seasonal changes in abundance, and vegetation may change during the growing season and at other times due to such influences as grazing or burning.

Temporal changes in distribution, abundance, or detectability can give rise to spurious conclusions. For example, sampling sites from south to north as the growing season progresses could falsely suggest greater vegetation biomass in the north than in the south. Similarly, sampling small mammals in early summer one year and late summer the next could falsely suggest an increase in abundance. Proper planning will therefore be necessary, not only to assure opportunities to detect species that are observable during limited periods, but also to prevent natural temporal variation from confounding assessments of distribution, abundance, or habitat preference. Inferences about resources that are temporally variable will be made with caution.

DATA ANALYSIS

Estimators for stratified random sampling are presented in Appendix I. Horvitz-Thompson estimators (Thompson 1992) are presented in Appendix II. Horvitz-Thompson estimators are appealing because they are flexible enough to handle any probability-based sampling strategy, requiring only that selection probabilities be known for sample elements. Horvitz-Thompson estimators will permit a consistent approach to analyses in the event that elements are not selected from some strata by simple random sampling.

Horvitz-Thompson estimators are based on the principle that any sampling strategy can be viewed as a rule for assigning selection probabilities to elements of a sampling frame. The selection probability for an element is the chance that it will be included in a sample drawn from the frame; consequently, selection probabilities control the expected composition of samples. In general, a Horvitz-Thompson estimator is a weighted sum of sample values. Weights are derived from selection probabilities and adjusted for expected differences in the composition of the sample and sampling frame.

Computing selection probabilities for complex sampling designs requires a general understanding of sampling theory, which is beyond the scope of this document. Sampling probabilities are relatively easy to compute for simple designs, however, including stratified random sampling. Four considerations are key:

- Selection probabilities of individual elements are required for Horvitz-Thompson estimation and must therefore be recorded every time a sample is drawn from the sampling frame. *To facilitate the detection and correction of errors, the selection probability should be recorded for every element in the sampling frame, not just for sampled elements.*
- Consider the problem of drawing a single random sample from a sampling frame comprising N elements. The probability of selecting any particular element is $1/N$, but the probability of drawing some element is 1. *Selection probabilities always sum to 1 for each draw.*
- Consider stratification, which requires that each sample be drawn from a specified subset of the sampling frame. Only elements that may be selected have nonzero selection probabilities. *Selection probabilities for elements in stratum i are therefore independent of selection probabilities for elements in other strata if n_i is fixed.*
- If n random samples are drawn with replacement from a finite frame comprising N elements, the selection probability for each element is $1/N$ for the first draw and for each subsequent draw. If sampling is without replacement, however, the selection probability for the second draw is 0 for the element drawn first and $\frac{1}{N-1}$ for elements that have not yet been chosen. Calculating selection probabilities can quickly become complicated for sampling from a finite frame without replacement. The practical importance of the difference between sampling with and without replacement is directly related to the sample size and inversely related to the size of the sampling frame. *Sampling frames should contain large numbers of elements to facilitate the estimation of selection probabilities.*

PARK-SPECIFIC CONSIDERATIONS

River parks

Access restrictions are a possibility that must be anticipated for terrestrial habitats in NIOB and MNRR river parks. Sampling (hence inference) will be restricted to areas where access is permitted.

MNRR includes a mid-river island that is of special management concern. If the island shifts in size or location due to hydrological affects new sample sites may need to be selected. In such case, selection probabilities will be recorded each time a new sample is drawn.

Large parks (>8000 ha)

Five of 13 properties in the Northern Great Plains Network (BADL, THRO, WICA, NIOB, and MNRR) exceed 8000 ha and encompass a variety of landforms and habitat types. Some contain large areas that must be traversed on foot. Advantages of stratification are likely to be substantial for such parks. For example, selection probabilities could be specified to stratify sampling in landscapes that contain more than one distinct habitat type, to sample randomly in homogeneous habitats with good access, and to concentrate sampling near roads in strata with limited access.

Small parks (<1500 ha)

Eight of 13 properties in the Northern Great Plains Network (AGFO, DETO, FOLA, FOUS, JECA, KNRI, MORU and SCBL) are <1500 ha. Small parks are likely to encompass less diverse landscapes than large parks, hence benefits of stratification are likely to be less important. Moreover, the amount of effort devoted to small parks may not be sufficient to permit separate estimates of means and variances for multiple strata. Simple random sampling may be sufficient in relatively homogeneous small parks such as MORU and JECA. However, AGFO, FOUS, FOLA, and KNRI include 2 distinct topographic zones—current floodplain and non-flooded uplands—that are likely to differ with respect to variables that will be measured and should probably be treated as separate strata. Likewise, SCBL (mixed-grass prairie and cedar butte) and DETO (ponderosa pine forest and prairie dog colony) could be stratified by habitat type.

EXAMPLE

In principle, the complexity of park sampling plans will be limited only by creativity in assigning selection probabilities. In practice, limited sample sizes are likely to require fairly simple plans, featuring simple random sampling within a

small number of strata. Though this example describes such typical cases, principles remain the same regardless of the sampling plan used.

Consider a hypothetical 1000 ha park with a relatively homogeneous landscape. Though areas of the park do not display obvious differences in features that are likely to affect the distribution or abundance of species, spatial patterns may still be present. Consequently, simple random sampling may not produce a representative sample if sample sites, by chance, happen to be clustered. Distributing samples throughout the park is thus desirable, but according to rules of probability that permit sound variance estimates and valid inferences. Stratification is thus appropriate.

A fine grid should first be overlaid on the park and used to construct a sampling frame of grid intersections. In this case, a grid-line spacing of 71 m will create a large, yet manageable, sampling frame. Such spacing will correspond with the resolution of the National Vegetation Classification System (e.g., Von Loh et al. 2000).

The second step is to divide the sampling frame into strata and tally elements (potential sample sites) within each stratum. In this example, the strata are of unequal size (Table 2, column 2), which will typically be the case when natural features or administrative boundaries are used to define strata. The number of elements in each stratum is approximately proportional to stratum area (Table 2, column 3), which will typically be true because sampling frames will be constructed from evenly spaced grid intersections.

Single-draw selection probabilities need to be calculated next (Table 2, column 4). For simple random sampling within each stratum, each element will have the same chance of selection in a single draw, $\frac{1}{N_i}$. Single-draw selection probabilities should sum to 1 for each stratum.

In this example, 25 samples will be distributed among 3 strata, roughly in proportion to stratum area (Table 2, column 5; sample sizes rounded down for strata 1 and 2 and up for stratum 3 to strengthen variance calculations for stratum 3, which contains the fewest samples). Because a specified number of samples will be selected from each stratum, selection probabilities for each draw will sum to 1 for each stratum. Because the grid used to define the sampling frame partitioned strata into large numbers of elements, in comparison with numbers of samples that will be selected, selection probabilities for sampling with replacement approximate those for sampling without replacement. The selection probability for each element within a stratum can thus be estimated from the

number of elements available for sampling and the number that will be selected (Table 2, column 6). Samples should ultimately be selected randomly from each stratum, according to selection probabilities defined in column 6 of Table 2.

Resulting data appear in column 7.

Because elements were selected by simple random sampling within strata, analyses can be based either on standard formulas in Appendix I or on Horvitz-Thompson estimators in Appendix II. We will use Horvitz-Thompson estimators to illustrate key principles: the application of standard formulas is straightforward.

The principle underlying analyses is this: if data value $y_{1(1)}$, for example, came from an element with a selection probability of 0.001 on each draw, then the probability of selecting $y_{1(1)}$ in 12 draws is approximately 0.012 and $y_{1(1)}$ represents 1.2% of the sampling frame. The anticipated sum of observations for

that portion of the sampling frame is thus $\frac{y_{1(1)}}{0.012}$. Collectively, the sums for

portions of the sampling frame represented by an entire set of observations are a Horvitz-Thompson estimate of the sum for the entire sampling frame:

$$\hat{\tau} = \frac{y_{1(1)}}{0.012} + \dots + \frac{y_{12(1)}}{0.012} + \frac{y_{1(2)}}{0.012} + \dots + \frac{y_{7(2)}}{0.012} + \frac{y_{1(3)}}{0.015} + \dots + \frac{y_{6(3)}}{0.015}.$$

Dividing $\hat{\tau}$ by the number of elements in the sampling frame produces an estimate of the mean per element, $\hat{\mu} = \frac{\hat{\tau}}{N}$. Formulas for calculating the

associated variance estimate are presented in Appendix II.

Table 2: Hypothetical example of stratification for the purpose of distributing samples geographically.

Stratum	Area (ha)	Number of elements ¹	Selection probability (each draw) ²	Samples (n_i)	Selection probability (B_i) ³	Data (y_{ib})
1	500	~1000	$\frac{1}{\sim 1000}$	12	$\sim \frac{12}{1000}$	$y_{1(1)}$
						$y_{2(1)}$
						...
						$y_{12(1)}$
2	300	~600	$\frac{1}{\sim 600}$	7	$\sim \frac{7}{600}$	$y_{1(2)}$
						$y_{2(2)}$
						...
						$y_{7(2)}$
3	200	~400	$\frac{1}{\sim 400}$	6	$\sim \frac{6}{400}$	$y_{1(3)}$
						$y_{2(3)}$
						...
						$y_{6(3)}$
Total	1000	~2000		25		

¹In practice, numbers of elements will not be exactly proportional to area because gridlines will not correspond exactly with boundaries used to define strata.

²The probability of selecting each element on a single draw. These selection probabilities sum to 1.

³The probability of selecting each element, when sampling without replacement, on some draw.

Approximated by the corresponding probability for sampling with replacement, n_i/N_i , because a modest number of samples will be selected from a large number of elements.

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ATTACHMENT I—ESTIMATORS FOR STRATIFIED RANDOM SAMPLING.

L	Number of strata
n_l	Number of elements sampled in stratum l .
n	Total number of elements sampled.
N_l	Number of elements in stratum l .
N	Total number of elements in the sampling frame.
$y_{i(l)}$	Observation i within stratum l .

Estimators for individual strata are the same as for simple random sampling.

Mean for stratum l :
$$\bar{y}_l = \frac{1}{n_l} \sum_i y_{i(l)}$$

Sample variance for stratum l :
$$s_l^2 = \frac{\sum_i (y_{i(l)} - \bar{y}_l)^2}{n_l - 1}$$

Standard error:
$$SE(\bar{y}_l) = \sqrt{\frac{s_l^2}{n_l}}$$

Overall mean and variance estimates are weighted sums of estimates for individual strata.

Population mean:
$$\bar{y}_{st} = \frac{1}{N} \sum_l N_l \bar{y}_l$$

Standard error:
$$SE(\bar{y}_{st}) = \sqrt{\frac{1}{N^2} \sum_l N_l^2 \left(\frac{s_l^2}{n_l} \right)}$$

ATTACHMENT II--HORVITZ-THOMPSON ESTIMATORS FOR ANY DESIGN (THOMPSON 1992).

B_i	Probability that element i is included in the sample.
B_{ij}	Probability that elements i and j are both included in the sample.
v	Effective sample size. Elements drawn more than once are counted only once.
y_i	Sample value i .
N	Number of elements in the sampling frame.

Population total (sum for elements in the sampling frame):

$$\hat{\tau}_\pi = \sum_{i=1}^v \frac{y_i}{\pi_i}.$$

Variance of the estimated total:

$$\text{var}(\hat{\tau}_\pi) = \sum_{i=1}^v \left(\frac{1}{\pi_i^2} - \frac{1}{\pi_i} \right) y_i^2 + 2 \sum_{i=1}^v \sum_{j>1}^v \left(\frac{1}{\pi_i \pi_j} - \frac{1}{\pi_{ij}} \right) y_i y_j.$$

The variance estimator for the population total is unbiased but computationally difficult. An alternative approximation, which is conservatively biased, is also available. A new variable, t_i , is created:

$$t_i = \frac{vy_i}{\pi_i}. \quad s_t^2 = \left(\frac{1}{v-1} \right) \sum_{i=1}^v (t_i - \hat{\tau}_\pi)^2.$$

The alternative variance estimator for a population total can then be calculated:

$$\widetilde{\text{var}}(\hat{\tau}_\pi) = \left(\frac{N-v}{N} \right) \frac{s_t^2}{v}.$$

Estimators for the population mean and its sample variance are derived from the estimators for population totals.

Population mean:

$$\hat{\mu}_\pi = \left(\frac{1}{N} \right) \hat{\tau}_\pi.$$

Variance of the estimated mean:

$$\text{var}(\hat{\mu}_\pi) = \left(\frac{1}{N^2} \right) \text{var}(\hat{\tau}_\pi)$$

APPENDIX D — RECORD OF COORDINATION WITH NON-NPS AGENCIES, ORGANIZATIONS, AND INDIVIDUALS

The following is a partial list of some of the contacts and discussions with non-NPS entities made by the Northern Great Plains Network Coordinators in FY01. Many follow-up discussions, or other less-substantive contacts were also made in FY01 by the Network Coordinators or staff from NGP Network parks. The following text does not include the involvement of subject-matter experts discussed elsewhere in this study plan.

In regards to the Missouri River and Recreation Area, Gerald Mestl (402 471-5447) of the Nebraska Game and Parks Commission was contacted on 3/21/01. The Nebraska Game and Parks Commission is currently contracting to have all of their Missouri River fish and macroinvertebrate information catalogued in a database. The project is expected to go for five years, but limited search capabilities should be available by 2002. Gerald suggested that the NGP Network Coordinator write a letter for a specific database search for fish species in the MNRR stretch of the Missouri River and address it to: Don Gabelhouse, Division Administrator, NEGFP, 2200 N 33rd, Lincoln, NE 68503.

Other sources of information suggested by Gerald include:

- University of South Dakota research, primarily thesis and dissertations. (A subsequent search of their on-line catalogue and did not find any relevant documents.)
- South Dakota Game, Fish and Parks: contact Cliff Stone 605-734-4538. (Cliff was contacted. He said that most of the fish data from South Dakota is from the reservoirs, and not the free-flowing river [3/21/01]. His best suggestion for other vertebrate groups was Doug Backlund at the SDNHP.)
- South Dakota State University Coop Unit: Dr. Charles Berry. Dr. Berry is working on a summary report of fisheries information.

In regards to the Niobrara National Scenic River, Steve Shainost (402 471-5443) of Nebraska Game, Fish & Parks was contacted on 3/21/01. Steve has a database of all fish work done on the Niobrara River as well as a bibliography of relevant references. He has agreed to send me a copy of the database search and the bibliography.

In regards to other vertebrates and plants at the NIOB, Mike Behrens (402 722-4440) of The Nature Conservancy, Niobrara Valley Preserve, was contacted. Mike updated the NGP Coordinator on current monitoring projects and additional data available through TNC (3/21/01). TNC began a bird monitoring project in 1997 to update the original survey work done by Brogie and Mossman in 1983. The new monitoring program surveys 12 routes every three years. The routes are done twice a year in June and July and are focused on breeding birds. TNC staff are currently preparing a manuscript for the Nebraska Bird Review.

TNC has also developed GIS data that is relevant to the NGP Network I&M Program. The survey routes from the bird monitoring mentioned above have been digitized. Also, they have several vegetation data layers that were developed from 2m IR photography. They are attempting to monitor the woody vegetation changes every 5-10 years. Mike indicated that the only other vertebrate monitoring they were doing was a project every other year to inventory Bailey's eastern woodrat populations in cooperation with a school group. Mary Claussen has a thesis on woodrats in the Niobrara Valley.

Kathy McPeak (402-376-3789) was contacted on 3/26/00 to discuss previous inventory work at Ft. Niobrara National Wildlife Refuge. The refuge has produced a "A biological survey of Ft. Niobrara and Valentine NWR". Kathy felt the bird and herp work in the report was probably okay, but the mammal work was probably not complete. There is currently a study on the river corridor on the refuge to determine the impacts of recreational use on birds. It is in the second year of a 2-3 year study with the University of Kansas doing the work.

John Dinan (402 471-5440) of Nebraska Game, Fish & Parks was contacted. John reviewed the NGP list of expected bird species in the parks in Nebraska and provided species lists from the breeding bird atlas blocks associated with the four national parks in Nebraska. The atlas is expected to be published in 2001. Wayne Mollhoff (402 441-8012) is another contact for the Nebraska Breeding Bird Atlas.

The U.S. Forest Service (USFS) may be a significant partner and collaborator with the NGP Network. The following is a brief summary of contacts and discussions with the Forest Service. Kerry Burns (605 673-9200), the wildlife biologist in the Black Hills National Forest Supervisor's Office was contacted on 3/22/01. He gave provided information about several inventory and monitoring initiatives that the Forest Service is planning for the Black Hills.

- Rare plants: The USFS is currently working with Dave Ode from the South Dakota Natural Heritage Program and Carolyn Seig of the USFS to monitor populations of rare plants. The Forest Service botanist is Deanna Reyher (605 673-9234). Deanna said the USFS is primarily focusing on the effect of different land management practices on rare plants, so she was unsure if the methods would overlap with the NPS I&M Program. She provided several documents relating to their rare plant inventories.
- Frogs: The USFS is working with Brian Smith at Black Hills State University to begin development of a monitoring program for leopard frogs, primarily identifying ponds where frogs presently occur and may occur in the future.
- Birds: The USFS is working with the Colorado Bird Observatory to develop a long-term bird monitoring protocol for the Black Hills. They are currently in the development stage, with first year start-up costs of approximately \$100,000. Each habitat costs approximately \$8,700. They plan to monitor 11 habitats and 100 bird species. There will be 30 transects, 2 miles long, in each habitat type. They will also do point counts, night surveys, and opportunistic searches of special areas such as heron rookeries. Examples of specific habitats of interest to the USFS include burned areas (e.g., Jewel Cave NM) and old-growth pine stands (e.g., Mount Rushmore NM). They currently have 15 breeding bird survey routes in the Hills. They also plan to increase bald eagle driving transect work. Rob Hoelscher (605 574-2534) is the primary contact for wildlife monitoring.
- Marten: The USFS has initiated pine marten surveys to find out where marten are in accordance with Forest Service-wide protocols for surveying fisher, marten, lynx, and wolverines. (Note - this is a separate effort from the South Dakota State University research for the GAP analysis program.)
- Small mammals: Josh Milsbaugh of the University of Missouri is particularly interested in inventory and monitoring issues and may be of assistance in coordinating small mammal surveys. The USFS is particularly interested in dwarf shrew populations.
- Bats: The Black Hills National Forest plans to continue limited monitoring of bat populations. Specifically, known hibernacula locations will be surveyed and mist-netting surveys will be conducted at suspected new locations. The USFS has a biologist on staff who has done a lot of work with Joel Tigner (a local bat expert).

- Fish: The State Game and Fish department has a program of electro-shocking 1000 stations across the Black Hills on a regular basis. This work was used by the USFS in its monitoring program. However, the state is discontinuing the work.
- Other: The USFS is initiating a population-level land snail monitoring program at a course scale. The effort consists primarily of identification of colony locations and tracking the presence and absence of these colonies over time. Identification to the species level for these tiny snails is quite difficult and specimens must be sent out to specialists. The Black Hills National Forest is also considering a butterfly monitoring program for species of concern.

Dan Svingen (701 250-4443) is a biologist with the USFS Grasslands Supervisors office in Bismarck, North Dakota. He was contacted in March 2001 about inventory and monitoring work in North Dakota conducted by the US Forest Service. They have numerous projects going on over the next couple of years:

- A survey for golden eagle aeries to determine if nests that were identified during a similar survey in the 80s are occupied. They are not focusing on THRO, but the NGP Network could contact the contractor to have the park done too. (However, THRO currently has people revisiting nests most years to monitor raptor nests.)
- A breeding bird survey is being done on the Little Missouri National Grasslands to update an original survey done by Sargeant and Kantrud (1975) in the 60's on North Dakota birds. The Sargeant and Kantrud survey was updated statewide by Larry Igl and Doug Johnson in 1992-93 (USGS-Biological Resources Division), but the new work would be specific to the Grasslands.
- The Forest Service is conducting a prairie dog mapping project to update mapping done in 1997.
- A fire effects study will be starting in a recent burn area near the North Unit of THRO. The study will focus primarily on insect responses to the fire, including woody draw insects. The project is expected to go for 5 years. USGS-BRD will also be doing some bird work studying the effects of the fire.
- The Forest Service has an agreement with North Dakota State University to develop a sharp-tailed grouse monitoring program.
- A fish inventory is planned for the tributaries of the Little Missouri River. A researcher from the University of Idaho will be doing the electro-shocking and seining work.
- The Forest Service is working with Rocky Mountain college to conduct burrowing owl studies. This is expected to be a long-term program.
- Dan mentioned that the contact for the rare plant model is Linda Spencer (503-668-1644). The USFS will also be developing a plant checklist for the Little Missouri Grasslands in the near future. They will also be developing a Dakota Buckwheat management strategy.

