Chapter 2–Area Description and Resources

This chapter describes the physical, biological, and socioeconomic environments and cultural resources of the project area.

Physical Environment

The physical features of the DGCA project area are the landforms, soils, and climate of the area including climate change.

Physiographic Features

A physiographic region is an area with a pattern of relief features or landforms that are significantly different from that of adjacent regions. There are many descriptions, some more detailed than others, of the physiographic regions in the prairie pothole landscape. However, in the simplest terms, North Dakota has at least four physiographic regions in the DGCA: the Red River Valley, the Drift Prairie, the Missouri Coteau, and the Missouri Slope. Within the South Dakota part of the DGCA project area, there are three physiographic regions: the Drift Prairie, the Dissected-till Plains, and the Great Plains.

An ecoregion is a major ecosystem (a biological community of interacting organisms and their physical environment) that is defined by distinctive geography. Figure 3 shows the location of 24 ecoregions in the project area for the DGCA (Bryce et al. 1998).

Landscape variability patterns in the ecoregions are more numerous and distinctive east to west, even though some variability exists from north to south, primarily due to the advancement and receding, stall, and melt of glaciers that occurred in a more north-to-south pattern. As glaciers advanced, they encountered topographic obstacles, which resulted in sediment being picked up and mixed with ice. When the glaciers melted between 10,000 and 12,000 years ago, the ice on top melted more quickly than ice that was trapped beneath the sediment. The uneven melting resulted in the hilly to gently rolling

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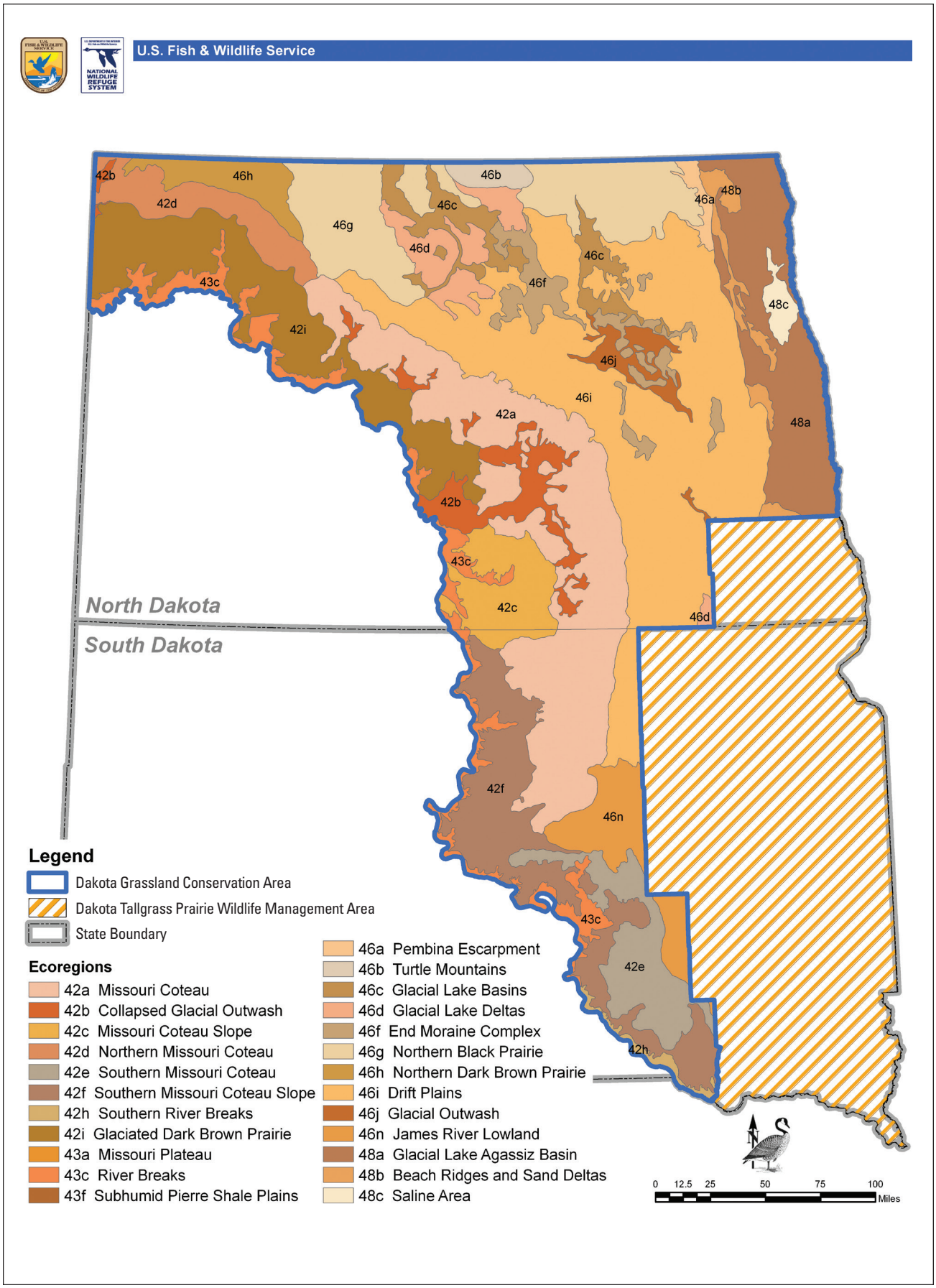