Richard Peterson (605 842-2017) of the South Dakota Ornithologist's Union and Breeding Bird Survey was contacted on 3/22/01. The South Dakota Breeding Bird Atlas was conducted from 1988-1993. There were three types of survey blocks: one set of random 3mi x 3mi areas, "special" blocks of high quality native habitat, and managed areas such as the National Parks that were surveyed entirely within their boundaries. Also, there were a few random blocks along the Missouri River. The similar Nebraska Breeding Bird Atlas data has already been collected and is available from Wayne Mollhoff (402 441-8012).

Vickie Smith (231 935-0076) of the South Dakota GAP analysis program was contacted on 3/01. She said they have done some mountain lion and pine marten surveys of the Black Hills and are developing a habitat model that will be tested in the near future.

Mike Ruggles of the Montana Game and Fish Department was contacted about data they had on fish of the upper Missouri River. Mike also suggested that David Galat at the University of Missouri be contacted for additional data on species of the upper Missouri River.

APPENDIX E – HABITAT DATA SHEET

The following Habitat Data Sheet form will be used to collect basic plant and habitat data. It will be used for all point sampling surveys. See Section 3 of the Northern Great Plains Study Plan for a detailed description of how the form will be used.

Figure x. Terrestrial Habitat Data Form for Vertebrate and Vascular Plant Inventories

Date: _____ Park: _____ Plot ID #: _____ Surveyors: _____

UTM Zone: _____ Datum: _____ Easting: _____ Northing: _____ Project File: _____ WP#: _____

Location Description: _____

Quad: _____ T: _____ R: _____ S: _____ Plot size, length (m): _____ width (m): _____ radius (m): _____ Photo Roll ID: _____ Photo #: _____

Site Characteristics:

Elevation (ft): _____ Slope: _____ Var: high med low Aspect: _____ Var: high med low

Topographic position: level toe slope lower-slope mid-slope upper-slope escarpment/face ledge crest depression draw

Slope-shape, Horizontal (30m): concave straight convex Vertical (30m): concave straight convex Surface water: in plot <50m >50m

Hydrologic regime: permanently flooded semi-permanently flooded seasonally/temporarily flooded intermittently flooded seep upland

Ground Cover: bryophyte/lichen 1 2 3 4 5 woody debris 1 2 3 4 5 grass litter 1 2 3 4 5 tree leaf litter 1 2 3 4 5
bedrock/boulder 1 2 3 4 5 gravel/cobble 1 2 3 4 5 sand/soil 1 2 3 4 5
(cover classes 1: <1%, 2: 1-5% 3: 5-25% 4: 25-50% 5: 50-100%)

Vegetation Description:

Leaf phenology (of uppermost stratum having > 10% cover):

Trees and shrubs
____ Evergreen
____ Deciduous
____ Mixed (evergreen, deciduous)
Herbs
____ Annual
____ Perennial

Physiognomic class (see definitions):

____ Forest
____ Woodland
____ Sparse Woodland
____ Shrubland
____ Sparse Shrubland
____ Herbaceous
____ Sparse Vegetation

Strata	Stratum Height ¹	Stratum Cover Class ²	Dominant Species (list top 3-5 species in order; use = sign to indicate equal importance)
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Canopy	1 2 3 4 5 6	A B C D	_____
Sub-canopy	1 2 3 4 5 6	A B C D	_____
Shrub	1 2 3 4 5 6	A B C D	_____
Herbaceous	1 2 3 4 5 6	A B C D	_____

¹Stratum Height Classes: 1: <0.5m 2: 0.5-5m 3: 5-10m 4: 10-20m 5: 20-30m 6: >30m

²Stratum Cover Classes: A: <10% B: 10-25% C: 25-60% D: 60-100%

APPENDIX F — LIST OF SPECIES

The following table lists the species documented, or expected to be found but not yet documented, in the Northern Great Plains Network. For a complete list of these species, their Species Taxonomic Number (TSN), synonyms they were recorded under, the source of the documentation, and other data see the Network Coordinator.

Report Common Name	AGFO	BADL	DETO	FOLA	FOUS	JECA	KNRI	MNRR	MORU	NIOB	SCBL	THRO	WICA
BIRDS													
ALDER FLYCATCHER										doc			
AMERICAN AVOCET		doc		exp	doc			doc		doc			doc
AMERICAN BITTERN		doc		exp	doc			exp		doc	exp		
AMERICAN COOT	exp	doc		doc	doc			doc					
AMERICAN CROW	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
AMERICAN GOLDEN PLOVER										doc			
AMERICAN GOLDFINCH	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
AMERICAN KESTREL	doc	doc	doc	doc	doc	exp	doc	doc		doc	doc	doc	doc
AMERICAN REDSTART		doc	exp	exp	doc	doc	doc	doc		doc		doc	doc
AMERICAN ROBIN	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
AMERICAN TREE SPARROW	doc										doc		doc
AMERICAN WHITE PELICAN				exp	doc		doc					doc	
AMERICAN WIGEON				doc	doc		doc					doc	
AMERICAN WOODCOCK								doc		doc			
ASH-THROATED FLYCATCHER	doc												
BAIRD'S SPARROW					exp		exp					doc	
BALD EAGLE	doc			exp	doc	exp	doc	exp		doc	doc	doc	doc
BANK SWALLOW	doc	doc		exp	doc		doc	doc		doc	doc	doc	
BARN SWALLOW	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc	doc	doc	doc
BARRED OWL								doc		doc			exp
BELL'S VIREO	exp	doc					exp	doc		doc			
BELTED KINGFISHER	doc	doc	doc	doc	exp		exp	doc		doc	doc	doc	doc
BLACK CAPPED CHICKADEE													doc
BLACK TERN	doc	doc			exp			doc		doc			
BLACK-AND-WHITE WARBLER		doc					doc	doc		doc		doc	
BLACK-BACKED WOODPECKER			doc			exp			exp				doc
BLACK-BELLIED PLOVER										doc			
BLACK-BILLED CUCKOO		doc	exp	exp	exp		doc	doc		doc	doc	doc	exp
BLACK-BILLED MAGPIE		doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
BLACK-CAPPED CHICKADEE	doc	doc	doc	exp	doc	doc	doc	doc	doc	doc	doc	doc	
BLACK-CROWNED NIGHT-HERON	doc	doc		doc	exp			exp		doc	exp	doc	
BLACK-HEADED GROSBEAK		doc	doc	exp	exp		doc			doc	doc	doc	doc
BLACK-NECKED STILT	doc			doc									
BLACKPOLL WARBLER			doc										
BLUE GROSBEAK	doc	doc		exp				doc		doc	doc	doc	
BLUE JAY	doc	doc	doc	doc	exp		doc	doc		doc	doc	doc	doc
BLUE-GRAY GNATCATCHER				exp				doc			doc		
BLUE-WINGED TEAL	doc	doc	exp	exp	doc		doc	doc		doc	doc	doc	doc

BOBOLINK	doc	doc		exp	doc		doc	doc		doc	exp	doc	exp
BOHEMIAN WAXWING					doc		doc						
BOREAL OWL					doc								
BREWER'S BLACKBIRD	doc	doc	doc	doc	doc		doc				exp	doc	doc
BREWER'S SPARROW	exp				doc						doc	doc	
BROAD-WINGED HAWK										doc	doc		
BROWN CREEPER			doc	doc		doc	doc		doc	doc			doc
BROWN THRASHER	doc	doc	doc	doc	exp		doc	doc		doc	doc	doc	doc
BROWN-HEADED COWBIRD	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
BUFFLEHEAD	doc												
BULLOCK'S ORIOLE					exp						doc		
BURROWING OWL	exp	doc		exp	doc		exp			doc	doc	doc	doc
CALIFORNIA GULL				exp	doc		doc						
CANADA GOOSE	doc	doc	doc	doc	doc		doc	exp		doc	doc	doc	doc
CANVASBACK					doc					exp			
CANYON WREN			doc	exp		exp			doc				doc
CASPIAN TERN				exp				doc					
CASSIN'S FINCH			exp			doc			exp				exp
CASSIN'S KINGBIRD	doc			exp							doc		
CATTLE EGRET								exp		doc			
CEDAR WAXWING	doc	doc	doc	exp	doc		doc	doc		doc	doc	doc	doc
CHESTNUT-COLLARED LONGSPUR	doc	doc			exp		exp			doc		doc	doc
CHESTNUT-SIDED WARBLER													doc
CHIMNEY SWIFT	exp						exp	doc		doc	doc		
CHIPPING SPARROW	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
CINNAMON TEAL													doc
CLARK'S NUTCRACKER			exp			doc			exp	doc			doc
CLAY-COLORED SPARROW			doc	exp	doc		doc			doc	doc	doc	
CLIFF SWALLOW	doc	doc	doc	doc	doc	exp	doc	doc		doc	doc	doc	doc
COMMON BARN-OWL	doc	doc		exp				exp		doc	doc		
COMMON GOLDENEYE					doc		doc			doc			
COMMON GRACKLE	doc	doc	doc	doc	doc			doc		doc	doc	doc	doc
COMMON LOON										doc			
COMMON MERGANSER				doc			doc				doc		
COMMON NIGHTHAWK	doc	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
COMMON RAVEN				doc	doc					doc		doc	
COMMON REDPOLL										doc			doc
COMMON SNIPE	doc	doc		exp	exp					doc	exp		doc
COMMON TERN					exp								
COMMON YELLOWTHROAT	doc	doc	exp	exp	doc	exp	doc	doc		doc	doc	doc	doc
COMMONN POORWILL	exp	doc	exp	exp	exp	doc		doc	exp	doc	doc	doc	doc
COOPER'S HAWK	doc	doc	doc	doc	exp	exp	doc	exp	exp	doc	exp	doc	doc
CORDILLERAN FLYCATCHER						doc			doc				doc
DARK-EYED JUNCO	doc		doc	doc		doc			doc		doc		doc
DICKCISSEL	doc	doc		exp	exp		exp	doc		doc	doc	doc	exp
DOUBLE-CRESTED CORMORANT				exp	doc		doc	doc		doc	doc		
DOWNY WOODPECKER	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
DUSKY FLYCATCHER			exp			doc			exp				doc

EARED GREBE				exp	doc					doc	exp		
EASTERN BLUEBIRD	exp	doc	exp	exp	exp	exp	doc	doc	exp	doc	doc	doc	doc
EASTERN KINGBIRD	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
EASTERN MEADOWLARK								doc		exp			
EASTERN PHOEBE	exp			exp	doc			doc		doc	doc		doc
EASTERN SCREECH-OWL	exp	doc	doc	doc	exp		doc	doc		doc	doc		exp
EASTERN WOOD-PEWEE							exp	doc		doc			
EUROPEAN STARLING	doc	doc	doc	doc	doc	exp	doc	doc	exp	doc	doc	doc	doc
FERRUGINOUS HAWK	exp	doc		exp	doc		exp			doc	doc	doc	doc
FIELD SPARROW	doc	doc		exp	exp		doc	doc		doc	doc	doc	doc
FORSTER'S TERN				exp	exp					doc			
FOX SPARROW				exp						doc			
FRANKLIN'S GULL					exp			doc		doc	doc		
GADWALL		doc		exp	doc		doc	exp		doc	exp	doc	doc
GOLDEN EAGLE	doc	doc	exp	doc	doc		doc			doc	doc	doc	doc
GOLDEN-CROWNED KINGLET													exp
GRASSHOPPER SPARROW	doc	doc	exp	exp	doc		doc	doc		doc	doc	doc	doc
GRAY CATBIRD	doc	doc		exp	doc		doc	doc		doc	exp	doc	doc
GRAY JAY			doc	exp		exp			doc				doc
GRAY PARTRIDGE	exp			exp	doc		doc	doc		doc		doc	doc
GRAY-CHEEKED THRUSH										doc			
GREAT BLUE HERON	doc		doc	doc	doc		doc	doc		doc	doc	doc	doc
GREAT CRESTED FLYCATCHER	exp	doc					doc	doc		doc			
GREAT EGRET	doc							doc		doc	doc		
GREAT GRAY OWL										doc			
GREAT HORNED OWL	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
GREAT-TAILED GRACKLE								doc					
GREATER PRAIRIE-CHICKEN	doc							doc					
GREATER SCAUP										doc			
GREATER WHITE-FRONTED GOOSE										doc			
GREATER YELLOWLEGS	doc												
GREEN-BACKED HERON				doc									
GREEN-TAILED TOWHEE	doc			exp									
GREEN-WINGED TEAL	doc			doc	doc			doc		doc	doc		doc
HAIRY WOODPECKER		doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
HARRIS' SPARROW				exp								doc	
HERMIT THRUSH										doc			
HERRING GULL							doc				doc		
HOODED MERGANSER										doc			
HORNED LARK	doc	doc	exp	exp	doc		doc	doc		doc	doc	doc	doc
HOUSE FINCH	exp	doc	exp	doc		exp					doc		exp
HOUSE SPARROW	exp	doc	doc	doc	doc		doc	doc		doc	doc	doc	exp
HOUSE WREN	doc	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
INDIGO BUNTING		doc	doc		exp		exp	doc		doc	doc	doc	doc
KILLDEER	doc	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
KING RAIL								doc		doc			
LARK BUNTING	doc	doc		exp	doc		doc	doc		doc	doc	doc	doc
LARK SPARROW	doc	doc	exp	doc	doc		doc	doc		doc	doc	doc	doc

LARK SPARROWS			doc										
LAZULI BUNTING	doc	doc	doc	exp	doc		doc			doc	doc	doc	doc
LEAST BITTERN								doc		doc			
LEAST FLYCATCHER				exp	doc		doc			doc		doc	doc
LEAST TERN					exp		doc	doc		doc			
LESSER SCAUP					doc								
LESSER YELLOWLEGS	doc									doc			
LEWIS' WOODPECKER			exp	exp		doc				doc			doc
LINCOLN'S SPARROW				exp									doc
LOGGERHEAD SHRIKE	doc	doc	exp	doc	doc		exp	doc		doc	doc	doc	doc
LONG-BILLED CURLEW	doc	doc		exp	doc					doc	exp	doc	exp
LONG-EARED OWL		doc	exp	exp			doc	doc	exp	doc	exp		doc
MACGILLIVRAY'S WARBLER			exp	doc		doc							exp
MALLARD	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
MARBLED GODWIT		exp			exp								
MARSH WREN	doc			exp	exp			doc		doc			
MCCOWN'S LONGSPUR		exp		exp	exp		exp				exp	doc	
MERLIN				exp	doc		doc			doc	exp	doc	doc
MOUNTAIN BLUEBIRD	doc	doc	doc	exp	doc	doc			exp	doc	doc	doc	doc
MOUNTAIN CHICKADEE				exp									
MOURNING DOVE	doc	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
MOURNING WARBLER										doc			
NASHVILLE WARBLER										doc			
NORTHERN BOBWHITE	doc							doc		doc	doc		
NORTHERN CARDINAL								doc		doc			
NORTHERN FLICKER	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc	doc
NORTHERN GOSHAWK			doc			exp	doc		exp				doc
NORTHERN HARRIER	doc	doc		exp	doc		doc	doc		doc	doc	doc	doc
NORTHERN MOCKINGBIRD	doc	doc		doc						doc	exp		
NORTHERN ORIOLE	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
NORTHERN PARULA										doc			
NORTHERN PINTAIL	doc	exp		doc	exp			doc		doc	exp		
NORTHERN ROUGH-WINGED SWALLOW	doc	doc	doc	exp	exp		doc	doc		doc	doc	doc	exp
NORTHERN SAW-WHET OWL			exp			exp			exp				doc
NORTHERN SHOVELER	doc			exp	doc			doc		doc	doc		doc
NORTHERN SHRIKE	doc						doc						doc
NORTHERN WATERTHRUSH												doc	
OLDSQUAW										doc			
OLIVE-SIDED FLYCATCHER				doc			doc			doc			exp
ORANGE-CROWNED WARBLER							doc						
ORCHARD ORIOLE	doc	doc		exp	exp		doc	doc		doc	doc		exp
OSPREY			doc	exp			doc	doc			doc		doc
OVENBIRD		doc	doc	exp	exp	doc	doc	doc	doc	doc		doc	doc
PALM WARBLER							doc						
PEREGRINE FALCON										doc			
PIED BILLED GREBE		doc		exp				doc		doc	exp		
PIED-BILLED GREBE					doc								
PINE GROSBEAK										doc			

PINE SISKIN	doc		doc			doc	exp		doc		doc	doc	doc
PINYON JAY	doc		doc	exp						doc			doc
PIPING PLOVER							exp	doc		doc			
PLAIN TITMOUSE				doc									
PLUMBEOUS VIREO									doc		exp		
PLUMBEUS VIREO													doc
POORWILLS			doc										
PRAIRIE FALCON	doc	doc	doc	exp	doc		doc			doc	doc	doc	doc
PROTHONOTARY WARBLER								doc					
PURPLE FINCH												doc	
PURPLE MARTIN					exp		doc	doc		doc			
PYGMY NUTHATCH				exp		exp							exp
RED CROSSBILL			doc	exp		doc	exp		doc		doc		doc
RED-BELLIED WOODPECKER								doc		doc			
RED-BREASTED NUTHATCH	exp		doc	exp		doc	doc		doc	doc	doc		doc
RED-EYED VIREO	exp	doc	doc	exp	doc		doc	doc		doc		doc	doc
RED-HEADED WOODPECKER	doc	doc	doc	doc	doc	exp	doc	doc		doc	doc	doc	doc
RED-NAPED SAPSUCKER													exp
RED-TAILED HAWK	doc	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
RED-WINGED BLACKBIRD	doc	doc	exp	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc
RED-WINGED BLACKBIRDS			doc										
REDHEAD	doc				doc					doc			
RING-BILLED GULL		doc		exp	doc		doc	doc		doc		doc	
RING-NECKED DUCK										doc			
RING-NECKED PHEASANT	doc	doc		exp	doc		doc	doc		doc	doc	doc	doc
ROCK DOVE	doc	doc	doc	exp	doc		doc	doc	exp	doc	doc	doc	doc
ROCK WREN	doc	doc	doc	doc	doc						doc	doc	doc
ROSE-BREASTED GROSBEAK			doc		exp		exp	doc		doc			
ROUGH-LEGGED HAWK	doc									doc			doc
ROUGH-WINGED SWALLOW					doc								
RUBY-CROWNED KINGLET						doc			doc				doc
RUBY-THROATED HUMMINGBIRD								exp		doc			
RUDDY DUCK		doc		exp	doc			doc		doc			
RUFFED GROUSE						exp			exp				
RUFOUS-SIDED TOWHEE	doc	doc	doc	doc	doc		doc	exp		doc	doc		
RUSTY BLACKBIRD										doc			
SAGE GROUSE				exp	doc								
SAGE THRASHER				doc									
SANDHILL CRANE	doc												
SAVANNAH SPARROW	doc	exp			doc		exp	doc		doc	doc	doc	
SAY'S PHOEBE	doc	doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
SCARLET TANAGER				exp			exp	doc		doc			
SEDGE WREN								doc		exp			
SEMPALMATED PLOVER				doc									
SHARP-SHINNED HAWK	doc	exp	exp	exp	exp	exp	doc	doc	exp	doc	exp	doc	doc
SHARP-TAILED GROUSE	doc	doc	exp	exp	exp		doc	doc		doc	exp	doc	doc
SHORT-EARED OWL	doc	doc		exp	exp		doc			doc	doc	doc	doc
SNOW BUNTING		doc											doc

SNOW GOOSE	doc									doc	doc		
SNOWY EGRET				exp				doc			exp		
SNOWY OWL							doc						
SNOWY PLOVER										doc			
SOLITARY SANDPIPER					doc								
SOLITARY VIREO			doc	exp		doc			exp				
SONG SPARROW				doc	doc		doc	doc		doc		doc	doc
SORA	doc	doc		exp	doc			exp		doc	doc		doc
SPOTTED SANDPIPER	exp	doc	exp	doc	doc		doc	doc		doc	exp	doc	doc
SPOTTED TOWHEE	doc	doc						doc			doc	doc	doc
SPRAGUE'S PIPIT		doc			doc		exp					doc	
STELLER'S JAY				doc									
SWAINSON'S HAWK	doc	doc		exp	exp		doc	doc		doc	doc	doc	
SWAINSON'S THRUSH	doc		exp	exp		doc			doc	doc	doc	doc	doc
SWAMP SPARROW								exp		doc			
TOWNSEND'S SOLITAIRE	doc		doc	exp		doc			doc		doc		doc
TREE SWALLOW			doc	exp	exp		doc	doc		doc		doc	
TRUMPETER SWAN										exp			
TUFTED TITMOUSE										doc		doc	
TUNDRA SWAN										doc			
TURKEY VULTURE	doc	doc	doc	exp	doc	doc	doc	doc	doc	doc	doc	doc	doc
UPLAND SANDPIPER	doc	doc		exp	doc		doc	doc		doc	doc	doc	doc
VEERY				exp	exp		exp						exp
VESPER SPARROW	doc	doc	exp	doc	doc		doc	doc		doc	doc	doc	doc
VESPER SPARROWS			doc										
VIOLET-GREEN SWALLOW	exp		doc	doc		doc			doc	doc	doc		doc
VIRGINIA RAIL	doc	doc		exp				exp		doc			
WARBLING VIREO	exp		doc	exp	doc	doc	doc	doc	doc	doc	doc	doc	doc
WESTERN BLUEBIRD				exp							doc		
WESTERN GREBE				exp	doc					doc	exp		
WESTERN KINGBIRD	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
WESTERN MEADOWLARK	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
WESTERN SCREECH-OWL				doc									
WESTERN Tanager			doc	doc		doc			doc	doc	doc	doc	doc
WESTERN WOOD-PEWEE	doc	doc	doc	exp	doc	exp			doc	exp	doc		doc
WHIP-POOR-WILL	doc							doc		doc			
WHITE-BREASTED NUTHATCH		doc	doc	exp	exp	doc	doc	doc	doc	doc	doc	doc	doc
WHITE-CROWNED SPARROW	doc			doc							doc	doc	
WHITE-FACED IBIS				exp						exp			
WHITE-RUMPED SANDPIPER										doc			
WHITE-TAILED KITE	doc												
WHITE-THROATED SWIFT	doc	doc	doc	exp		doc			doc		doc		doc
WHITE-WINGED SCOTER										doc			
WHOOPING CRANE										doc			
WILD TURKEY	doc	doc	doc	doc	exp	exp	doc	doc	doc	doc	doc	doc	doc
WILLET	doc	exp		exp	doc					doc			doc
WILLOW FLYCATCHER					exp		doc	doc		doc		doc	
WILSON'S PHALAROPE	doc	doc		exp	exp			exp		exp	exp	doc	doc

WINTER WREN										doc			
WOOD DUCK	doc		doc	exp			doc	doc		doc	doc		doc
WOOD THRUSH								doc		doc			
YELLOW WARBLER	doc	doc	doc	doc	doc		doc	doc		doc	doc	doc	doc
YELLOW-BILLED CUCKOO		doc		exp				doc		doc	doc	doc	
YELLOW-BREASTED CHAT		doc	exp	doc	doc		doc	doc		doc	doc	doc	doc
YELLOW-HEADED BLACKBIRD	doc	doc		doc	doc			doc		doc	doc	doc	
YELLOW-RUMPED WARBLER	doc		doc	exp		doc	doc		doc			doc	doc
YELLOW-THROATED VIREO								doc		exp			
FISH													
AMERICAN EEL								exp					
AMERICAN GIZZARD SHAD								doc		exp	exp		
AMERICAN PADDLEFISH					doc		exp	doc					
BIGMOUTH BUFFALO					doc		doc	doc		exp			
BIGMOUTH SHINER				exp				doc		doc	exp		
BLACK BUFFALO								exp					
BLACK BULLHEAD		doc			doc		exp	doc		doc		doc	
BLACK CRAPPIE								doc		doc			
BLACKNOSE DACE								exp		exp			
BLACKNOSE SHINER								exp		exp			
BLOCH'S GIZZARD SHAD								doc					
BLUE CATFISH								exp					
BLUE SUCKER					doc		doc	doc					
BLUEGILL	exp							doc		doc	exp		
BLUNTNOST MINNOW								doc					
BRASSY MINNOW	doc	exp		exp	doc		exp	doc		doc		exp	
BROOK STICKLEBACK					doc		exp	exp		doc		doc	
BROOK TROUT								doc	exp	exp			doc
BROWN TROUT	doc			exp	doc					doc	exp		
BURBOT					doc		exp	doc		exp		doc	
CENTRAL STONEROLLER	doc	exp		doc				doc		exp	exp		
CHANNEL CATFISH		doc			doc		doc	doc		doc	exp	doc	
CHINOOK SALMON					doc								
CISCO					doc		doc						
COMMON CARP		doc	exp	doc	doc		doc	doc	exp	doc	exp	doc	
COMMON SHINER				exp				exp		exp	exp		
CREEK CHUB	doc	exp	exp	doc	doc		doc	doc		doc	exp	doc	doc
EMERALD SHINER				exp	doc		exp	doc		exp		exp	
FATHEAD MINNOW	doc	exp	exp	exp	doc		doc	doc		doc	exp	doc	doc
FINESCALE DACE			exp							doc			
FLATHEAD CATFISH								doc		exp			
FLATHEAD CHUB		doc	exp		doc			doc		doc		doc	
FRESHWATER DRUM					doc			doc					
GOLDEN SHINER		exp			doc		exp	exp		doc		exp	
GOLDEYE		doc			doc		doc	doc		doc		doc	
GRASS CARP								doc					
GRASS PICKEREL								doc		doc			
GREEN SUNFISH			exp	exp	doc		doc	doc		doc		doc	

HIGHFIN CARPSUCKER								doc					
HORNEYHEAD CHUB				exp									
IOWA DARTER	doc				exp		exp	exp		exp	exp		
JOHNNY DARTER				doc			doc	doc		exp	exp		
LAKE CHUB			exp		doc					exp			
LAKE STURGEON								exp					
LAKE WHITEFISH					doc								
LARGEMOUTH BASS	exp							doc		doc			
LARGESCALE STONEROLLER								doc					
LONGNOSE DACE	doc	doc	exp	doc	doc			doc	exp	doc	exp	doc	doc
LONGNOSE GAR								doc					
LONGNOSE SUCKER				doc	doc		doc			exp	exp		
MIMIC SHINER								doc					
MOUNTAIN SUCKER									exp				doc
MUSKELLUNGE							doc	exp		doc			
NORTHERN PIKE				doc	doc		doc	doc		doc	exp	doc	
NORTHERN REDBELLY DACE							exp			doc		exp	
ORANGESPOTTED SUNFISH								doc		exp			
ORANGETHROAT DARTER	exp									exp	exp		
PALLID STURGEON					doc			doc					
PEARL DACE										exp			
PLAINS KILLIFISH				exp				doc		exp	exp		
PLAINS MINNOW		doc			doc		exp	doc		exp		doc	
PLAINS TOPMINNOW	doc	exp						doc		doc	exp		exp
QUILLBACK		exp	exp					doc		doc	exp		
RAINBOW SMELT					doc		doc	doc					
RAINBOW TROUT				exp	doc					doc			
RED SHINER		doc		doc			doc	doc		doc	exp		
RIVER CARPSUCKER		doc			doc		doc	doc		doc		doc	
RIVER SHINER								doc		doc	exp		
ROCK BASS								doc		doc			
SAND SHINER		exp	exp	exp	exp		doc	doc		doc	exp	doc	
SAUGER		doc			doc		doc	doc		exp		doc	
SHORthead REDHORSE		exp	exp		doc		doc	doc		doc	exp	exp	
SHORTNOSE GAR					exp			doc					
SHOVELNOSE STURGEON					doc		doc	doc		doc			
SICKLEFIN CHUB					doc			doc					
SILVER CHUB								doc					
SILVER LAMPREY								exp					
SMALLMOUTH BASS								doc					
SMALLMOUTH BUFFALO					doc		doc	doc					
SPOTFIN SHINER								doc		doc			
SPOTTAIL SHINER					doc		doc	doc					
STONECAT		doc	exp	exp	doc		exp	doc		doc	exp	doc	
STURGEON CHUB		doc			doc			exp				doc	
SUCKERMOUTH MINNOW				doc				doc		exp			
TADPOLE MADTOM								exp			exp		
TOPEKA SHINER								exp		exp			

WALLEYE					doc		doc	doc		doc	exp	doc	
WESTERN SILVERY MINNOW		exp	exp		doc		exp	exp		doc		doc	
WHITE BASS					doc			doc			exp		
WHITE CRAPPIE					doc			doc					
WHITE SUCKER	doc	exp	exp	doc	doc		doc	doc	exp	doc	exp	doc	doc
YELLOW BULLHEAD		exp			exp			doc		exp			
YELLOW PERCH				doc	doc		doc	doc		doc			
HERPETOFAUNA													
BLANDING'S TURTLE										doc			
BOREAL CHORUS FROG												doc	
BULLFROG	doc	doc		doc				exp		doc	exp		
BULLSNAKE	doc	doc	doc	doc						doc	doc		
CANADIAN TOAD					exp		doc					doc	
COMMON GARTER SNAKE	doc		exp	exp	exp	exp	doc	exp	exp	doc	doc	doc	doc
COMMON LESSER EARLESS LIZARD										doc			
COMMON SNAPPING TURTLE	doc	doc	exp	doc	exp		exp	exp		doc		doc	doc
EASTERN FENCE LIZARD	exp			exp						doc	doc		
EASTERN HOG-NOSED SNAKE								exp		doc			
FALSE MAP TURTLE								exp					
FOX SNAKE								exp		exp			
GRAY TREEFROG								exp					
GREAT PLAINS TOAD	doc	doc	doc	doc	exp		exp	exp		doc	doc	doc	doc
GREATER SHORT-HORNED LIZARDS	doc	exp	exp										
MANY-LINED SKINK	doc			exp						doc	exp		
MILK SNAKE	doc	doc		exp				exp		doc	doc		doc
NORTHERN CRICKET FROG								exp		doc			
NORTHERN LEOPARD FROG	doc	doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
NORTHERN WATER SNAKE	doc							exp		doc			
ORNATE BOX TURTLE	doc	doc		exp						doc	doc		
PAINTED TURTLE	doc	doc	exp	exp	exp		exp	exp		doc	doc	doc	doc
PIGMY SHORT-HORNED LIZARD	doc												
PINE SNAKE	doc	doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
PLAINS GARTER SNAKE	doc	doc	doc	exp	exp		doc	exp		doc	doc	doc	doc
PLAINS LEOPARD FROG								exp		exp			
PLAINS SPADEFOOT		doc	exp									doc	doc
PLAINS SPADEFOOT TOAD	doc			exp	exp		doc	exp		doc	exp		
PRAIRIE SKINK								exp					
RACER	doc	doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
RED-BELLIED SNAKE						exp			exp				exp
RING-NECKED SNAKE								exp		exp			
SAGEBRUSH LIZARD				exp	exp	doc						doc	
SHORT-HORNED LIZARD				exp	exp						doc	doc	
SIX-LINED RACERUNNER	doc	exp		exp				exp		doc	exp		
SMOOTH GREEN SNAKE	doc		doc		exp	doc	exp		exp	doc		doc	doc
SMOOTH SOFTSHELL TURTLE								exp		exp		doc	
SPINY SOFTSHELL TURTLE	doc		exp	exp				exp		doc	doc		
STRIPED CHORUS FROG	doc	doc	exp	doc	exp	exp	doc	exp	exp	doc	doc	exp	doc
TIGER SALAMANDER	doc	doc	exp	exp	exp	exp	doc	exp	exp	doc	doc	doc	doc

WESTERN HOG-NOSED SNAKE	doc	doc	doc	exp	exp		exp	exp		doc	doc	doc	exp
WESTERN RATTLESNAKE	doc	doc	doc	exp	exp		exp			doc	doc	doc	doc
WESTERN TERRESTRIAL GARTER SNAKE	doc			exp		exp			exp				doc
WOOD FROG					exp								
WOODHOUSE'S TOAD	doc	doc	exp	doc	exp		doc	exp		doc	doc	doc	doc
MAMMALS													
BADGER	doc	doc	doc	exp	doc	exp	doc	exp	exp	doc	doc	doc	doc
BEAVER	doc	doc	doc	doc	doc		doc	exp	exp	doc	doc	doc	exp
BIG BROWN BAT	exp	doc	doc	exp	doc	doc	exp	exp	exp	doc	doc	doc	exp
BIGHORN SHEEP		doc										doc	
BISON		doc										doc	doc
BLACK-FOOTED FERRET		doc											
BLACK-TAILED JACK RABBIT	doc	doc		exp				exp		doc	exp		
BLACK-TAILED PRAIRIE DOG	doc	doc	doc		doc					doc	doc	doc	doc
BOBCAT	exp	doc	doc	exp	exp	doc	exp	exp	exp	doc	exp	doc	doc
BUSHY-TAILED WOODRAT	doc	doc	doc	exp	doc	doc			exp		doc	exp	doc
COYOTE	doc	doc	doc	doc	doc	doc	doc	exp	exp	doc	doc	doc	doc
DEER MOUSE	doc	doc	doc	doc	doc	doc	doc	exp	exp	doc	doc	doc	doc
DESERT COTTONTAIL	doc	doc	doc	doc	doc	doc			exp		doc	doc	doc
DOMESTIC CAT							doc						
DWARF SHREW						exp			exp				exp
EASTERN COTTONTAIL	doc	exp		exp	exp		doc	exp		doc	doc	doc	doc
EASTERN MOLE	doc			doc				exp		doc	doc		
EASTERN PIPISTRELLE								exp					
EASTERN SPOTTED SKUNK	exp	doc	exp	doc		exp		exp	exp	exp	exp		exp
EASTERN WOODRAT										doc			
ERMINE		doc	exp			exp			exp				doc
FOX SQUIRREL		doc	doc	doc	exp		doc	exp		doc	doc	doc	
FRANKLIN'S GROUND SQUIRREL								exp		exp			
FRINGED MYOTIS	exp	doc	exp	exp		doc			exp		exp		exp
GRAY FOX		doc						exp		exp	exp		
GRAY SQUIRREL							exp					doc	
GRAY WOLF					doc								
HAYDEN'S SHREW		doc	exp			exp			exp	doc			doc
HISPID POCKET MOUSE	doc	doc	exp	doc		exp		exp		doc	doc		doc
HOARY BAT	exp	doc	exp	exp	doc	doc	exp	exp	exp	doc	exp	doc	exp
HORSE												doc	
HOUSE MOUSE	exp	doc	exp	exp	exp	exp	doc	exp	exp	doc	doc	doc	exp
KEEN'S MYOTIS										doc			
LEAST CHIPMUNK	exp	doc	doc		doc	doc	exp		exp			doc	doc
LEAST SHREW		exp						exp		exp			doc
LEAST WEASEL		exp			doc		doc	exp		exp	exp	doc	exp
LITTLE BROWN BAT		doc	doc	doc	doc	doc	exp	exp	exp			doc	exp
LONG-EARED MYOTIS		doc	exp	exp	doc		exp					doc	exp
LONG-LEGGED MYOTIS		doc	exp	exp	exp	exp	exp		exp			doc	exp
LONG-TAILED VOLE			exp			doc			exp				exp
LONG-TAILED WEASEL	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	exp
MASKED SHREW	doc	doc		exp	doc	doc	doc	exp		doc	exp	doc	

MEADOW JUMPING MOUSE	exp	doc	doc	exp	exp		doc	exp	exp	doc	exp	doc	doc
MEADOW VOLE	doc	doc	exp		doc	doc	doc	exp	exp	doc	doc	doc	doc
MERRIAM'S SHREW			exp	exp	doc							doc	
MINK	doc	exp	exp	exp	doc	exp	doc	exp	exp	doc	doc	doc	exp
MOUNTAIN GOAT									doc				
MOUNTAIN LION			exp			exp			exp				doc
MULE DEER	doc	doc	doc	doc	doc	exp	doc		exp	doc	doc	doc	doc
MUSKRAT	doc	doc	exp	doc	doc		doc	exp		doc	doc	doc	doc
NORTHERN FLYING SQUIRREL			exp			exp			exp				doc
NORTHERN GRASSHOPPER MOUSE	doc	doc	exp	exp	doc	exp	doc	exp	exp	doc	doc	doc	exp
NORTHERN LONG-EARED BAT		exp			exp	doc	exp	exp	exp			doc	exp
NORTHERN POCKET GOPHER	exp	doc	doc	doc	exp	doc	doc		exp			doc	doc
NORTHERN SHORT-TAILED SHREW							doc	exp		doc			
NORWAY RAT		doc			exp		exp	exp		exp		exp	
NUTTALL'S COTTONTAIL			exp			doc			exp				exp
OLIVE-BACKED POCKET MOUSE	doc	doc	exp	exp	exp	exp	exp			doc	exp	doc	exp
ORD'S KANGAROO RAT	doc	doc		doc	doc	exp				doc	doc	doc	
PALLID BAT				exp									
PLAINS HARVEST MOUSE	doc	doc	exp	doc		exp		exp	exp	doc	exp	exp	exp
PLAINS POCKET GOPHER	doc	doc	exp	doc				exp		doc	doc		
PLAINS POCKET MOUSE	doc	doc		exp				exp		doc	doc		
PORCUPINE	doc	doc	doc	doc	doc	doc	doc	exp	exp	doc	doc	doc	doc
PRAIRIE VOLE	doc	doc	doc	doc	doc	doc	exp	exp		doc	doc	doc	doc
PRONGHORN	doc	doc		exp	exp		doc			doc		doc	doc
PYGMY SHREW								exp					
RACCOON	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	doc
RED BAT	exp	exp		exp	doc	exp	exp	exp	exp	doc	exp	doc	exp
RED FOX	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	
RED SQUIRREL			doc	doc		doc			exp				doc
RICHARDSON'S GROUND SQUIRREL					doc		exp					doc	
RIVER OTTER		exp		doc	exp		exp					exp	
SAGEBRUSH VOLE					exp							doc	
SILKY POCKET MOUSE	doc			exp							exp		
SILVER-HAIRED BAT	exp	doc	exp	exp	doc	doc	exp	exp	exp	exp	exp	doc	exp
SMALL-FOOTED MYOTIS	exp	doc	exp	exp		doc			exp	doc	doc	doc	exp
SOUTHERN BOG LEMMING								exp		exp			
SOUTHERN RED-BACKED VOLE			exp		exp	doc	doc		exp			exp	doc
SPOTTED GROUND SQUIRREL	exp	doc		exp						doc	exp		
STRIPED SKUNK	doc	doc	doc	doc	exp	exp	doc	exp	exp	doc	doc	doc	doc
SWIFT FOX	doc	doc		exp	doc								
THIRTEEN-LINED GROUND SQUIRREL	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	doc
TOWNSEND'S BIG-EARED BAT		doc	exp	exp	exp	doc			exp				doc
VIRGINIA OPOSSOM				doc				exp		doc	doc		
WAPITI		exp	doc	doc	doc	exp			exp			doc	doc
WESTERN HARVEST MOUSE	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	doc
WESTERN JUMPING MOUSE					exp								
WHITE-FOOTED MOUSE	exp	doc	doc		doc	exp	doc	exp	exp	doc		doc	doc
WHITE-TAILED DEER	doc	doc	doc	doc	doc	exp	doc	exp	exp	doc	doc	doc	doc

WHITE-TAILED JACK RABBIT	exp	doc	exp	exp	doc		doc	exp		doc	exp	doc	exp
WOODCHUCK								exp		exp			
YELLOW-BELLIED MARMOT			doc						exp				
PLANTS													
ABRONIA FRAGRANS	doc				exp						doc		doc
ABUTILON THEOPHRASTI					exp			exp					
ACALYPHA RHOMBOIDEA								exp					
ACALYPHA VIRGINICA										doc			
ACER NEGUNDO		doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
ACER SACCHARINUM								exp					
ACHILLEA MILLEFOLIUM		doc	doc	exp	doc	doc	doc		doc	doc		doc	doc
ACHNATHERUM HYMENOIDES	doc	doc	doc	doc	exp	doc					doc	doc	doc
ACHNATHERUM NELSONII SSP. NELSONII			exp										
ACHNATHERUM RICHARDSONII						doc							
ACHNATHERUM ROBUSTUM					exp	exp							doc
ACROPTILON REPENS		doc	exp									doc	doc
ACTAEA RUBRA			exp			doc	doc	exp	doc				doc
ADIANTUM PEDATUM								exp					
ADOXA MOSCHATELLINA													doc
AGALINIS ASPERA		doc								doc			
AGALINIS TENUIFOLIA				doc				exp		doc			
AGASTACHE FOENICULUM					exp	doc			doc			doc	doc
AGASTACHE NEPETOIDES								exp					
AGASTACHE SCROPHULARIIFOLIA								exp					
AGERATINA ALTISSIMA VAR. ALTISSIMA								exp					
AGOSERIS GLAUCA		doc	doc		exp	doc	doc		doc	doc		doc	doc
AGRIMONIA GRYPOSEPALA										doc			
AGRIMONIA STRIATA					exp		doc					doc	doc
AGROPYRON CRISTATUM	doc	doc	doc	exp	doc	doc	doc			doc	doc	doc	doc
AGROSTEMMA GITHAGO					exp								
AGROSTIS EXARATA			doc										doc
AGROSTIS GIGANTEA					doc			exp		doc			
AGROSTIS HYEMALIS					exp				doc				doc
AGROSTIS SCABRA			doc						doc	doc		doc	doc
AGROSTIS STOLONIFERA	doc		doc	doc	exp	doc			doc	doc	doc		doc
ALCEA ROSEA													doc
ALISMA GRAMINEUM		doc			exp							doc	
ALISMA SUBCORDATUM					exp			exp		doc		doc	
ALISMA TRIVIALE		doc	exp	exp								doc	
ALLIARIA PETIOLATA								exp					
ALLIUM CERNUUM				doc		doc			exp				doc
ALLIUM DRUMMONDII		doc											doc
ALLIUM GEYERI						exp							doc
ALLIUM PERDULCE										doc			
ALLIUM STELLATUM							doc						
ALLIUM TEXTILE	doc	doc	doc	exp	exp	exp	doc				doc	doc	doc
ALLIUM TRICOCCUM								exp					
ALMUTASTER PAUCIFLORUS							doc						