Figure 3. Map of ecoregions in the Dakota Grassland Conservation Area.

topography characteristic of large parts of the project area. Similarly, other ecoregions resulted from the advance of parts of the glaciers with differing levels of resistance, ranging from low to extreme, and melting or running off the landscape in differing sequences. The subsequent landforms resulted from movement and melt-timing differentials. The sedimentary deposition is up to 600 feet thick and is characterized as an unsorted mixture of clay, silt, sand, cobbles, and boulders, or "till."

The depressions between hills in the glaciated landscape are described as "potholes," which fill seasonally with water to form wetlands. The project area is punctuated with areas created by runoff from melting glaciers, resulting in gravel and sand depositions (Bluemle 1977). The grinding of rock by the glaciers created a nutrient-rich soil on which grasslands were established.

In general, soils in the project area are described as Mollisoils, which are dark in color due to high content of organic matter. The soil suborder is Borolls, which are moist–wet and cool (Barker and Whitman 1989, Bryce et al. 1998). Flat fertile soils of the Red River Valley in the eastern and northeastern parts of North Dakota developed under long-term inundation in the glacial bed of historic Lake Agassiz. Also within the project area, there are other similar fertile soils, primarily the result of lacustrine (lake-associated) deposits characteristic to lakebed and river valley areas.

Climate

The climate of the DGCA project area is continental, with very hot summers coupled with very cold winters. Due to the span of the project area from north to south and east to west, it is difficult to capture meaningful temperature and precipitation averages, because ranges are highly variable. However, temperatures can range from –60 to 121 degrees Fahrenheit, and precipitation averages generally range from 13 to 22 inches. Temperatures can vary as much as 70 degrees within a 24-hour period. Precipitation as well as temperatures within a specific locale are highly variable and can range from less than 10 inches in one year to more than 30 inches in another. The western edge on average receives the lowest average annual precipitation and eastern parts receive the highest average annual precipitation.

Climate in the project area often changes from extreme drought to flood in relatively short periods. Similarly, abrupt changes in temperature occur seasonally as well as daily. This climate variability is responsible for the productivity and diversity of wetland and grassland habitats found in the DGCA.

Climate Change

The Service identified climate change resulting from human activity as a potential factor that could substantially affect fish and wildlife populations in the PPR. Effects could be direct, such as changes in temperature and precipitation influencing species and their habitats, or indirect, such as habitat loss caused by conversion of habitat for biofuels. While planning needs to consider both direct and indirect effects, there are considerable uncertainties about climate change and future land use that greatly complicates any analysis.

Many species in the PPR are adapted to highly variable conditions (Niemuth et al. 2008, Wiens 1974, Woodhouse and Overpeck 1998). These species respond behaviorally and physiologically (for example, nest site selection and reproductive output) and, therefore, should respond well to habitat conservation efforts.

Due to the uncertainties associated with climate change and the dynamic wet–dry hydrologic cycles of the project area, the Service sees that landscape-scale protection of existing habitats as a sound approach to increase resiliency of the PPR and to buffer against unpredictable climate variables.

The Service is working with U.S. Geological Survey scientists to model climatic changes in the PPR and to develop adaptive management strategies that accommodate these changes. Protection of grassland in the project area is estimated to bank 44,000–93,000 pounds (20–42 metric tons) per acre of carbon dioxide equivalent. These estimates—based on the difference between the organic carbon in soil of native prairie and that of traditional cropland—were derived using methods described by the Intergovernmental Panel on Climate Change (IPCC) (Eggleston et al. 2006).