ALOPECURUS AEQUALIS			doc	exp	exp					doc		doc	doc
ALOPECURUS ARUNDINACEUS											doc		
ALOPECURUS CAROLINIANUS			exp		exp								doc
ALOPECURUS GENICULATUS					exp								
ALOPECURUS PRATENSIS				exp									
ALYSSUM ALYSSOIDES			exp										doc
ALYSSUM DESERTORUM	doc		doc	exp		doc					doc	doc	doc
AMARANTHUS ALBUS	doc	doc	doc	exp	exp					doc	doc	doc	doc
AMARANTHUS ARENICOLA										doc			
AMARANTHUS BLITOIDES	doc		doc	doc							doc		doc
AMARANTHUS HYBRIDUS	doc	doc									doc		
AMARANTHUS POWELLII				exp									
AMARANTHUS RETROFLEXUS	doc	doc	doc	exp	exp		doc			doc	doc	doc	doc
AMARANTHUS RUDIS								exp					
AMBROSIA ACANTHICARPA				exp	exp								
AMBROSIA ARTEMISIIFOLIA		doc	exp		exp	exp		exp		doc	doc		doc
AMBROSIA PSILOSTACHYA	doc	doc	doc	doc	exp	exp	doc	exp		doc	doc	doc	doc
AMBROSIA TOMENTOSA				exp									
AMBROSIA TRIFIDA	doc	doc	exp	doc	exp		doc	exp		doc	doc	doc	doc
AMELANCHIER ALNIFOLIA			doc		doc	doc	doc		doc	doc		doc	doc
AMELANCHIER HUMILIS					exp				doc				
AMMANNIA COCCINEA		doc											
AMMANNIA ROBUSTA								exp		doc			
AMORPHA CANESCENS		doc			exp			exp		doc			doc
AMORPHA FRUTICOSA		exp		doc			doc	exp		doc			doc
AMORPHA NANA		doc					doc						doc
AMPHICARPA BRACTEATA							doc						
AMPHICARPAEA BRACTEATA							exp			doc			
ANAGALLIS ARVENSIS													doc
ANAGALLIS MINIMA										doc			
ANAPHALIS MARGARITACEA													doc
ANDROPOGON GERARDII		doc	doc		exp	doc	doc	exp	doc	doc		doc	doc
ANDROPOGON HALLII	doc	doc		doc	exp					doc	doc	doc	
ANDROSACE OCCIDENTALIS		doc	doc		exp		doc			doc		doc	doc
ANDROSACE SEPTENTRIONALIS					exp	doc			exp				exp
ANEMONE CANADENSIS		doc			exp		doc	exp				doc	
ANEMONE CAROLINIANA		doc								doc			
ANEMONE CYLINDRICA		doc	doc		exp	exp	doc	exp		doc		doc	doc
ANEMONE MULTIFIDA					exp	exp							
ANEMONE PATENS		doc	doc		exp	doc	exp		exp	doc		doc	doc
ANEMONE VIRGINIANA					exp			exp				doc	doc
ANTENNARIA DIMORPHA		doc	exp										doc
ANTENNARIA HOWELLII			doc										
ANTENNARIA HOWELLII SSP. NEODIOICA												doc	4
ANTENNARIA MICROPHYLLA	doc	doc	exp	exp	exp	exp	exp		doc	doc	doc	doc	doc
ANTENNARIA NEGLECTA		doc			exp	exp				doc		doc	doc
ANTENNARIA PARLINII					exp				exp			doc	
ANTENNARIA PLANTAGINIFOLIA									doc				

ANTENNARIA ROSEA						doc	doc						doc
ANTHEMIS COTULA		doc											doc
APIOs AMERICANA										doc			
APOCYNUM ANDROSAEMIFOLIUM			doc		exp	doc			doc	doc		doc	doc
APOCYNUM CANNABINUM	doc	doc	doc	doc	doc		doc	exp			doc	doc	doc
AQUILEGIA BREVISTYLA						doc							doc
AQUILEGIA CANADENSIS						exp		exp		doc		doc	doc
ARABIS CANADENSIS								exp					
ARABIS DRUMMONDII			doc										doc
ARABIS GLABRA			doc		exp								
ARABIS HIRSUTA		doc	doc		exp	exp	doc	exp		doc		doc	doc
ARABIS HOLBOELLII	doc	doc	doc	exp	exp	exp	doc				doc	doc	doc
ARABIS HOLBOELLII VAR. RETROFRACTA													doc
ARABIS X DIVARICARPA			doc		exp							doc	
ARALIA NUDICAULIS									doc	doc		doc	doc
ARALIA RACEMOSA								exp		doc			
ARCTIUM LAPPA		doc											
ARCTIUM MINUS		exp	doc	exp	exp	doc	doc		doc	doc		doc	doc
ARCTOSTAPHYLOS UVA-URSI			doc		exp	doc			doc			doc	doc
ARENARIA HOOKERI	doc		exp	exp							doc		doc
ARENARIA HOOKERI SSP. HOOKERI											doc		
ARGEMONE HISPIDA				doc									
ARGEMONE POLYANTHEMOS	doc	doc			exp					doc	doc		doc
ARGENTINA ANSERINA					doc		doc					doc	doc
ARISAEMA TRIPHYLLUM								exp					
ARISTIDA BASIRAMEA								exp		doc			
ARISTIDA LONGISPICA													doc
ARISTIDA OLIGANTHA								exp					
ARISTIDA PURPUREA	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
ARISTIDA PURPUREA VAR. FENDLERIANA						exp							
ARISTIDA PURPUREA VAR. LONGISETA										doc			doc
ARNICA CORDIFOLIA			exp										
ARNICA FULGENS			doc		exp							doc	
ARNICA SORORIA			doc										
ARTEMISIA ABSINTHIUM					exp		doc					doc	
ARTEMISIA BIENNIS		doc	exp	doc	exp	doc				doc		doc	
ARTEMISIA CAMPESTRIS		doc	doc	doc	exp		doc	exp	exp	doc	doc	doc	doc
ARTEMISIA CANA		doc	doc	exp	doc	doc	doc				doc	doc	doc
ARTEMISIA DRACUNCULUS		doc	doc	doc	exp	doc	doc	exp			doc	doc	doc
ARTEMISIA FILIFOLIA	doc	doc		doc						doc	doc		doc
ARTEMISIA FRIGIDA	doc	doc	doc	doc	doc	doc	doc			doc	doc	doc	doc
ARTEMISIA GLOBULARIA											doc		
ARTEMISIA LONGIFOLIA		exp			exp							doc	
ARTEMISIA LUDOVICIANA	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc	doc
ARTEMISIA TRIDENTATA			doc		exp							doc	
ASCLEPIAS ARENARIA										doc			
ASCLEPIAS ENGELMANNIANA											doc		
ASCLEPIAS INCARNATA	doc			doc				exp		doc	doc		doc

ASCLEPIAS LANUGINOSA										doc		doc	
ASCLEPIAS OVALIFOLIA					exp	doc							doc
ASCLEPIAS PUMILA	doc	doc	doc	doc	exp	doc				doc	doc	doc	doc
ASCLEPIAS SPECIOSA	doc	doc	doc	doc	doc	doc					doc	doc	doc
ASCLEPIAS STENOPHYLLA		doc	doc							doc	doc		doc
ASCLEPIAS SYRIACA							doc	exp			doc		doc
ASCLEPIAS TUBEROSA								exp					
ASCLEPIAS UNCIALIS													doc
ASCLEPIAS VERTICILLATA		doc	doc		exp		doc	exp		doc		doc	doc
ASCLEPIAS VIRIDIFLORA	doc	doc	doc	exp	exp		doc			doc	doc	doc	doc
ASPARAGUS OFFICINALIS		doc		exp	doc		doc			doc	doc	doc	doc
ASPERUGO PROCUMBENS												doc	
ASTRAGALUS ADSURGENS		doc	doc	doc	exp	exp	doc		doc		doc	doc	doc
ASTRAGALUS AGRESTIS		doc	doc		exp							doc	doc
ASTRAGALUS ALPINUS													doc
ASTRAGALUS AUSTRALIS						exp							
ASTRAGALUS BARRII		doc											
ASTRAGALUS BISULCATUS		exp	doc		exp							doc	doc
ASTRAGALUS CANADENSIS		doc			exp			exp		doc			
ASTRAGALUS CERAMICUS										doc		doc	
ASTRAGALUS CRASSICARPUS		doc	doc		exp	doc	doc			doc		doc	doc
ASTRAGALUS CRASSICARPUS VAR.													doc
ASTRAGALUS DRUMMONDII			doc	exp	exp	exp							doc
ASTRAGALUS FLEXUOSUS			doc		exp	exp						doc	doc
ASTRAGALUS GILVIFLORUS		doc	doc		exp	exp						doc	doc
ASTRAGALUS GRACILIS		doc		exp							doc		doc
ASTRAGALUS HYALINUS		doc											
ASTRAGALUS KENTROPHYTA	doc										doc		
ASTRAGALUS LOTIFLORUS	doc	doc	doc	exp						doc	doc	doc	doc
ASTRAGALUS MISSOURIENSIS	doc	doc	doc	exp	exp	doc	doc				doc	doc	doc
ASTRAGALUS MOLLISSIMUS	doc	doc									doc		
ASTRAGALUS PECTINATUS					exp						doc	doc	
ASTRAGALUS PLATTENSIS		doc	exp										doc
ASTRAGALUS PURSHII		doc	doc	exp	exp							doc	doc
ASTRAGALUS RACEMOSUS		doc			exp							doc	doc
ASTRAGALUS SERICOLEUCUS				exp									
ASTRAGALUS SPATULATUS	doc		doc	exp	exp	doc					doc	doc	doc
ASTRAGALUS TENELLUS		doc	exp		exp							doc	
ATRIPLEX ARGENTEA		doc			exp							doc	
ATRIPLEX CANESCENS		doc			exp						doc	doc	
ATRIPLEX CONFERTIFOLIA		doc										doc	
ATRIPLEX GARDNERI											doc		
ATRIPLEX HORTENSIS					exp								
ATRIPLEX MICRANTHA	doc				exp						doc		
ATRIPLEX NUTTALLII		doc			doc							doc	doc
ATRIPLEX PATULA			doc										
ATRIPLEX PROSTRATA											doc		
ATRIPLEX SUBSPICATA	doc	exp	doc	exp							doc	doc	

AVENA FATUA					exp		doc				doc		
AVENA SATIVA			doc								doc		
AXYRIS AMARANTHOIDES					exp								
AZOLLA MEXICANA								exp					
BACOPA ROTUNDIFOLIA										doc			doc
BALSAMORHIZA SAGITTATA			doc										
BASSIA HYSSOPIFOLIA				exp									
BECKMANNIA SYZIGACHNE			doc	exp	exp		doc					doc	
BERBERIS THUNBERGII								exp					
BERULA ERECTA				exp	exp					doc	doc		doc
BESSEYA WYOMINGENSIS			doc		exp	doc							doc
BETULA OCCIDENTALIS									doc			doc	doc
BETULA PAPYRIFERA					exp	doc			doc	doc		doc	doc
BIDENS CERNUA		doc		doc	exp			exp		doc			doc
BIDENS CORONATA										doc			
BIDENS FRONDOSA	doc		exp	doc	exp		doc	exp		doc	doc	doc	
BIDENS TRIPARTITA				doc	exp			exp			doc		
BIDENS VULGATA					exp			exp					doc
BOEHMERIA CYLINDRICA								exp		doc			
BOLTONIA ASTEROIDES								exp					
BOTRYCHUM CAMPESTRE										doc			
BOTRYCHUM MATRICARIIFOLIUM										doc			
BOTRYCHUM VIRGINIANUM								exp		doc			
BOUTELOUA CURTIPENDULA	doc	doc	doc	exp	doc	doc	doc	exp		doc	doc	doc	doc
BOUTELOUA GRACILIS	doc	doc	doc	doc	doc	doc	doc			doc	doc	doc	doc
BOUTELOUA HIRSUTA		doc								doc		doc	doc
BRACHYELYTRUM ERECTUM								exp					
BRASSICA JUNCEA					exp								
BRASSICA NIGRA		doc											
BRICKELLIA EUPATORIOIDES	doc		doc	doc		doc	doc	exp			doc		
BRICKELLIA EUPATORIOIDES VAR.		doc			exp	exp	exp			doc	doc	doc	doc
BRICKELLIA EUPATORIOIDES VAR.													doc
BRICKELLIA GRANDIFLORA											doc		
BROMUS ARVENSIS													doc
BROMUS CARINATUS			doc										
BROMUS CILIATUS			exp		exp		doc			doc		doc	
BROMUS COMMUTATUS			doc	exp	exp	doc							doc
BROMUS INERMIS	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc	doc
BROMUS INERMIS VAR. PUMPELLIANUS													doc
BROMUS JAPONICUS	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
BROMUS KALMII						exp							doc
BROMUS LATIGLUMIS								exp		doc			
BROMUS PORTERI			doc		exp	doc							
BROMUS PUBESCENS								exp					
BROMUS SQUARROSUS	doc	doc		exp	exp						doc		
BROMUS TECTORUM	doc	doc	doc	doc	exp	doc	doc	exp		doc	doc	doc	doc
BUCHLOE DACTYLOIDES	doc	doc	doc	doc	exp	doc				doc	doc	doc	doc
BUGLOSSOIDES ARVENSIS													doc

CALAMAGROSTIS CANADENSIS										doc			
CALAMAGROSTIS MONTANENSIS			doc		doc							doc	
CALAMAGROSTIS STRICTA					exp							doc	
CALAMOVILFA LONGIFOLIA	doc	doc	doc	doc	doc		doc	exp			doc	doc	doc
CALLITRICHE HERMAPHRODITICA												doc	
CALLITRICHE PALUSTRIS			exp										doc
CALOCHORTUS GUNNISONII		doc	doc			doc							doc
CALOCHORTUS NUTTALLII		doc	doc		exp							doc	doc
CALYLOPHUS SERRULATUS	doc	doc	exp	exp	exp		doc			doc	doc	doc	doc
CALYPSO BULBOSA			doc										
CALYSTEGIA SEPIUM		doc	exp		exp		doc	exp				doc	doc
CAMELINA MICROCARPA	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
CAMELINA SATIVA					exp								doc
CAMPANULA APARINOIDES										doc			doc
CAMPANULA RAPUNCULOIDES													doc
CAMPANULA ROTUNDIFOLIA			doc	exp	exp	doc	doc		doc	doc		doc	doc
CAMPANULASTRUM AMERICANUM								exp		doc			
CANNABIS SATIVA								exp		doc	doc		
CAPSELLA BURSA-PASTORIS		doc	doc	exp	exp	doc		exp			doc	doc	doc
CARAGANA ARBORESCENS					exp								
CARDAMINE BULBOSA										doc			
CARDAMINE PENNSYLVANICA													doc
CARDARIA CHALAPENSIS				exp									
CARDARIA DRABA					exp							exp	
CARDUUS ACANTHOIDES				exp									
CARDUUS NUTANS			doc	doc				exp			doc	doc	doc
CAREX AGGREGATA								exp					
CAREX ALBICANS								exp					
CAREX AMPHIBOLA								exp					
CAREX AQUATILIS					exp								
CAREX ATHERODES			exp		exp			exp				doc	
CAREX AUREA					exp	exp				doc			
CAREX BACKII			doc			exp			exp				doc
CAREX BEBBII			exp										
CAREX BLANDA			doc					exp		doc			doc
CAREX BREVIOR		doc	doc		exp	exp		exp		doc	doc	doc	doc
CAREX CEPHALOPHORA								exp					
CAREX COMOSA										doc			
CAREX CONJUNCTA								exp					
CAREX CRISTATELLA					exp			exp				doc	
CAREX DAVISII								exp					
CAREX DEWEYANA					exp	exp							
CAREX DIANDRA										doc			
CAREX DOUGLASII													doc
CAREX DURIUSCULA	doc	doc	doc	exp	exp					doc	doc	doc	doc
CAREX EBURNEA								exp		doc		doc	
CAREX EMORYI			doc					exp				doc	
CAREX FILIFOLIA	doc	doc	doc	doc	doc	exp	doc		exp	doc	doc	doc	doc

CAREX FOENEA			doc			exp			doc			
CAREX GRANULARIS										doc		
CAREX GRAVIDA		doc	doc		exp		doc	exp			doc	
CAREX HALLII	doc				exp						doc	doc
CAREX HITCHCOCKIANA								exp				
CAREX HOODII			doc						exp			doc
CAREX HYSTERICINA				exp				exp		doc		doc
CAREX INOPS			doc				doc					
CAREX INOPS SSP. HELIOPHILA		doc			exp	exp	exp	exp	exp	doc		doc
CAREX INTERIOR										doc		
CAREX JAMESII								exp				
CAREX LACUSTRIS								exp				
CAREX LAEVICONICA					exp			exp				
CAREX LEAVENWORTHII								exp				
CAREX MEADII								exp		doc		
CAREX MESOCHOREA								exp				
CAREX MICROPTERA			doc			exp						
CAREX MOLESTA					exp			exp				
CAREX NEBRASCENSIS	doc		doc	doc	exp	exp				doc	doc	doc
CAREX OLIGOCARPA								exp				
CAREX PECKII						exp			doc	doc		
CAREX PELLITA			doc	exp	exp	exp		exp		doc		doc
CAREX PENNSYLVANICA		doc	doc				doc					doc
CAREX PRAEGRACILIS	doc	doc	doc		exp					doc	doc	
CAREX PRATICOLA			exp									
CAREX RICHARDSONII						exp						doc
CAREX ROSEA								exp				
CAREX ROSSII			doc			exp						
CAREX ROSTRATA					exp		doc					
CAREX SARTWELLII		doc			exp							
CAREX SAXIMONTANA		doc			exp			exp		doc		doc
CAREX SCOPARIA								exp		doc		
CAREX SPARGANIOIDES								exp				
CAREX SPRENGELII			doc		exp	exp	doc	exp		doc		doc
CAREX STIPATA								exp		doc		
CAREX STRICTA					exp					doc		doc
CAREX SYCHNOCEPHALA					exp							
CAREX TENERA								exp				doc
CAREX TETANICA										doc		
CAREX TORREYI			doc		exp							doc
CAREX TRIBULOIDES								exp				
CAREX UTRICULATA			doc									
CAREX VULPINOIDEA					exp		doc	exp		doc		doc
CAREX XERANTICA					exp							
CARYA CORDIFORMIS								exp				
CASTILLEJA SESSILIFLORA		doc	doc	exp	doc	doc	doc			doc		doc
CASTILLEJA SULPHUREA						doc			doc			doc
CATABROSA AQUATICA					exp							doc

CATALPA SPECIOSA								exp					
CAULOPHYLLUM THALICTROIDES								exp					
CEANOTHUS HERBACEUS								exp		doc			
CEANOTHUS VELUTINUS			doc										
CELASTRUS SCANDENS		doc			exp			exp		doc		doc	doc
CELTIS OCCIDENTALIS		doc						exp		doc	doc		doc
CENCHRUS LONGISPINUS	doc	doc	exp	doc				exp		doc	doc		doc
CENTAUREA BIEBERSTEINII		doc										doc	doc
CENTAUREA CYANUS		doc											doc
CENTAUREA DIFFUSA											doc		
CERASTIUM ARVENSE		exp	doc	exp	exp	doc						doc	doc
CERASTIUM BRACHYPODIUM					exp					doc			
CERASTIUM FONTANUM SSP. VULGARE		doc			exp								doc
CERASTIUM NUTANS			doc		exp							doc	
CERATOCEPHALA TESTICULATA			doc										doc
CERATOPHYLLUM DEMERSUM								exp		doc			
CERCOCARPUS MONTANUS	doc			exp		doc					doc		doc
CHAENACTIS DOUGLASII					exp							exp	doc
CHAITURUS MARRUBIASTRUM								exp					
CHAMAECRISTA FASCICULATA								exp					
CHAMAERHODOS ERECTA					exp							doc	
CHAMAESYCE ALBOMARGINATA		exp											
CHAMAESYCE FENDLERI				exp									
CHAMAESYCE GEYERI	doc										doc		
CHAMAESYCE GLYPTOSPERMA	doc	doc	doc	doc	exp	exp		exp			doc	doc	doc
CHAMAESYCE MISSURICA	doc	doc		doc						doc	doc	doc	doc
CHAMAESYCE NUTANS		doc						exp					
CHAMAESYCE PROSTRATA								exp			doc		doc
CHAMAESYCE SERPENS		doc						exp		doc		doc	
CHAMAESYCE SERPYLLIFOLIA				doc			doc				doc		
CHAMAESYCE SERPYLLIFOLIA SSP.		doc		doc	exp		exp					doc	doc
CHAMAESYCE STICTOSPORA		doc			exp	exp		exp					doc
CHAMERION ANGUSTIFOLIUM						doc							
CHAMERION ANGUSTIFOLIUM SSP.		doc			exp	exp			doc				doc
CHEILANTHES FEEI			doc			doc							doc
CHENOPODIUM ALBUM	doc	doc			doc	exp	doc			doc	doc	doc	doc
CHENOPODIUM ALBUM VAR. STRIATUM		doc			exp			exp					
CHENOPODIUM AMBROSIOIDES		doc											
CHENOPODIUM BERLANDIERI	doc	exp	doc	doc	exp	exp		exp			doc	doc	doc
CHENOPODIUM CAPITATUM		doc											
CHENOPODIUM DESICCATUM	doc	doc	doc		exp						doc	doc	
CHENOPODIUM FREMONTII	doc		doc		exp						doc	doc	
CHENOPODIUM GLAUCUM	doc			exp	exp			exp			doc	doc	
CHENOPODIUM INCANUM											doc		
CHENOPODIUM LEPTOPHYLLUM		doc										doc	
CHENOPODIUM PRATERICOLA	doc		doc	doc		exp		exp			doc	doc	doc
CHENOPODIUM RUBRUM			doc		exp								
CHENOPODIUM SIMPLEX		doc	doc		exp	exp	doc	exp		doc		doc	doc

CHENOPODIUM STANDLEYANUM					exp			exp		doc			
CHENOPODIUM SUBGLABRUM												doc	
CHLORIS VERTICILLATA				doc									
CHORISPORA TENELLA			doc		exp					doc	doc	doc	doc
CICUTA BULBIFERA										doc			
CICUTA DOUGLASII									exp				doc
CICUTA MACULATA	doc		doc	exp	exp		doc	exp	doc	doc	doc	doc	
CINNA ARUNDINACEA					exp			exp		doc			
CINNA LATIFOLIA					exp							doc	
CIRCAEA LUTETIANA								exp		doc			doc
CIRSIUM ALTISSIMUM								exp		doc			
CIRSIUM ARVENSE	doc	doc	doc	doc	doc	doc	doc	exp	exp		doc	doc	doc
CIRSIUM CANESCENS	doc	doc		exp						doc	doc		
CIRSIUM DISCOLOR								exp					
CIRSIUM DRUMMONDII									exp				doc
CIRSIUM FLODMANII	doc		doc	doc	exp		doc				doc	doc	doc
CIRSIUM HILLII													doc
CIRSIUM OCHROCENTRUM				exp					doc		doc		doc
CIRSIUM UNDULATUM		doc	doc		exp	doc						doc	doc
CIRSIUM VULGARE		doc	doc	exp	exp	doc		exp			doc		doc
CLAYTONIA PERFOLIATA			exp										
CLEMATIS COLUMBIANA						doc							
CLEMATIS COLUMBIANA VAR. TENUILOBA													doc
CLEMATIS FREMONTII													doc
CLEMATIS HIRSUTISSIMA VAR. SCOTTII													doc
CLEMATIS LIGUSTICIFOLIA		doc	doc	doc	exp	doc				doc	doc	doc	doc
CLEMATIS VIRGINIANA								exp		doc	doc	doc	
CLEOME SERRATA													doc
CLEOME SERRULATA	doc	doc	doc	doc	exp					doc	doc	doc	doc
COELOGLOSSUM VIRIDE						doc		exp					
COELOGLOSSUM VIRIDE VAR. VIRIDE						exp							
COLLINSIA PARVIFLORA			exp			doc							doc
COLLOMIA LINEARIS		doc	doc		exp		doc			doc		doc	doc
COMANDRA UMBELLATA	doc	doc	doc	exp	exp	doc	doc	exp		doc	doc	doc	doc
COMMELINA COMMUNIS								exp					
COMMELINA ERECTA										doc			
CONIUM MACULATUM			exp	exp				exp		doc	doc		doc
CONRINGIA ORIENTALIS		doc			exp	doc						doc	
CONVOLVULUS ARVENSIS	doc	doc	doc	doc	exp	doc		exp	doc	doc	doc	doc	doc
CONYZA CANADENSIS	doc	doc	exp	doc	exp	doc	doc	exp		doc	doc	doc	doc
CONYZA RAMOSISSIMA		exp								doc		doc	doc
CORALLORRHIZA MACULATA			doc			doc							doc
CORALLORRHIZA WISTERIANA													doc
COREOPSIS TINCTORIA											doc		
CORISPERMUM AMERICANUM VAR.										doc			
CORISPERMUM NITIDUM										doc			
CORISPERMUM VILLOSUM								exp					
CORNUS AMOMUM								exp					

CORNUS CANADENSIS													doc
CORNUS DRUMMONDII								exp					doc
CORNUS SERICEA			doc		doc	doc	doc		doc				
CORNUS SERICEA SSP. SERICEA					exp	exp	exp		exp	doc		doc	doc
CORONILLA VARIA						doc							
CORYDALIS AUREA			doc			doc				doc			doc
CORYDALIS CURVISILIQUA SSP.													doc
CORYDALIS MICRANTHA		doc						exp					doc
CORYLUS AMERICANA					exp			exp		doc			
CORYLUS CORNUTA									doc			doc	doc
CRATAEGUS CHRYSOCARPA			doc		exp		doc					doc	doc
CRATAEGUS DOUGLASII					doc								
CRATAEGUS DOUGLASII VAR. DOUGLASII			doc										
CRATAEGUS MOLLIS								exp					
CRATAEGUS SUCCULENTA		doc			exp								doc
CREPIS ACUMINATA			doc										
CREPIS ATRIBARBA											doc		
CREPIS OCCIDENTALIS		doc	exp		exp							doc	
CREPIS RUNCINATA				exp	exp					doc		doc	
CROTON TEXENSIS	doc	exp		doc						doc	doc		
CRYPTANTHA CANA	doc			doc							doc		doc
CRYPTANTHA CELOSIOIDES	doc	doc	doc	exp	exp						doc	doc	doc
CRYPTANTHA CINEREA	doc			doc							doc		
CRYPTANTHA CRASSISEPALA		doc											doc
CRYPTANTHA FENDLERI		doc											
CRYPTANTHA MINIMA	doc	doc		doc						doc	doc		doc
CRYPTANTHA THYRSIFLORA	doc	doc		exp							doc		doc
CRYPTANTHA TORREYANA			doc										
CRYPTOTAENIA CANADENSIS								exp					
CUSCUTA CORYLI										doc			
CUSCUTA GRONOVII					exp							doc	
CUSCUTA INDECORA							doc						
CUSCUTA MEGALOCARPA								exp					
CUSCUTA PENTAGONA												doc	
CUSCUTA POLYGONORUM								exp					
CYCLOLOMA ATRIPLICIFOLIUM								exp		doc			doc
CYMOPTERUS ACAULIS	doc	doc	exp	exp	exp						doc	doc	
CYMOPTERUS MONTANUS		doc	doc								doc		doc
CYNOGLOSSUM OFFICINALE			doc	exp	exp	doc			doc		doc		doc
CYPERUS ACUMINATUS		doc								doc			doc
CYPERUS BIPARTITUS								exp		doc			
CYPERUS DIANDRUS								exp		doc			
CYPERUS ERYTHORRHIZOS								exp		doc			
CYPERUS ESCULENTUS VAR.								exp					
CYPERUS LUPULINUS								exp					doc
CYPERUS LUPULINUS SSP. LUPULINUS													doc
CYPERUS ODORATUS								exp		doc			
CYPERUS SCHWEINITZII					exp			exp		doc			doc

CYPERUS SQUARROSUS				doc	exp					doc	doc		doc
CYPERUS STRIGOSUS								exp		doc			
CYPRIPEDIUM CANDIDUM										doc			
CYSTOPTERIS FRAGILIS		doc	doc		exp	doc		exp		doc		doc	
CYSTOPTERIS PROTRUSA								exp					
CYSTOPTERIS TENUIS								exp					
DACTYLIS GLOMERATA	doc	doc	doc					exp		doc	doc		doc
DALEA AUREA		doc								doc	doc		doc
DALEA CANDIDA	doc	doc	doc	doc	exp	doc	doc	exp		doc	doc	doc	doc
DALEA CANDIDA VAR. CANDIDA													doc
DALEA CANDIDA VAR. OLIGOPHYLLA										doc			doc
DALEA CYLINDRICEPS													doc
DALEA ENNEANDRA		exp								doc		doc	doc
DALEA LEPORINA								exp					
DALEA PURPUREA	doc	doc	doc	exp	doc	doc	doc	exp		doc	doc	doc	doc
DALEA PURPUREA VAR. PURPUREA													doc
DALEA VILLOSA										doc			
DANTHONIA INTERMEDIA						doc							doc
DANTHONIA SPICATA			doc		exp	doc			doc				doc
DANTHONIA UNISPICATA			doc										
DASIPHORA FLORIBUNDA		doc			exp	doc						doc	
DAUCUS CAROTA													doc
DELPHINIUM BICOLOR			doc		exp	doc						doc	doc
DELPHINIUM CAROLINIANUM								exp		doc			
DELPHINIUM CAROLINIANUM SSP.		doc								doc			doc
DELPHINIUM GEYERI				exp									
DELPHINIUM NUTTALLIANUM													doc
DESCHAMPSIA CAESPITOSA					exp								
DESCURAINIA PINNATA	doc	doc	doc	exp	exp	exp		exp		doc	doc	doc	doc
DESCURAINIA PINNATA SSP. INTERMEDIA													doc
DESCURAINIA SOPHIA	doc	doc	doc	doc	exp	exp	doc				doc	doc	doc
DESMANTHUS ILLINOENSIS								exp		doc			
DESMODIUM CANADENSE										doc			
DESMODIUM CANESCENS								exp					
DESMODIUM GLUTINOSUM								exp		doc			
DESMODIUM PANICULATUM								exp					
DIANTHUS ARMERIA													doc
DIARRHENA OBOVATA								exp					
DICENTRA CUCULLARIA								exp					
DICHANTHELIUM ACUMINATUM										doc		doc	
DICHANTHELIUM ACUMINATUM VAR.								exp					
DICHANTHELIUM LEIBERGII								exp	doc				
DICHANTHELIUM LINEARIFOLIUM									exp				doc
DICHANTHELIUM OLIGOSANTHES			doc		exp				exp	doc		doc	doc
DICHANTHELIUM OLIGOSANTHES VAR.			doc					exp					
DICHANTHELIUM WILCOXIANUM			doc				doc			doc		doc	
DIGITARIA ISCHAEMUM					exp			exp					
DIGITARIA SANGUINALIS										doc			

DIPSACUS FULLONUM													exp
DIPSACUS FULLONUM SSP. SYLVESTRIS													doc
DISPORUM TRACHYCARPUM			doc		exp	doc						doc	doc
DISTICHLIS SPICATA	doc	doc	doc	doc	exp	doc					doc	doc	
DODECATHEON MEADIA													doc
DODECATHEON PULCHELLUM			doc			doc		exp					doc
DRABA AUREA													doc
DRABA NEMOROSA			doc	exp	exp							doc	doc
DRABA REPTANS	doc	doc	doc			doc		exp		doc	doc	doc	doc
DRACOCEPHALUM PARVIFLORUM						doc				doc			doc
DRYOPTERIS CARTHUSIANA								exp		doc			
DYSSODIA PAPPOSA	doc	doc	doc	doc	exp	doc		exp		doc	doc	doc	doc
ECHINACEA ANGUSTIFOLIA		doc	doc		doc	exp	doc	exp		doc	doc	doc	doc
ECHINACEA ANGUSTIFOLIA VAR.													doc
ECHINACEA PALLIDA						doc							
ECHINOCEREUS VIRIDIFLORUS		doc											doc
ECHINOCHLOA CRUS-GALLI					doc						doc		
ECHINOCHLOA CRUSGALLI		doc				exp		exp				doc	exp
ECHINOCHLOA MURICATA	doc		doc	doc		doc		exp		doc	doc		
ECHINOCYSTIS LOBATA	doc		doc	exp	exp		doc	exp		doc	doc		doc
ECHINODORUS BERTEROI		doc											
ECHINODORUS CORDIFOLIUS		doc											
ECLIPTA PROSTRATA								exp					
ELAEAGNUS ANGUSTIFOLIA	doc	doc		doc	doc	doc	doc	exp		doc	doc	doc	doc
ELAEAGNUS COMMUTATA					exp							doc	
ELAEAGNUS UMBELLATA								exp					
ELATINE RUBELLA										doc			
ELEOCHARIS ACICULARIS		doc	exp		exp			exp		doc		doc	
ELEOCHARIS COMPRESSA		exp			exp							doc	
ELEOCHARIS ERYTHROPODA	doc	doc			exp		doc	exp		doc	doc	doc	
ELEOCHARIS OBTUSA										doc			
ELEOCHARIS PALUSTRIS		doc	doc	exp	exp	doc		exp					doc
ELEUSINE INDICA								exp					
ELLISIA NYCTELEA	doc	doc	doc	exp	exp	doc	doc	exp		doc	doc		doc
ELODEA TUTTALLII										doc			
ELYMUS ALBICANS						doc							doc
ELYMUS CANADENSIS	doc	doc	doc	doc	doc	doc	doc	exp	doc	doc	doc	doc	doc
ELYMUS CANINUS		doc	doc		exp		doc		doc	doc		doc	doc
ELYMUS DIVERSIGLUMIS													doc
ELYMUS ELYMOIDES	doc	exp	doc	exp							doc		
ELYMUS ELYMOIDES SSP. ELYMOIDES		doc			exp							doc	doc
ELYMUS GLAUCUS			doc										
ELYMUS HYSTRIX								exp					
ELYMUS LANCEOLATUS	doc		exp								doc		
ELYMUS LANCEOLATUS SSP. LANCEOLATUS		doc			exp	exp						doc	doc
ELYMUS MACROURUS					doc								
ELYMUS REPENS		doc	doc	doc	exp	doc	doc	exp			doc	doc	doc
ELYMUS TRACHYCAULUS	doc		doc	exp		doc					doc		

ELYMUS TRACHYCAULUS SSP.						exp							
ELYMUS TRACHYCAULUS SSP.		exp			exp	exp							
ELYMUS VILLOSUS			doc		exp	exp	doc	exp		doc		doc	
ELYMUS VIRGINICUS		doc	doc		exp	exp	doc	exp	doc	doc	doc	doc	doc
ELYMUS X PSEUDOREPENS													doc
ENDOLEPIS DIOICA					exp							doc	
ENGELMANNIA PERISTENIA		doc											doc
EPILOBIUM BRACHYCARPUM		doc	exp		exp							doc	doc
EPILOBIUM CILIATUM			doc	exp		exp			doc	doc	doc	doc	doc
EPILOBIUM CILIATUM SSP. CILIATUM										doc			
EPILOBIUM COLORATUM								exp		doc			
EPILOBIUM LEPTOPHYLLUM	doc				exp			exp		doc	doc		
EPILOBIUM PYGMAEUM												exp	
EQUISETUM ARVENSE			doc	exp	doc		doc	exp	exp	doc	doc	doc	doc
EQUISETUM HYEMALE					exp		doc	exp		doc	doc		doc
EQUISETUM LAEVIGATUM	doc	exp	doc	doc	exp	doc	doc		exp	doc	doc	doc	doc
ERAGROSTIS CILIANENSIS	doc	doc	doc	doc	exp	doc		exp			doc	doc	doc
ERAGROSTIS HYPNOIDES								exp		doc			
ERAGROSTIS MINOR				exp									
ERAGROSTIS PECTINACEA								exp		doc	doc		
ERAGROSTIS SPECTABILIS								exp		doc			doc
ERAGROSTIS TRICHODES										doc			
ERECHTITES HIERACIIFOLIA								exp					
ERICAMERIA NAUSEOSA			doc			doc							
ERICAMERIA NAUSEOSA VAR. NAUSEOSA		doc	doc	exp	doc	exp					doc	doc	doc
ERICAMERIA PARRYI VAR. PARRYI											doc		
ERIGERON ACRIS SSP. DEBILIS													doc
ERIGERON ANNUUS								exp		doc			
ERIGERON ASPER													doc
ERIGERON BELLIDIASTRUM	doc	exp								doc	doc		doc
ERIGERON CAESPITOSUS				exp	exp						doc		doc
ERIGERON CANUS		doc	doc	exp		exp					doc	doc	doc
ERIGERON COMPOSITUS		doc			exp								
ERIGERON CORYMBOSUS				doc									
ERIGERON DIVERGENS			exp	doc									
ERIGERON FLAGELLARIS						exp							doc
ERIGERON FORMOSISSIMUS						exp							
ERIGERON GLABELLUS					exp		doc					doc	doc
ERIGERON LONCHOPHYLLUS					exp							doc	doc
ERIGERON OCHROLEUCUS			doc										doc
ERIGERON PHILADELPHICUS			exp		exp			exp		doc		doc	doc
ERIGERON PUMILUS	doc	doc	exp	exp	exp		doc				doc	doc	doc
ERIGERON SPECIOSUS													doc
ERIGERON STRIGOSUS		doc	doc		exp	exp	doc	exp		doc		doc	doc
ERIGERON SUBTRINERVIS		exp	doc			exp			doc			doc	doc
ERIOCHLOA VILLOSA								exp					
ERIOGONUM ALATUM				exp							doc		
ERIOGONUM ANNUUM	doc	doc	exp	doc	exp					doc	doc		doc

ERIOGONUM BREVICAULE				exp									
ERIOGONUM EFFUSUM				doc									
ERIOGONUM FLAVUM	doc	doc	doc	exp	doc						doc	doc	doc
ERIOGONUM GORDONII		doc											
ERIOGONUM MICROTHECUM				doc									
ERIOGONUM PAUCIFLORUM		doc	doc		exp						doc	doc	doc
ERIOGONUM PAUCIFLORUM VAR.		doc										doc	doc
ERIOGONUM VISHERI		doc											
ERIOPHORUM ANGUSTIFOLIUM SSP.					exp								
ERIOPHORUM VIRIDICARINATUM					exp								
ERUCASTRUM GALLICUM					exp								
ERYSIMUM CAPITATUM			doc	doc		doc	doc						doc
ERYSIMUM CAPITATUM VAR. CAPITATUM	doc	doc	doc	doc	exp	exp	exp			doc	doc	doc	doc
ERYSIMUM CHEIRANTHOIDES		doc	doc		exp	doc	doc	exp		doc		doc	doc
ERYSIMUM INCONSPICUUM			exp		exp	doc		exp		doc		doc	doc
ERYTHRONIUM ALBIDUM								exp					
ERYTHRONIUM MESOCHOREUM								exp					
ESCOBARIA MISSOURIENSIS			doc			doc							
ESCOBARIA MISSOURIENSIS VAR.		doc	doc		exp	exp						doc	doc
ESCOBARIA VIVIPARA							doc				doc		
ESCOBARIA VIVIPARA VAR. VIVIPARA	doc	doc		exp	exp		exp			doc	doc	doc	doc
EUONYMUS ATROPURPUREUS								exp					
EUPATORIUM ALTISSIMUM								exp					
EUPATORIUM MACULATUM			exp					exp		doc			doc
EUPATORIUM PERFOLIATUM								exp		doc			
EUPATORIUM PURPUREUM								exp					doc
EUPATORIUM SEROTINUM								exp					
EUPHORBIA AGRARIA							doc						
EUPHORBIA BRACHYCERA	doc	doc	doc	exp		doc					doc	doc	doc
EUPHORBIA COROLLATA								exp					
EUPHORBIA DAVIDII				doc				exp			doc		doc
EUPHORBIA ESULA			doc		doc	doc	exp	exp				doc	doc
EUPHORBIA HEXAGONA	doc									doc	doc		
EUPHORBIA MARGINATA		doc						exp					doc
EUPHORBIA PSEUDOVIRGATA										doc		doc	
EUPHORBIA SPATHULATA		doc	doc		exp						doc	doc	doc
EUSTOMA EXALTATUM SSP. RUSSELLIANUM				4									
EUTHAMIA GRAMINIFOLIA VAR.										doc			
EUTHAMIA GYMNOSPERMOIDES										doc	doc		doc
EUTHAMIA OCCIDENTALIS				doc							doc		
EVAX PROLIFERA		doc											doc
EVOLVULUS NUTTALLIANUS		doc	doc	exp						doc	doc		doc
FESTUCA ALTAICA					exp								
FESTUCA IDAHOENSIS			doc			doc			doc				
FESTUCA RUBRA			doc										
FESTUCA SAXIMONTANA			doc										
FESTUCA SUBVERTICILLATA								exp		doc			
FESTUCA TRACHYPHYLLA					exp	doc			doc			doc	doc