Adaptation, Mitigation, and Engagement

The Service's strategic response to climate change involves three core strategies: adaptation, mitigation, and engagement (USFWS 2010).

- Through adaptation, the negative effects of climate change on wildlife can be reduced by conserving habitats that are expected to be resilient.

- Carbon sequestration forms one of the key elements of mitigation. Prairie vegetation stores carbon in its deep fibrous roots, with approximately 80 percent of the plant biomass located belowground. It is equally as important to protect existing carbon stores, as it is to sequester atmospheric carbon.

- Engagement involves cooperation, communication, and partnerships to address the conservation challenges presented by climate change (USFWS 2010).

Biological Environment

The biological environment described in this section comprises habitat and associated wildlife in the project area. Appendix B contains a list of plant and animal species that occur over the project area.

The uniqueness of the DGCA lies in the millions of depressional wetlands that constitute one of the richest wetland systems in the world. These wetlands—or prairie potholes—and surrounding grasslands support an entire suite of plants and animals. In addition, the grasslands support yet another suite of plants and animals. In many cases, the biodiversity of this highly productive area relies on a combination of resources from the potholes and the native prairie grasslands. The PPR is breeding habitat for a myriad of wetland and grassland birds and supports high numbers of spring and fall migrants.

Once vast grassland, the PPR is now largely an agricultural system dominated by cropland. Despite these changes, millions of wetlands and large tracts of native prairie remain. The PPR is one of the most altered—yet also one of the most important—migratory bird habitats in the Western Hemisphere.

Uplands

The project area lies in the native mixed-grass prairie of the northern plains and includes small elements of native tallgrass prairie to the east and native shortgrass prairie to the west (Whitman and Wali 1975). The vegetation is largely a wheatgrass–needlegrass type (Bryce et al. 1998, Martin et al. 1998). The area has six primary species of grass: prairie Junegrass, green needlegrass, needle and thread, blue grama, little bluestem, and yellow sedge. There are 11 secondary grass species: western wheatgrass, Canada wildrye, spike oats, big sandgrass, ticklegrass, porcupinegrass, mat muhly, sideoats grama, Leiberg's panicum, needleleaf sedge, and threadleaf sedge. In areas of glacial outwash, plains muhly and saltgrass may be found (Bryce et al. 1998).

Many wildflowers and other forbs make up 5–15 percent of the vegetative cover. The native prairie has 65 species of common forbs including the following: pasqueflower, western wallflower, prairie smoke, Missouri milkvetch, lead plant, Indian breadroot, purple prairie clover, gaura, harebell, narrowleaf blazing star, purple coneflower, and western yarrow.

John and Karen Hollingsworth / USFWS

Tallgrass Prairie

Other common forbs are sunflowers, goldenrods, asters, sageworts, and wild mint (USDA 1975).

Wooded and shrubby areas cover less than 1 percent of the land in the project area and primarily occur on slopes and in ravines (Niemuth et al. 2008, Whitman and Wali 1975). Wooded areas often comprise aspen and green ash, especially in the northwestern section of the Missouri Coteau. Pockets of western snowberry shrubs can be found throughout the project area (Barker and Whitman 1989, Martin et al. 1998).

In addition to the tremendous diversity of common plants in the upland grasslands, several plant species are considered rare, threatened, or endangered at the State level in North Dakota and South Dakota (Hagen et al. 2005, USFWS 2011b). The Dakota buckwheat found in dry, upland, native prairie is endangered in North Dakota, and another seven grassland species are threatened. Rare plants in the project area are prairie mimosa, Rocky Mountain iris, bottle gentian, small-flowered penstemon, and western prairie fringed-orchid.

Wetlands

About 10 percent of the project area is primarily palustrine (marsh) emergent wetland (Cowardin et al. 1979). These wetland habitats have temporary, seasonal, semipermanent, and permanent water regimes; the variation in the length of time water persists in these wetlands results in different types of vegetation.

- Ephemeral, temporary, and seasonal wetlands that have water for several weeks support vegetation that comprises wetland–low native prairie, wet meadow, and shallow marsh zones. Common plants include bluegrass, sedges, western snowberry, prairie cordgrass, and wild lily. Other plants in temporary and seasonal wetlands include smartweed, rushes, and reed canarygrass.