FIMBRISTYLIS PUBERULA										doc	doc		
FRAGARIA VESCA					exp			exp		doc		doc	doc
FRAGARIA VIRGINIANA			doc		exp	exp	doc	exp	doc			doc	doc
FRASERA SPECIOSA						doc							doc
FRAXINUS PENNSYLVANICA		doc	doc	doc	doc		doc	exp		doc	doc	doc	doc
FRITILLARIA ATROPURPUREA	doc	doc			exp	doc					doc	doc	
FROELICHIA FLORIDANA										doc			
FROELICHIA GRACILIS										doc			
GAILLARDIA ARISTATA					exp	doc						doc	doc
GAILLARDIA PULCHELLA										doc			
GALEOPSIS BIFIDA													doc
GALEOPSIS TETRAHIT													doc
GALIMUM APARINE		doc	doc		exp	exp		exp	doc	doc	doc	doc	doc
GALIMUM BOREALE		doc	doc		exp	exp	doc		exp			doc	doc
GALIMUM CIRCAEZANS								exp	doc	doc			
GALIMUM TINCTORIUM								exp					
GALIMUM TRIFIDUM					exp								
GALIMUM TRIFLORUM			doc		exp	exp	doc	exp	doc	doc	doc		doc
GAURA COCCINEA	doc	doc	doc	doc	exp	doc	doc			doc	doc	doc	doc
GAURA MOLLIS	doc	doc		doc						doc	doc		doc
GAYOPHYTUM DIFFUSUM			doc										
GENTIANA AFFINIS					exp							doc	
GENTIANA ANDREWSII										doc			
GENTIANA ANDREWSII VAR. ANDREWSII													doc
GENTIANELLA AMARELLA					exp							doc	doc
GERANIUM BICKNELLII		doc	doc										
GERANIUM CAROLINIANUM		doc	doc							doc		doc	
GERANIUM MACULATUM													doc
GERANIUM PUSILLUM			doc										doc
GERANIUM RICHARDSONII						exp			doc				doc
GERANIUM VISCOSISSIMUM													doc
GEUM ALEPPICUM			doc		exp	exp	doc			doc		doc	doc
GEUM CANADENSE			exp		exp		doc	exp		doc		doc	doc
GEUM MACROPHYLLUM			doc										
GEUM TRIFLORUM			doc		doc	doc						doc	doc
GLANDULARIA BIPINNATIFIDA			doc										
GLANDULARIA BIPINNATIFIDA VAR.		doc											doc
GLAUX MARITIMA					exp							doc	
GLECHOMA HEDERACEA								exp					
GLECOMA HEDERACEA					exp					doc			
GLEDITSIA TRIACANTHOS	doc							exp			doc		
GLYCERIA BOREALIS					exp								
GLYCERIA GRANDIS			exp		exp		doc	exp		doc		doc	doc
GLYCERIA MAXIMA													doc
GLYCERIA STRIATA			doc		exp	doc		exp		doc		doc	doc
GLYCYRRHIZA LEPIDOTA	doc	doc	doc	doc	doc	exp	doc	exp	doc	doc	doc	doc	doc
GRATIOLA NEGLECTA					exp							doc	doc
GRINDELIA SQUARROSA	doc	doc	doc	doc	exp	doc	doc	exp		doc	doc	doc	doc

GRINDELIA SQUARROSA VAR.													doc
GUTIERREZIA SAROTHRAE	doc	doc	doc	doc	doc	doc	doc			doc	doc	doc	doc
GYMNOCLADUS DIOICUS					exp			exp					
GYP SOPHILA PANICULATA					exp	doc	doc		doc	doc		doc	doc
HACKELIA DEFLEXA			doc		exp	doc	doc		doc	doc		doc	doc
HACKELIA FLORIBUNDA		doc	exp						doc			doc	doc
HACKELIA VIRGINIANA								exp		doc	doc		doc
HALENIA DEFLEXA					exp								doc
HALOGETON GLOMERATUS		doc											
HEDEOMA DRUMMONDII	doc	doc	doc	exp	exp	doc					doc	doc	doc
HEDEOMA HISPIDA							doc	exp		doc			doc
HEDEOMA HISPIDUM	doc	doc	doc		exp		exp				doc	doc	
HEDEOMA PULEGIOIDES		doc											
HEDYSARUM ALPINUM						doc							
HEDYSARUM BOREALE			doc		exp							doc	
HELEN IUM AUTUMNALE					exp			exp		doc			
HELIANTHEMUM BICKNELLII			doc							doc			doc
HELIANTHUS ANNUUS	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
HELIANTHUS GIGANTEUS													doc
HELIANTHUS GROSSESERRATUS										doc			doc
HELIANTHUS HIRSUTUS								exp					
HELIANTHUS MAXIMILIANI	doc	doc	doc		exp		doc			doc	doc	doc	doc
HELIANTHUS NUTTALLII			exp		exp					doc			doc
HELIANTHUS PAUCIFLORUS			doc				doc	exp					
HELIANTHUS PAUCIFLORUS SSP.		doc			exp	exp	exp			doc		doc	doc
HELIANTHUS PETIOLARIS	doc	doc	doc	doc	exp			exp			doc	doc	doc
HELIANTHUS PUMILUS				exp									
HELIANTHUS TUBEROSUS								exp		doc			doc
HELICTOTRICHON HOOKERI					exp								
HELIOPSIS HELIANTHOIDES								exp		doc			
HERACLEUM MAXIMUM								exp		doc			doc
HERACLEUM SPHONDYLIUM					exp	doc			doc	doc			doc
HESPERIS MATRONALIS		doc	doc		exp		doc			doc	doc	exp	doc
HESPEROSTIPA COMATA					doc	doc	doc						
HESPEROSTIPA COMATA SSP. COMATA	doc	doc	doc	doc	exp	exp	exp			doc	doc	doc	doc
HESPEROSTIPA SPARTEA			doc		doc	doc	doc	exp		doc		doc	doc
HETERANTHERA LIMOSA													doc
HETEROTHECA STENOPHYLLA VAR.										doc			
HETEROTHECA VILLOSA	doc		doc	doc	doc	doc	doc				doc		doc
HETEROTHECA VILLOSA VAR. FOLIOSA													doc
HETEROTHECA VILLOSA VAR. MINOR													doc
HETEROTHECA VILLOSA VAR. VILLOSA		doc			exp		exp					doc	doc
HEUCHERA AMERICANA VAR. HIRSUTICAULIS													doc
HEUCHERA RICHARDSONII			doc		exp	doc	doc		doc	doc		doc	doc
HIBISCUS TRIONUM								exp					
HIERACIUM ALBIFLORUM			doc						doc				doc
HIERACIUM CANADENSE			doc										
HIERACIUM UMBELLATUM			doc										doc

HIEROCHLOE ALPINA						doc							
HIEROCHLOE ALPINA SSP. ALPINA					exp	exp							
HIPPURIS VULGARIS				exp									
HORDEUM BRACHYANTHERUM						doc							
HORDEUM JUBATUM	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
HORDEUM PUSILLUM		doc			exp			exp		doc	doc	doc	doc
HUMULUS LUPULUS			exp	exp	exp	doc	doc	exp				doc	doc
HYDROPHYLLUM VIRGINIANUM								exp					
HYMENOPAPPUS FILIFOLIUS	doc	doc	doc	doc	exp	doc				doc	doc	doc	doc
HYMENOPAPPUS FILIFOLIUS VAR.			doc	doc									
HYMENOPAPPUS TENUIFOLIUS		doc			exp					doc			
HYMENOXYS RICHARDSONII					exp							doc	
HYOSCYAMUS NIGER		doc			exp	doc						doc	doc
HYPERICUM CANADENSE													doc
HYPERICUM MAJUS										doc			
HYPOXIS HIRSUTA										doc			
IMPATIENS CAPENSIS								exp		doc			
IMPATIENS PALLIDA								exp					
IPOMOEA LEPTOPHYLLA		doc		doc						doc	doc		doc
IPOMOEA NIL											doc		
IPOMOPSIS CONGESTA		doc	doc		exp	doc					doc	doc	doc
IPOMOPSIS LONGIFLORA										doc			
IPOMOPSIS SPICATA		doc		exp									doc
IRIS MISSOURIENSIS			exp			doc							doc
IVA ANNUA											doc		
IVA AXILLARIS		doc		exp	exp						doc	doc	
IVA XANTHIFOLIA	doc	doc	doc	doc	exp	doc	doc				doc	doc	doc
JUGLANS NIGRA								exp		doc	doc		
JUNCUS ALPINOARTICULATUS SSP.										doc			
JUNCUS ARCTICUS								exp					
JUNCUS BALTICUS	doc	doc	doc		exp	exp	doc			doc	doc	doc	
JUNCUS BRACHYPHYLLUS										doc			
JUNCUS BUFONIUS					exp					doc		doc	doc
JUNCUS COMPRESSUS			exp	exp									
JUNCUS DUDLEYI					exp	exp		exp		doc			doc
JUNCUS EFFUSUS		doc										doc	
JUNCUS ENSIFOLIUS													doc
JUNCUS INTERIOR		doc	doc		exp	exp		exp				doc	doc
JUNCUS LONGISTYLIS					exp	exp				doc	doc		
JUNCUS MARGINATUS										doc			
JUNCUS NODOSUS			exp				doc			doc		doc	
JUNCUS TENUIS			exp			exp							doc
JUNCUS TORREYI	doc		exp	doc	exp			exp		doc	doc	doc	doc
JUNIPERUS COMMUNIS			doc		exp	doc	doc		doc			doc	doc
JUNIPERUS HORIZONTALIS					doc				exp	doc		doc	doc
JUNIPERUS SCOPULORUM		doc	doc	doc	doc	doc			exp		doc	doc	doc
JUNIPERUS VIRGINIANA		doc						exp		doc	doc		doc
KOCHIA SCOPARIA	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc

KOELERIA MACRANTHA	doc	doc	doc	exp	doc	doc	doc		doc	doc	doc	doc	doc
KRASCHENINNIKOVIA LANATA	doc			doc	doc						doc	doc	
LACTUCA BIENNIS													doc
LACTUCA CANADENSIS			doc					exp		doc			doc
LACTUCA FLORIDANA								exp					
LACTUCA LUDOVICIANA		doc			exp	exp		exp				doc	
LACTUCA PULCHELL					doc								
LACTUCA SERRIOLA	doc	doc	doc	doc	exp	doc	doc	exp			doc	doc	doc
LACTUCA TATARICA	doc		doc				doc	exp			doc		
LACTUCA TATARICA VAR. PULCHELLA		doc	doc		doc	exp	exp			doc	doc	doc	4
LAMIUM AMPLEXICAULE											doc		
LAPORTEA CANADENSIS								exp		doc			
LAPPULA CENCHRUSOIDES					exp						doc		
LAPPULA OCCIDENTALIS	doc		doc				doc				doc		
LAPPULA OCCIDENTALIS VAR. CUPULATA												doc	
LAPPULA OCCIDENTALIS VAR. OCCIDENTALIS		doc	doc	doc	exp		exp			doc		doc	doc
LAPPULA SQUARROSA		doc			exp	doc		exp				doc	doc
LATHYRUS OCHROLEUCUS			doc			doc			doc				doc
LATHYRUS POLYMORPHUS	doc	doc	doc	exp						doc	doc		doc
LECHEA STRICTA										doc			
LEERSIA ORYZOIDES			doc	doc				exp		doc			
LEERSIA VIRGINICA								exp		doc			
LEMNA MINOR	doc		exp	exp	exp					doc	doc		doc
LEMNA TRISULCA					exp					doc			
LEONURUS CARDIACA						doc		exp					doc
LEPIDIUM CAMPESTRE													doc
LEPIDIUM DENSIFLORUM	doc	doc	doc	exp	exp	doc	doc	exp			doc	doc	doc
LEPIDIUM LATIFOLIUM											doc		
LEPIDIUM PERFOLIATUM		doc	exp		exp							doc	doc
LEPIDIUM RAMOSISSIMUM					exp								
LEPIDIUM VIRGINICUM	doc	exp									doc		
LEPTOCHLOA FUSCA SSP. FASCICULARIS					exp			exp					
LEPTODACTYLON CAESPITOSUM											doc		
LESPEDEZA CAPITATA								exp		doc			
LESQUERELLA ALPINA	doc		doc		exp						doc	doc	doc
LESQUERELLA ARENOSA		doc	exp	exp	exp	doc	doc					doc	doc
LESQUERELLA LUDOVICIANA	doc	doc		exp	exp					doc	doc	doc	doc
LESQUERELLA MONTANA													doc
LEUCOCRINUM MONTANUM	doc	doc	doc	exp		doc					doc	exp	doc
LEYMUS CINEREUS													doc
LEYMUS INNOVATUS						doc							
LIATRIS ASPERA								exp		doc			
LIATRIS LIGULISTYLIS					exp	doc	doc						doc
LIATRIS PUNCTATA	doc	doc	doc	doc	exp	doc	doc			doc	doc	doc	doc
LIATRIS SQUARROSA		exp								doc			
LIATRIS SQUARROSA VAR. GLABRATA										doc			
LILIUM PHILADELPHICUM					exp	exp	doc					doc	doc
LIMOSELLA AQUATICA			exp										

LINANTHUS SEPTENTRIONALIS			doc										
LINARIA VULGARIS					exp							doc	doc
LINDERNIA DUBIA								exp		doc			
LINNAEA BOREALIS						doc							doc
LINUM AUSTRALE			doc										
LINUM COMPACTUM			doc								doc		doc
LINUM PERENNE			doc		doc	doc	doc					doc	doc
LINUM RIGIDUM	doc	doc	doc	doc	doc	exp	doc			doc	doc	doc	doc
LINUM RIGIDUM VAR. RIGIDUM													doc
LINUM SULCATUM								exp					
LINUM USITATISSIMUM				exp									
LIPARIS LOESELII										doc			
LITHOPHRAGMA PARVIFLORUM			doc										doc
LITHOSPERMUM CANESCENS								exp				doc	
LITHOSPERMUM CAROLINIENSE										doc			
LITHOSPERMUM INCISUM	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
LOBELIA SIPHILITICA				doc				exp		doc			doc
LOBELIA SPICATA					exp	doc				doc			doc
LOGFIA ARVENSIS			exp										
LOLIUM ARUNDINACEUM	doc		doc								doc		
LOLIUM PERSICUM					exp								
LOLIUM PRATENSE		doc	doc										
LOMATIUM FOENICULACEUM		doc	doc		exp	doc						doc	doc
LOMATIUM MACROCARPUM		doc			exp								
LOMATIUM NUTTALLII	doc										doc		
LOMATIUM ORIENTALE	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	
LONICERA DIOICA					exp	doc		exp	doc	doc			doc
LONICERA MAACKII								exp					
LONICERA TATARICA							doc						
LOTUS UNIFOLIOLATUS			doc				doc						
LOTUS UNIFOLIOLATUS VAR. UNIFOLIOLATUS		doc			exp		exp			doc		doc	doc
LUDWIGIA PALUSTRIS										doc			
LUDWIGIA POLYCARPA										doc			
LUPINUS ARGENTEUS			doc		doc	doc						doc	doc
LUPINUS PARVIFLORUS													doc
LUPINUS PARVIFLORUS SSP. FLORIBUNDUS													doc
LUPINUS PUSILLUS	doc	doc		exp	exp						doc	doc	
LUPINUS SERICEUS			exp										
LYCIUM BARBARUM										doc	doc		
LYCOPUS AMERICANUS	doc	exp	exp	exp	exp			exp		doc	doc	doc	doc
LYCOPUS ASPER	doc			doc	exp		doc	exp		doc	doc	doc	
LYCOPUS UNIFLORUS								exp					
LYCOPUS VIRGINICUS								exp					
LYGODESMIA JUNCEA	doc	doc	doc	exp	exp	doc	doc	exp		doc	doc	doc	doc
LYSIMACHIA CILIATA			doc		exp	doc	doc	exp	doc	doc		doc	doc
LYSIMACHIA HYBRIDA					exp								
LYSIMACHIA THYRSIFLORA										doc			doc
LYTHRUM ALATUM										doc			

LYTHRUM ALATUM VAR. ALATUM										doc			
LYTHRUM SALICARIA										doc			
MACHAERANTHERA CANESCENS	doc	doc	doc	doc	exp	doc					doc	doc	
MACHAERANTHERA CANESCENS VAR.													doc
MACHAERANTHERA CANESCENS VAR.						exp							
MACHAERANTHERA GRINDELIOIDES			doc		exp							doc	doc
MACHAERANTHERA GRINDELIOIDES VAR.			doc	exp									
MACHAERANTHERA PINNATIFIDA	doc		doc	doc		doc	doc				doc		
MACHAERANTHERA PINNATIFIDA VAR.		doc	doc	doc	exp		exp			doc		doc	doc
MACHAERANTHERA TANACETIFOLIA		doc		doc									
MADIA GLOMERATA			exp										
MAHONIA REPENS			doc			doc							
MAIANTHEMUM CANADENSE									doc				doc
MAIANTHEMUM RACEMOSUM SSP.								exp					doc
MAIANTHEMUM STELLATUM	doc	doc	doc		doc	doc	doc	exp	doc	doc	doc	doc	doc
MALUS IOENSIS VAR. IOENSIS													doc
MALUS PUMILA			doc							doc			
MALUS SYLVESTRIS			doc										
MALVA NEGLECTA		doc	doc	exp	exp		doc			doc		doc	
MALVA PARVIFLORA					exp							doc	
MALVA SYLVESTRIS					exp								
MARRUBIUM VULGARE						doc							doc
MARSILEA VESTITA					exp					doc			doc
MATRICARIA DISCOIDEA			doc		exp	doc							
MATTEUCCIA STRUTHIOPTERIS								exp					
MEDICAGO LUPULINA	doc	doc	doc	doc	exp	doc	doc	exp		doc	doc	doc	doc
MEDICAGO SATIVA	doc	doc	doc	exp	doc	doc	doc	exp		doc	doc	doc	doc
MELILOTUS ALBA		doc			exp	doc	doc			doc		doc	doc
MELILOTUS OFFICINALIS	doc	doc	doc	doc	doc	exp	doc	exp		doc	doc	doc	doc
MENISPERMUM CANADENSE								exp					
MENTHA ARVENSIS	doc	doc	doc	exp	exp	exp	doc	exp	doc	doc	doc	doc	doc
MENTZELIA ALBICAULIS											doc		exp
MENTZELIA DECAPETALA	doc	doc	doc		exp					doc	doc	doc	doc
MENTZELIA DISPERSA			doc									doc	
MENTZELIA MULTIFLORA												exp	
MENTZELIA NUDA	doc	doc		doc						doc	doc		exp
MENTZELIA NUDA VAR. STRICTA													doc
MENTZELIA OLIGOSPERMA													doc
MERTENSIA LANCEOLATA		doc	doc		exp	doc						doc	doc
MERTENSIA OBLONGIFOLIA					exp								
MICROSERIS NUTANS			doc										
MIMOSA NUTTALLII										doc			
MIMULUS FLORIBUNDUS													doc
MIMULUS GLABRATUS										doc	doc		doc
MIMULUS RINGENS								exp		doc			
MIRABILIS ALBIDA		doc										doc	doc
MIRABILIS HIRSUTA	doc				exp		doc	exp	doc	doc	doc		doc
MIRABILIS LINEARIS	doc	doc	doc	exp	exp	exp	doc			doc	doc	doc	doc

MIRABILIS NYCTAGINEA		doc	doc		exp	exp	doc			doc	doc	doc	doc
MIRABILIS OXYBAPHOIDES													doc
MOEHRINGIA LATERIFLORA			exp		exp	doc	doc			doc		doc	doc
MOLLUGO VERTICILLATA										doc			
MONARDA BRADBURIANA							doc		doc				
MONARDA FISTULOSA		doc	doc		exp	doc	exp	exp	exp	doc		doc	doc
MONARDA FISTULOSA VAR. MOLLIS													doc
MONARDA PECTINATA										doc	doc		
MONOLEPIS NUTTALLIANA		doc	exp	doc	exp							doc	doc
MONROA SQUARROSA	doc	doc		doc						doc	doc	doc	doc
MORUS ALBA								exp		doc			
MORUS RUBRA								exp					
MUHLENBERGIA ASPERIFOLIA	doc			doc	exp	doc				doc	doc	doc	
MUHLENBERGIA BUSHII								exp					
MUHLENBERGIA CUSPIDATA	doc	doc	doc		doc	doc	doc		doc	doc	doc	doc	doc
MUHLENBERGIA FILIFORMIS										doc			
MUHLENBERGIA FRONDOSA								exp					
MUHLENBERGIA MEXICANA	doc		doc					exp		doc	doc	doc	
MUHLENBERGIA MONTANA													doc
MUHLENBERGIA PUNGENS	doc									doc	doc		
MUHLENBERGIA RACEMOSA	doc	doc	doc	exp	exp	doc		exp	doc	doc	doc	doc	doc
MUHLENBERGIA RICHARDSONIS					exp							doc	
MUHLENBERGIA SCHREBERI								exp					
MUHLENBERGIA SYLVATICA													doc
MUHLENBERGIA TORREYI													doc
MUSINEON DIVARICATUM		doc	exp	exp	exp							doc	doc
MUSINEON TENUIFOLIUM	doc					doc					doc		doc
MYOSOTIS ARVENSIS													doc
MYOSOTIS LAXA										doc			
MYOSOTIS SYLVATICA													doc
MYOSOTIS VERNA													doc
MYOSOTON AQUATICUM								exp					
MYOSURUS MINIMUS			doc		exp								doc
MYRIOPHYLLUM SIBIRICUM			exp									doc	
MYRIOPHYLLUM VERTICILLATUM					exp								
NAJAS GUADALUPENSIS								exp					
NASSELLA VIRIDULA		doc	doc	exp	doc	doc	doc			doc	doc	doc	doc
NAVARRETIA INTERTEXTA					exp							doc	
NELUMBO LUTEA								exp					
NEPETA CATARIA		doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
NESLIA PANICULATA													doc
NOTHOCALAIS CUSPIDATA	doc	doc	doc		exp	doc				doc	doc	doc	doc
NUTTALLANTHUS CANADENSIS													doc
NYMPHAEA ODORATA										doc			
OENOTHERA ALBICAULIS		doc	doc	doc	exp					doc		doc	doc
OENOTHERA BIENNIS	doc	doc								doc	doc	doc	doc
OENOTHERA CAESPITOSA	doc	doc	doc		exp						doc	doc	doc
OENOTHERA CORONOPIFOLIA		exp	doc			exp							doc

OENOTHERA LACINIATA		doc	doc							doc		doc	doc
OENOTHERA LATIFOLIA		doc										doc	doc
OENOTHERA NUTTALLII	doc	doc			exp	exp	doc			doc	doc	doc	doc
OENOTHERA PALLIDA												exp	
OENOTHERA RHOMBIPETALA										doc			
OENOTHERA VILLOSA	doc		doc	doc	exp	exp		exp	doc		doc	doc	doc
OENOTHERA VILLOSA SSP. STRIGOSA													doc
OLIGONEURON ALBUM		doc				doc	doc					doc	doc
OLIGONEURON RIGIDUM			doc				doc						doc
OLIGONEURON RIGIDUM VAR. RIGIDUM		doc	doc	exp	exp	exp	exp	exp		doc	doc	doc	doc
ONOCLEA SENSIBILIS										doc			
ONOPORDUM ACANTHIUM			doc	doc									doc
ONOSMODIUM MOLLE		exp	doc		exp	doc	doc	exp		doc			doc
OPHIOGLOSSUM VULGATUM										doc			
OPUNTIA FRAGILIS	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
OPUNTIA HUMIFUSA		doc											doc
OPUNTIA HUMIFUSA VAR. HUMIFUSA										doc			
OPUNTIA MACRORHIZA	doc	doc		doc				exp			doc		
OPUNTIA POLYACANTHA	doc	doc	doc	doc	doc	doc					doc	doc	doc
OROBANCHE FASCICULATA	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
OROBANCHE LUDOVICIANA	doc	doc	doc		exp						doc	doc	
OROBANCHE LUDOVICIANA SSP.												doc	
OROBANCHE UNIFLORA		doc											
ORTHILIA SECUNDA						doc							
ORTHOCARPUS LUTEUS		doc	doc		exp	exp	doc					doc	doc
ORYZOPSIS ASPERIFOLIA			doc			doc			doc				doc
OSMORHIZA CLAYTONII								exp		doc			
OSMORHIZA DEPAUPERATA						doc							
OSMORHIZA LONGISTYLIS			doc		exp		doc	exp	doc	doc		doc	doc
OSTRYA VIRGINIANA								exp		doc			doc
OXALIS CORNICULATA													doc
OXALIS STRICTA		doc	doc		exp	exp	doc	exp		doc		doc	doc
OXALIS VIOLACEA								exp					
OXYTROPIS BESSEYI VAR. BESSEYI			doc										
OXYTROPIS CAMPESTRIS		doc	doc		exp	exp						doc	doc
OXYTROPIS CAMPESTRIS VAR. DISPAR													doc
OXYTROPIS CAMPESTRIS VAR. SPICATA													doc
OXYTROPIS LAMBERTII	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
OXYTROPIS MONTICOLA			doc										
OXYTROPIS NANA			doc										
OXYTROPIS SERICEA	doc	doc	exp	exp	doc	exp					doc	doc	doc
PACKERA CANA	doc	doc	doc	exp	exp	exp					doc	doc	doc
PACKERA FENDLERI													doc
PACKERA PAUPERCUA						exp							
PACKERA PLATTENSIS	doc	doc	doc		exp		doc	exp		doc	doc	doc	doc
PACKERA TRIDENTICULATA										doc			
PANICUM CAPILLARE	doc	doc	doc	doc	exp	exp		exp		doc	doc	doc	
PANICUM DICHOTOMIFLORUM								exp		doc	doc		

PANICUM MILIACEUM					exp								
PANICUM VIRGATUM	doc	doc		doc	exp	doc	doc	exp		doc	doc	doc	doc
PARIETARIA PENNSYLVANICA	doc	doc	doc	exp	exp	doc	doc	exp		doc	doc	doc	doc
PARNASSIA PALUSTRIS					exp								
PARNASSIA PALUSTRIS VAR. PARVIFLORA													doc
PARONYCHIA DEPRESSA	doc			doc		exp					doc		doc
PARONYCHIA SESSILIFLORA	doc	doc			exp	exp					doc	doc	doc
PARTHENIUM ALPINUM				exp									
PARTHENOCISSUS QUINQUEFOLIA								exp		doc			doc
PARTHENOCISSUS VITACEA		doc	doc	doc	exp		doc	exp	doc	doc	doc	doc	doc
PASCOPYRUM SMITHII	doc	doc	doc	doc	doc	doc	doc		doc	doc	doc	doc	doc
PASPALUM SETACEUM								exp		doc			
PASTINACA SATIVA				exp	exp		doc						
PECTIS ANGUSTIFOLIA										doc			
PEDICULARIS CANADENSIS													doc
PEDIOMELUM ARGOPHYLLUM	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
PEDIOMELUM CUSPIDATUM		doc							doc	doc			doc
PEDIOMELUM DIGITATUM		doc								doc			
PEDIOMELUM ESCULENTUM		doc	doc	exp	exp	doc	doc		doc	doc	doc	doc	doc
PEDIOMELUM HYPOGAEUM										doc			
PEDIOMELUM HYPOGAEUM VAR.										doc	doc		
PELLAEA ATROPURPUREA						doc		exp					
PELLAEA GASTONYI													doc
PELLAEA GLABELLA			doc		exp	doc						exp	
PELLAEA GLABELLA SSP. OCCIDENTALIS			doc			exp							
PENNISETUM GLAUCUM		doc		doc			exp			doc		doc	
PENSTEMON ALBIDUS	doc	doc	doc	exp	exp	doc	doc			doc	doc	doc	doc
PENSTEMON ANGUSTIFOLIUS	doc	doc		exp	exp				doc	doc	doc	doc	doc
PENSTEMON ERIANTHERUS		doc	doc		exp	doc						doc	doc
PENSTEMON GLABER		doc	doc			doc					doc		doc
PENSTEMON GLABER VAR. ALPINUS													doc
PENSTEMON GRACILIS		doc	doc		exp		doc		doc	doc		doc	doc
PENSTEMON GRANDIFLORUS		doc	doc				doc	exp	doc	doc			doc
PENSTEMON NITIDUS			exp		exp							doc	
PENSTEMON RADICOSUS													doc
PENTHORUM SEDOIDES								exp		doc			
PERIDERIDIA GAIRDNERI			doc										
PERIDERIDIA GAIRDNERI SSP. BOREALIS			doc										
PHACELIA HASTATA	doc										doc	doc	
PHACELIA LEPTOSEPALA	doc										doc		
PHACELIA LINEARIS			doc										
PHALARIS ARUNDINACEA			doc	doc	doc		doc	exp			doc		doc
PHLEUM ALPINUM													doc
PHLEUM PRATENSE		doc	doc	exp	exp	doc			doc	doc			doc
PHLOX ALYSSIFOLIA		doc	doc		exp	doc							doc
PHLOX ANDICOLA	doc	doc			exp	exp				doc	doc		doc
PHLOX DIFFUSA SSP. SCLERANTHIFOLIA													doc
PHLOX DIVARICATA								exp					

PHLOX GRACILIS			doc										
PHLOX GRACILIS SSP. GRACILIS		doc	doc										
PHLOX HOODII	doc	doc	doc		doc	doc	doc				doc	doc	doc
PHRAGMITES AUSTRALIS		doc			doc			exp			doc	doc	
PHRYMA LEPTOSTACHYA							doc	exp		doc			doc
PHYLA CUNEIFOLIA				doc									
PHYLA LANCEOLATA								exp					
PHYSALIS HEDERIFOLIA											doc		
PHYSALIS HETEROPHYLLA		doc	exp		exp			exp		doc		doc	doc
PHYSALIS HISPIDA	doc			exp							doc		
PHYSALIS LONGIFOLIA		doc		doc				exp			doc		doc
PHYSALIS PUMILA		doc											
PHYSALIS VIRGINIANA	doc	doc			exp	doc	doc	exp		doc	doc	doc	doc
PHYSARIA BRASSICOIDES		doc	doc								doc	doc	
PHYSOCARPUS MONOGYNUS			exp	exp		doc			doc				doc
PHYSOCARPUS OPULIFOLIUS										doc			doc
PHYSOSTEGIA VIRGINIANA								exp					
PICEA GLAUCA									doc				
PICEA PUNGENS										doc	doc		
PICRADENIOPSIS OPPOSITIFOLIA		doc		exp								doc	doc
PILEA FONTANA								exp					
PILEA PUMILA								exp		doc			
PINUS PONDEROSA		doc	doc	doc		doc			doc	doc	doc	doc	doc
PIPTATHERUM MICRANTHUM		doc	doc		exp	doc			doc	doc	doc	doc	doc
PIPTATHERUM RACEMOSUM								exp					
PLAGIOBOTHRYIS SCOULERI					exp								
PLANTAGO ARISTATA		doc											
PLANTAGO ELONGATA					exp							doc	
PLANTAGO ERIOPODA					exp								
PLANTAGO LANCEOLATA				exp									
PLANTAGO MAJOR		exp	doc	exp	exp	doc	doc	exp	doc	doc		doc	doc
PLANTAGO PATAGONICA	doc	doc	doc	doc	doc	exp	doc	exp		doc	doc	doc	doc
PLANTAGO RUGELII								exp					doc
PLATANThERA DILATATA VAR. DILATATA													doc
PLATANThERA HYPERBOREA VAR.										doc			doc
PLATANThERA STRICTA						exp							doc
POA ARIDA					exp							doc	
POA BULBOSA			doc									doc	
POA COMPRESSA	doc	exp	doc		exp	doc		exp	doc	doc	doc	doc	doc
POA CUSICKII					exp							doc	
POA FENDLERIANA			exp			doc							doc
POA NEMORALIS						doc							doc
POA NEMORALIS SSP. INTERIOR		doc	doc		exp	exp						doc	doc
POA PALUSTRIS	doc	doc	exp	exp	exp	doc			doc		doc	doc	doc
POA PRATENSIS	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
POA SECUNDA	doc	doc	doc	exp	doc	doc					doc	doc	doc
POA SYLVESTRIS										doc			
POA TRIVIALIS						doc		exp					

POLANISIA DODECANDRA	doc	doc	doc	doc	exp			exp		doc	doc	doc	doc
POLANISIA DODECANDRA SSP.			doc	doc									
POLANISIA JAMESII										doc			doc
POLYGALA ALBA		doc	doc		exp	doc	doc			doc		doc	doc
POLYGALA SENEGA						doc							doc
POLYGALA VERTICILLATA		doc			exp			exp		doc			doc
POLYGONATUM BIFLORUM		exp			exp			exp	doc	doc		doc	doc
POLYGONATUM BIFLORUM VAR.												exp	
POLYGONUM ACHOREUM			exp		exp	doc		exp		doc	doc	doc	
POLYGONUM AMPHIBIUM		doc			exp		doc			doc		doc	
POLYGONUM AMPHIBIUM VAR. EMERSUM								exp					
POLYGONUM ARENASTRUM					exp			exp		doc		doc	doc
POLYGONUM AVICULARE		doc	doc	exp				exp				doc	doc
POLYGONUM BISTORTOIDES													doc
POLYGONUM BUXIFORME													doc
POLYGONUM CONVULVULUS	doc	doc	doc	exp	exp		doc	exp		doc	doc	doc	doc
POLYGONUM DOUGLASII			doc		exp							doc	
POLYGONUM ERECTUM										doc		doc	
POLYGONUM HYDROPIPER								exp					
POLYGONUM HYDROPIPEROIDES								exp					
POLYGONUM LAPATHIFOLIUM			exp	doc	exp			exp		doc	doc	doc	doc
POLYGONUM PENSYLVANICUM								exp			doc	doc	
POLYGONUM PERSICARIA				doc	exp			exp		doc		doc	doc
POLYGONUM PUNCTATUM								exp		doc			
POLYGONUM RAMOSISSIMUM	doc	doc	exp	exp	exp		doc	exp			doc		doc
POLYGONUM SCANDENS				exp				exp		doc			
POLYGONUM TENUE										doc			
POLYGONUM VIRGINIANUM								exp					
POLYPOGON MONSPELIENSIS				doc	exp					doc			
POPULUS ALBA				exp				exp		doc			doc
POPULUS ANGUSTIFOLIA				exp									doc
POPULUS BALSAMIFERA					exp				exp			doc	
POPULUS DELTOIDES	doc	doc	doc	doc	doc		doc	exp	doc	doc	doc	doc	doc
POPULUS DELTOIDES SSP. MONILIFERA										doc			
POPULUS TREMULA													doc
POPULUS TREMULOIDES			doc		exp	doc		exp	doc	doc		doc	doc
POPULUS X ACUMINATA				doc					doc				
PORTULACA OLERACEA		doc	doc	doc	exp			exp			doc		doc
POTAMOGETON FOLIOSUS			exp					exp					
POTAMOGETON GRAMINEUS					exp								
POTAMOGETON NODOSUS								exp		doc			
POTAMOGETON PUSILLUS					exp							doc	
POTAMOGETON RICHARDSONII					exp							doc	
POTENTILLA ARGUTA			doc		exp	exp	doc			doc		doc	doc
POTENTILLA ARGUTA SSP. ARGUTA													doc
POTENTILLA CONCINNA					exp	exp						doc	doc
POTENTILLA CONCINNA VAR. CONCINNA													doc
POTENTILLA EFFUSA						exp							

POTENTILLA FISSA			doc			exp			doc				doc
POTENTILLA GLANDULOSA			exp			exp							doc
POTENTILLA GRACILIS		doc	exp		exp								doc
POTENTILLA HIPPIANA		doc			exp	exp			doc			doc	doc
POTENTILLA NORVEGICA			exp		exp	exp		exp		doc		doc	doc
POTENTILLA PARADOXA				doc	exp		doc	exp			doc	doc	
POTENTILLA PENNSYLVANICA	doc	doc	doc		exp	doc	doc			doc	doc	doc	doc
POTENTILLA RECTA		doc			exp			exp					
POTENTILLA RIVALIS					exp			exp		doc			
PROBOSCIDEA LOUISIANICA		doc								doc			
PRUNELLA VULGARIS			exp			doc		exp		doc			doc
PRUNUS AMERICANA		doc	doc		doc		doc	exp		doc		doc	doc
PRUNUS PENNSYLVANICA			doc		exp							doc	doc
PRUNUS PUMILA		doc			exp		doc			doc		doc	doc
PRUNUS PUMILA VAR. BESSEYI										doc			
PRUNUS VIRGINIANA		doc	doc	exp	doc	doc	doc	exp	doc	doc	doc	doc	doc
PSATHYROSTACHYS JUNCEA											doc		
PSEUDOGNAPHALIUM MACOUNII			doc										
PSEUDOGNAPHALIUM VISCOSUM			doc		exp								doc
PSEUDOROEGNERIA SPICATA			doc	doc							doc		
PSEUDOROEGNERIA SPICATA SSP. SPICATA		doc	doc	doc	exp	exp						doc	doc
PSORALIDIUM LANCEOLATUM	doc	doc	doc	exp	exp		doc	exp		doc	doc	doc	
PSORALIDIUM TENUIFLORUM	doc	doc		doc		doc					doc		doc
PTERIDIUM AQUILINUM									doc				
PTEROSPORA ANDROMEDA			doc						doc	doc			doc
PUCCINELLIA NUTTALLIANA					exp							doc	doc
PULSATILLA PATENS							doc		doc				doc
PYCNANTHEMUM VIRGINIANUM										doc			
PYROLA CHLORANTHA						exp							doc
PYROLA ELLIPTICA													doc
PYRROCOMA LANCEOLATA VAR.					exp							doc	
PYRROCOMA UNIFLORA VAR. UNIFLORA				exp									
QUERCUS MACROCARPA			doc		exp			exp	doc	doc		doc	doc
QUERCUS RUBRA								exp					
RANUNCULUS ABORTIVUS			doc		exp		doc	exp		doc		doc	doc
RANUNCULUS ACRIS													doc
RANUNCULUS AQUATILIS			doc										doc
RANUNCULUS CARDIOPHYLLUS													doc
RANUNCULUS CYMBALARIA		doc	doc	exp	doc	exp	doc			doc		doc	
RANUNCULUS FLABELLARIS								exp					
RANUNCULUS GLABERRIMUS		doc	doc									doc	doc
RANUNCULUS LONGIROSTRIS					exp					doc		doc	doc
RANUNCULUS MACOUNII	doc		doc		exp	exp					doc		doc
RANUNCULUS MICRANTHUS						exp							
RANUNCULUS PENNSYLVANICUS								exp	doc				
RANUNCULUS RECURVATUS								exp					
RANUNCULUS RHOMBOIDEUS						exp						doc	doc
RANUNCULUS SCELERATUS			doc	doc	exp			exp		doc		doc	doc

RANUNCULUS TRICHOPHYLLUS VAR.													doc
RATIBIDA COLUMNIFERA	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc
RATIBIDA PINNATA								exp					
RATIBIDA TAGETES		doc	doc										doc
REDFIELDIA FLEXUOSA										doc			
RHAMNUS CATHARTICA	doc										doc		doc
RHAMNUS LANCEOLATA								exp		doc			
RHUS AROMATICA	doc	doc			exp					doc	doc	doc	doc
RHUS GLABRA								exp		doc			doc
RHUS TRILOBATA	doc	exp	doc	doc	exp	doc					doc	exp	
RIBES AMERICANUM		doc			exp	doc	doc	exp		doc		doc	doc
RIBES AUREUM	doc		doc	doc		doc			doc		doc		doc
RIBES AUREUM VAR. VILLOSUM		doc			exp					doc		doc	doc
RIBES CEREUM	doc	doc	doc	exp	doc	doc			doc		doc		doc
RIBES HIRTELLUM					exp								
RIBES MISSOURIENSE								exp	doc	doc		doc	doc
RIBES OXYACANTHOIDES			doc		exp	doc				doc			doc
RIBES OXYACANTHOIDES SSP. SETOSUM					exp							doc	doc
RIBES RUBRUM													doc
ROBINIA PSEUDOACACIA					doc			exp			doc		
RORIPPA CURVIPES			doc										
RORIPPA NASTURTIUM-AQUATICUM				exp	exp					doc			doc
RORIPPA PALUSTRIS	doc		doc	exp	exp			exp		doc	doc	doc	doc
RORIPPA SESSILIFLORA								exp					
RORIPPA SINUATA		doc			exp		doc	exp			doc		
RORIPPA SYLVESTRIS								exp					
ROSA ACICULARIS						exp			doc				doc
ROSA ACICULARIS SSP. SAYI			exp										
ROSA ARKANSANA	doc	doc	doc		doc	doc	doc	exp		doc	doc	doc	doc
ROSA BLANDA		doc											
ROSA MULTIFLORA								exp					
ROSA WOODSII	doc	doc	doc	exp	doc	exp	doc	exp	doc	doc	doc	doc	doc
ROOTALA RAMOSIOR		exp											
RUBUS DELICIOSUS													doc
RUBUS IDAEUS			doc		exp	exp			doc			doc	doc
RUBUS IDAEUS SSP. STRIGOSUS													doc
RUBUS OCCIDENTALIS								exp		doc			
RUBUS PUBESCENS									doc				
RUDBECKIA HIRTA		doc	exp			doc			doc	doc	doc	doc	doc
RUDBECKIA HIRTA VAR. PULCHERRIMA												exp	
RUDBECKIA LACINIATA								exp					
RUMEX ALTISSIMUS		doc								doc			
RUMEX AQUATICUS VAR. FENESTRATUS		doc			exp								
RUMEX CRISPUS	doc	exp	doc	doc	doc	doc		exp		doc	doc	doc	doc
RUMEX LONGIFOLIUS					exp								
RUMEX MARITIMUS			exp	doc	exp			exp		doc			
RUMEX PATIENTIA								exp			doc		
RUMEX SALICIFOLIUS			doc				doc				doc		

RUMEX SALICIFOLIUS VAR. MEXICANUS		doc			exp		exp					doc	
RUMEX STENOPHYLLUS		doc		doc	exp			exp		doc	doc	doc	
RUMEX VENOSUS	doc	doc	doc		exp					doc	doc	doc	doc
SAGITTARIA CALYCINA								exp					
SAGITTARIA CUNEATA	doc	doc	exp	doc	exp						doc	doc	doc
SAGITTARIA ENGELMANNIANA										doc			
SAGITTARIA GRAMINEA													doc
SAGITTARIA LATIFOLIA		doc			exp			exp		doc		doc	
SALICORNIA RUBRA					exp								
SALIX AMYGDALOIDES	doc	doc	doc	doc	exp		doc	exp		doc	doc	doc	doc
SALIX BEBBIANA			exp		exp							doc	doc
SALIX ERIOCEPHALA			doc		exp		doc	exp		doc		doc	doc
SALIX EXIGUA	doc	doc		doc	doc		doc	exp		doc	doc	doc	doc
SALIX FRAGILIS	doc			exp							doc		
SALIX HUMILIS					exp							doc	
SALIX INTERIOR											doc		
SALIX LUCIDA					exp								
SALIX LUTEA	doc	doc			exp						doc	doc	doc
SALIX NIGRA													doc
SALIX PENTANDRA					exp								
SALIX PETIOLARIS		doc			exp								
SALIX PLANIFOLIA									doc				
SALSOLA COLLINA	doc			doc				exp			doc		
SALSOLA KALI	doc		doc			doc	doc				doc	doc	doc
SALSOLA TRAGUS	doc	doc	doc	exp	exp						doc		doc
SALVIA AZUREA											doc		doc
SALVIA AZUREA VAR. GRANDIFLORA										doc			doc
SALVIA REFLEXA		doc	doc	exp	exp	doc				doc	doc	doc	doc
SAMBUCUS NIGRA				doc									
SAMBUCUS NIGRA SSP. CANADENSIS				doc				exp		doc			
SAMBUCUS RACEMOSA									doc				doc
SANGUINARIA CANADENSIS								exp					
SANICULA CANADENSIS								exp		doc			doc
SANICULA MARILANDICA			doc		exp	doc	doc		doc			doc	doc
SANICULA ODORATA								exp					
SAPONARIA OFFICINALIS					exp								doc
SARCOBATUS VERMICULATUS		doc			exp							doc	
SCHEDONNARDUS PANICULATUS	doc	doc	doc		exp	doc				doc	doc	doc	doc
SCHIZACHNE PURPURASCENS		doc	doc		exp	doc			doc			doc	
SCHIZACHYRIUM SCOPARIUM	doc	exp	doc	doc	doc	doc	doc	exp	doc		doc		doc
SCHIZACHYRIUM SCOPARIUM VAR.		doc	doc	doc	exp		exp			doc		doc	
SCHOENOPLECTUS ACUTUS							doc	exp					
SCHOENOPLECTUS ACUTUS VAR. ACUTUS					exp		exp			doc		doc	
SCHOENOPLECTUS AMERICANUS							doc						
SCHOENOPLECTUS FLUVIATILIS					exp			exp				doc	
SCHOENOPLECTUS MARITIMUS					exp							doc	
SCHOENOPLECTUS PUNGENS			doc										
SCHOENOPLECTUS PUNGENS VAR.		doc	doc	exp	exp		exp			doc		4	

SCHOENOPLECTUS TABERNAEMONTANI	doc	doc	exp	doc	exp	exp		exp		doc	doc	doc	doc
SCHOENOPLECTUS TORREYI												doc	
SCIRPUS ATROVIRENS		doc			exp			exp		doc		doc	doc
SCIRPUS MICROCARPUS			doc										
SCIRPUS PALLIDUS			exp			exp		exp		doc			doc
SCOLOCHLOA FESTUCACEA					exp							doc	
SCROPHULARIA LANCEOLATA			doc			doc		exp		doc			doc
SCROPHULARIA MARILANDICA								exp					
SCUTELLARIA BRITTONII				exp									
SCUTELLARIA GALERICULATA					exp					doc			doc
SCUTELLARIA LATERIFLORA							doc	exp		doc			
SCUTELLARIA PARVULA										doc			
SECALE CEREALE			doc							doc	doc		
SEDUM ACRE													doc
SEDUM LANCEOLATUM			exp			doc							doc
SELAGINELLA DENSE		doc	doc		exp							doc	doc
SELAGINELLA RUPESTRIS										doc			
SENECIO CRASSULUS													doc
SENECIO EREMOPHILUS													doc
SENECIO INTEGERRIMUS	doc	doc	exp		exp	exp				doc	doc	doc	doc
SENECIO INTEGERRIMUS VAR. EXALTATUS													doc
SENECIO JACOBAEA						doc							
SENECIO RAPIFOLIUS			doc						doc				
SENECIO RIDDELLII	doc	exp				exp				doc	doc		doc
SENECIO SPARTIOIDES				doc									
SETARIA PUMILA				doc			doc	exp					
SETARIA VERTICILLATA								exp					
SETARIA VIRIDIS	doc	doc	doc	doc	exp	doc		exp		doc	doc	doc	doc
SHEPHERDIA ARGENTEA		doc	doc	doc	exp	doc	doc			doc	doc	doc	doc
SHEPHERDIA CANADENSIS					doc	doc			doc				doc
SHINNERSOSERIS ROSTRATA								exp		doc			
SICYOS ANGULATUS								exp					
SILENE ANTIRRHINA		doc	doc					exp		doc		doc	doc
SILENE CSEREI					exp							doc	
SILENE DRUMMONDII			exp			exp							doc
SILENE DRUMMONDII VAR. DRUMMONDII						doc							
SILENE LATIFOLIA						doc		exp					
SILENE LATIFOLIA SSP. ALBA					exp	exp				4		doc	doc
SILENE MENZIESII			doc										
SILENE NOCTIFLORA					exp								doc
SILENE STELLATA								exp					
SILENE VULGARIS													doc
SILPHIUM INTEGRIFOLIUM								exp					
SILPHIUM LACINIATUM								exp					
SILPHIUM PERFOLIATUM								exp					
SINAPIS ARVENSIS					exp		doc	exp					doc
SISYMBRIUM ALTISSIMUM	doc	doc	doc	doc	exp	doc	doc			doc	doc	doc	doc
SISYMBRIUM LOESELII		doc	doc		exp			exp		doc			

SISYRINCHIUM ANGUSTIFOLIUM		doc			exp							doc	doc
SISYRINCHIUM CAMPESTRE								exp					
SISYRINCHIUM MONTANUM	doc	exp	doc	exp	exp	doc				doc	doc		doc
SIUM CARSONII													doc
SIUM SUAVE					exp					doc			doc
SMILAX ECIRRATA								exp					
SMILAX HERBACEA		doc	doc		exp	doc	exp	exp		doc		doc	doc
SMILAX LASIONEURA			doc				doc						
SMILAX TAMNOIDES								exp					
SOLANUM AMERICANUM							doc			doc			doc
SOLANUM DULCAMARA				exp									
SOLANUM INTERIUS								exp			doc		
SOLANUM NIGRUM			doc	doc									
SOLANUM PHYSALIFOLIUM													doc
SOLANUM PTYCANTHUM		doc								doc			doc
SOLANUM PTYCHANTHUM			doc										
SOLANUM ROSTRATUM		doc	exp	doc	exp	doc				doc	doc	doc	doc
SOLANUM TRIFLORUM	doc	doc	doc		exp					doc	doc	doc	doc
SOLIDAGO CANADENSIS	doc	doc	exp	doc	exp	doc	doc	exp		doc	doc	doc	doc
SOLIDAGO GIGANTEA	doc			exp	exp		doc	exp		doc	doc	doc	doc
SOLIDAGO MISSOURIENSIS	doc	doc	doc	exp	exp	doc	doc		doc	doc	doc	doc	doc
SOLIDAGO MOLLIS	doc	doc	doc	exp	exp	exp	doc			doc	doc	doc	doc
SOLIDAGO NANA													doc
SOLIDAGO NEMORALIS			doc		exp	exp	doc			doc	doc	doc	doc
SOLIDAGO SPECIOSA									doc	doc			doc
SOLIDAGO VELUTINA		doc											
SONCHUS ARVENSIS				doc	exp		doc	exp				doc	doc
SONCHUS ARVENSIS SSP. ULIGINOSUS				doc	exp								
SONCHUS ASPER			exp		exp	doc		exp			doc		doc
SONCHUS OLERACEUS	doc										doc		
SORGHASTRUM NUTANS	doc			doc		doc		exp		doc	doc		doc
SORGHUM HALEPENSE					exp								
SPARGANIUM ANGUSTIFOLIUM													doc
SPARGANIUM ERECTUM SSP.					exp								
SPARGANIUM EURYCARPUM					exp			exp		doc		doc	
SPARTINA GRACILIS					exp							doc	
SPARTINA PECTINATA	doc	doc	doc	doc	doc		doc	exp		doc	doc	doc	doc
SPHAERALCEA COCCINEA	doc	doc	doc	exp	doc	doc	doc			doc	doc	doc	doc
SPHENOPHOLIS INTERMEDIA								exp					
SPHENOPHOLIS OBTUSATA	doc				exp	doc		exp		doc	doc	doc	
SPIRAEA BETULIFOLIA									doc				doc
SPIRANTHES CERNUA										doc			
SPIRANTHES ROMANZOFFIANA													doc
SPIRODELA POLYRRHIZA								exp		doc			
SPOROBOLUS AIROIDES	doc	doc		doc							doc	doc	doc
SPOROBOLUS COMPOSITUS								exp					
SPOROBOLUS COMPOSITUS VAR.		doc			exp								
SPOROBOLUS CRYPTANDRUS	doc	doc	doc	doc	doc	doc	doc	exp		doc	doc	doc	doc

SPOROBOLUS HETEROLEPIS		exp			exp	doc			doc				doc
SPOROBOLUS NEGLECTUS					exp			exp					
STACHYS PALUSTRIS			exp		exp	doc	doc						doc
STACHYS PILOSA								exp					
STACHYS TENUIFOLIA								exp					
STANLEYA PINNATA					exp							doc	
STAPHYLEA TRIFOLIA								exp					
STELLARIA CRASSIFOLIA					exp								
STELLARIA LONGIFOLIA					exp					doc			doc
STELLARIA LONGIPES					exp								doc
STELLARIA MEDIA		doc	doc		exp						doc		doc
STENOTUS ARMERIOIDES VAR.					exp							doc	
STEPHANOMERIA RUNCINATA											doc	doc	
STROPHOSTYLES HELVULA								exp					
STROPHOSTYLES LEIOSPERMA										doc			
STUCKENIA FILIFORMIS SSP. FILIFORMIS			exp	doc									
STUCKENIA PECTINATUS			doc		exp							doc	
SUAEDA CALCEOLIFORMIS					exp							doc	
SUAEDA MOQUINII					exp							doc	
SYMPHORICARPOS ALBUS		doc	doc		exp	exp			doc	doc		doc	doc
SYMPHORICARPOS OCCIDENTALIS	doc	doc	doc	doc	doc	exp	doc	exp	doc	doc	doc	doc	doc
SYMPHORICARPOS ORBICULATUS		doc											
SYMPHYOTRICHUM BOREALE													doc
SYMPHYOTRICHUM CILIATUM				exp	exp								
SYMPHYOTRICHUM CILIOLATUM			exp						doc				doc
SYMPHYOTRICHUM EATONII													doc
SYMPHYOTRICHUM ERICOIDES VAR.	doc	doc		doc	exp		doc	exp		doc	doc	doc	doc
SYMPHYOTRICHUM FALCATUM						doc							
SYMPHYOTRICHUM FALCATUM VAR.													doc
SYMPHYOTRICHUM FALCATUM VAR.	doc	doc	doc	exp	exp	exp					doc	doc	doc
SYMPHYOTRICHUM LAEVE						doc							
SYMPHYOTRICHUM LAEVE VAR. GEYERI													doc
SYMPHYOTRICHUM LAEVE VAR. LAEVE		exp	doc		exp	exp	doc	exp	doc	doc		doc	doc
SYMPHYOTRICHUM LANCEOLATUM													doc
SYMPHYOTRICHUM LANCEOLATUM VAR.			exp	doc	exp							doc	doc
SYMPHYOTRICHUM LANCEOLATUM VAR.				doc	exp			exp		doc		doc	
SYMPHYOTRICHUM NOVAE-ANGLIAE			doc					exp		doc			
SYMPHYOTRICHUM OBLONGIFOLIUM		doc	doc		exp	doc		exp		doc		doc	doc
SYMPHYOTRICHUM ONTARIONE								exp					
SYMPHYOTRICHUM PRAEALTUM VAR.										doc			
SYMPHYOTRICHUM PUNICEUM VAR.										doc			
SYRINGA VULGARIS										doc			doc
TALINUM CALYCIUM										doc			
TALINUM PARVIFLORUM										doc			doc
TAMARIX CHINENSIS				doc									
TAMARIX PARVIFLORA		doc											
TAMARIX RAMOSISSIMA											doc		
TANACETUM VULGARE										doc			doc

TARAXACUM LAEVIGATUM			doc	exp	exp	exp							
TARAXACUM OFFICINALE	doc	doc	doc		exp	exp	doc	exp	doc	doc	doc	doc	doc
TARAXACUM OFFICINALE SSP. VULGARE													doc
TETRANEURIS ACAULIS	doc					doc					doc		
TETRANEURIS ACAULIS VAR. ACAULIS		doc	doc	exp	exp	exp						doc	4
TETRANEURIS SCAPOSA VAR. SCAPOSA											doc		
TEUCRIUM CANADENSE				doc	exp			exp		doc	doc	doc	
THALICTRUM DASYCARPUM		exp	doc		exp	exp	doc	exp	doc	doc		doc	doc
THALICTRUM DIOICUM						exp			doc				doc
THALICTRUM FENDLERI						doc							
THALICTRUM REVOLUTUM		exp											doc
THALICTRUM VENULOSUM					exp	exp			doc			doc	doc
THELESERMA FILIFOLIUM										doc	doc		doc
THELESERMA FILIFOLIUM VAR. FILIFOLIUM													doc
THELESERMA MEGAPOTAMICUM		exp		doc		doc					doc		doc
THELESERMA SUBNUDUM												exp	
THELESERMA SUBNUDUM VAR.												doc	
THELYPODIUM INTEGRIFOLIUM	doc										doc		
THELYPTERIS PALUSTRIS										doc			
THERMOPSIS MONTANA													doc
THERMOPSIS RHOMBIFOLIA	doc	doc	doc		exp	doc			doc		doc	doc	doc
THINOPYRUM INTERMEDIUM		doc	doc				doc	exp			doc		doc
THINOPYRUM PONTICUM				exp		doc					doc		doc
THLASPI ARVENSE		doc	doc	exp	doc	doc	doc	exp		doc	doc	doc	doc
TILIA AMERICANA								exp		doc			
TOWNSENDIA EXSCAPA		doc			exp	exp				doc		doc	doc
TOWNSENDIA GRANDIFLORA	doc	doc		doc							doc		doc
TOWNSENDIA HOOKERI				exp		doc							doc
TOXICODENDRON RADICANS		doc			doc			exp				doc	
TOXICODENDRON RYDBERGII		doc	doc	doc		doc	doc		doc	doc	doc	doc	doc
TRADESCANTIA BRACTEATA		doc			exp			exp			doc	doc	doc
TRADESCANTIA OCCIDENTALIS	doc	doc	doc	doc	exp		doc			doc	doc		doc
TRAGOPOGON DUBIUS	doc	doc	doc	exp	doc	doc	doc	exp		doc	doc	doc	doc
TRAGOPOGON PORRIFOLIUS		doc											
TRAGOPOGON PRATENSIS		doc											doc
TRIBULUS TERRESTRIS	doc	doc		doc						doc	doc		
TRIFOLIUM DUBIUM		doc											
TRIFOLIUM FRAGIFERUM				doc									
TRIFOLIUM HYBRIDUM		doc			exp	doc				doc			
TRIFOLIUM INCARNATUM													doc
TRIFOLIUM PRATENSE		doc	exp	exp		doc	doc			doc		doc	doc
TRIFOLIUM REPENS			doc		exp	doc			doc	doc		doc	doc
TRIGLOCHIN CONCINNUM					exp								
TRIGLOCHIN MARITIMA										doc		doc	
TRIGLOCHIN MARITIMUM	doc			exp	exp						doc	exp	
TRIGLOCHIN PALUSTRE					exp					doc			doc
TRIODANIS LEPTOCARPA		doc			exp				exp			doc	doc
TRIODANIS PERFOLIATA		doc	doc		exp				doc	doc			doc

TRIOSTEUM PERFOLIATUM								exp					
TRIPLASIS PURPUREA								exp		doc			
TRIPTEROCALYX MICRANTHUS					exp							doc	
TRITICUM AESTIVUM			exp								doc		
TYPHA ANGUSTIFOLIA		exp		exp	exp		doc	exp				exp	doc
TYPHA LATIFOLIA	doc	doc	exp	doc	doc	doc	exp	exp		doc	doc	doc	doc
ULMUS AMERICANA		doc			doc		doc	exp		doc	doc	doc	doc
ULMUS PUMILA					exp			exp			doc		doc
ULMUS RUBRA		doc						exp		doc			
ULMUS THOMASII								exp					
URTICA DIOICA	doc		doc	doc	exp	doc	doc	exp	doc	doc	doc	doc	doc
UTRICULARIA MACRORHIZA					exp			exp		doc			exp
VACCARIA HISPANICA					exp								doc
VALERIANA EDULIS						doc							
VERBASCUM THAPSUS		doc	doc	exp	exp	doc		exp	doc	doc	doc		doc
VERBENA BRACTEATA	doc	doc	doc	doc	exp	doc		exp		doc	doc	doc	doc
VERBENA HASTATA	doc			doc				exp		doc	doc		doc
VERBENA STRICTA		doc		exp		exp		exp		doc	doc	doc	doc
VERBENA URTICIFOLIA								exp		doc			
VERBESINA ENCELOIDES			doc	doc								doc	
VERBESINA ENCELOIDES SSP. ENCELOIDES													doc
VERNONIA FASCICULATA								exp		doc			
VERONICA AMERICANA			doc	exp		doc				doc			doc
VERONICA ANAGALLIS-AQUATICA	doc			doc				exp		doc	doc		doc
VERONICA ARVENSIS		doc											doc
VERONICA PEREGRINA			doc		exp			exp		doc		doc	doc
VERONICA SCUTELLATA					exp								
VIBURNUM LENTAGO			doc		exp			exp				doc	doc
VIBURNUM OPULUS													doc
VICIA AMERICANA		doc	doc	exp	doc	exp	doc	exp	doc		doc	doc	doc
VICIA AMERICANA SSP. MINOR													doc
VICIA SATIVA												doc	
VICIA VILLOSA										doc	doc		
VIOLA ADUNCA			doc			doc			doc			doc	doc
VIOLA AFFINIS								exp					
VIOLA CANADENSIS		doc	doc			doc	doc	exp	doc	doc		doc	doc
VIOLA NEPHROPHYLLA			doc		exp	doc		exp		doc		doc	doc
VIOLA NUTTALLII	doc	doc	doc	exp	exp	doc	doc				doc	doc	doc
VIOLA PALUSTRIS													doc
VIOLA PEDATIFIDA			doc			exp	doc	exp					doc
VIOLA PUBESCENS								exp					doc
VIOLA SORORIA			doc					exp					
VIOLA VALLICOLA			doc										
VITIS RIPARIA		exp	doc	exp	exp		doc	exp		doc	doc	doc	doc
VITIS VULPINA		doc			exp							doc	
VULPIA OCTOFLORA	doc		doc				doc	exp			doc		
VULPIA OCTOFLORA VAR. OCTOFLORA		doc	doc	exp	exp		exp			doc	doc	doc	doc
WOODSIA OBTUSA								exp					

WOODSIA OREGANA		doc	doc		exp				doc	doc	doc	doc	doc
WOODSIA SCOPULINA			doc						doc				
X ELYHORDEUM MACOUNII					exp					doc		doc	
XANTHIUM STRUMARIUM		doc	exp	exp	exp		doc	exp		doc	doc	doc	doc
YUCCA GLAUCA	doc	doc	doc	doc	doc	doc				doc	doc	doc	doc
ZANNICHELLIA PALUSTRIS				doc	exp			exp		doc		doc	
ZANTHOXYLUM AMERICANUM								exp		doc			
ZIGADENUS ELEGANS					exp	doc							
ZIGADENUS VENENOSUS	doc	doc	doc	exp	exp	doc					doc	doc	doc
ZIZIA APTERA					exp	doc							doc
ZIZIA AUREA								exp					