- Semipermanent or permanent wetlands have water present through most or all of the year. These wetlands may have any of the vegetation zones already mentioned, as well as deep marsh zones with pondweed and milfoil, shallow marsh zones with bulrush and cattail, and open-water areas with no vegetation.

Two other types of wetland are found on the Missouri Coteau: alkali ponds and fens. Alkali ponds generally have reduced diversity, although widgeongrasses are common (Stewart and Kantrud 1971). Fens are alkali bogs that support a diversity of flora including some of the rarest plants in North Dakota (Duxbury 1986).

The wetlands in the project area also support several species of plants that have small or declining populations in North Dakota. Fifteen species of wetland plants are considered threatened, and pullup muhly and elk sedge are endangered at the State level in North Dakota. In wetter native prairie areas within the project area, rare or imperiled species occur such as the joint-spike sedge, fringed gentian, and sedge mousetail (Hagen et al. 2005, USFWS 2011b).

Federally Listed Species

Under classification of the Endangered Species Act, there are eight endangered and threatened species (scaleshell mussel, Topeka shiner, pallid sturgeon, least tern, whooping crane, gray wolf, western prairie fringed-orchid, and piping plover) and two candidate species (Dakota skipper and Sprague's pipit) that occur in the project area or nearby.

Endangered Species

SCALESHELL MUSSEL. The scaleshell is a relatively small freshwater mussel with a thin, fragile shell and faint green rays. It grows to about 1–4 inches in length. The inside of the shell is pinkish white or light purple and highly iridescent. The scaleshell gets its name from the scaly appearance of the shell, which is only seen in females.

Scaleshell historically occurred across most of the eastern United States. Scaleshell mussels live in medium-sized and large rivers with stable channels and good water quality. They bury themselves in sand and gravel on the river bottom with only the edge of their partially opened shells exposed. As river currents flow over them, they siphon particles out of the water for food such as plant debris, plankton, and other microorganisms.

The life cycle of the scaleshell, like most freshwater mussels, is unusual and complex. Their eggs develop into microscopic larvae (glochidia) within the gills of the female. The female discharges its glochidia into the river, where they must attach to gills or fins of a fish to continue developing. Each mussel species has specific fish species (host fish) that the glochidia need to develop. Glochidia continue growing on the fish and transform into juveniles. After a few weeks, they drop off, land on the river bottom, and continue maturing into adults.

The roles of scaleshell mussels in river ecosystems are as food for wildlife like muskrats, otters, and raccoons and as filters that improve water quality. During the last 50 years, this species became increasingly rare within its reduced range. Of the 55 historical populations, 14 remain scattered within the Mississippi River basin in Arkansas, Missouri, and Oklahoma. Toxins and declines in water quality from pollution easily harm adult mussels because they are sedentary (stay in one place). Pollution may come from specific, identifiable sources such as factories, sewage treatment plants, and solid waste disposal sites or from diffuse sources like runoff from cultivated fields, pastures, cattle feedlots, poultry farms, mines, construction sites, private wastewater discharges, and road drainage. Contaminants reduce water quality and may directly kill mussels, reduce the ability of surviving mussels to have young, or result in poor health or disappearance of host fish.

Sedimentation is material suspended in water that usually moves as the result of erosion. Although sedimentation is a natural process, poor land use practices, dredging, impoundments, intensive timber harvesting, heavy recreational use, and other activities may accelerate erosion and increase sedimentation. A sudden or slow blanketing of the river bottom with sediment can suffocate freshwater mussels, because it is difficult for them to move away from the threat. Increased sediment levels may also make it difficult for scaleshell to feed, which can lead to decreased growth, reproduction, and survival.

Dams affect both upstream and downstream mussel populations by disrupting natural flow patterns, scouring river bottoms, changing water temperatures, and eliminating habitat. The scaleshell and many other river mussels and fish cannot survive in the still water impounded behind dams. Scaleshell and other mussels depend on their host fish for dispersal. Because dams are barriers to fish movement and migration, this, in turn, prevents the dispersal of mussels upstream. Upstream mussel

populations then become isolated from downstream populations, leading to small unstable populations that are more likely to die out.

The recent invasion of the exotic zebra mussel into the United States poses a substantial threat to the scaleshell mussel, because it starves and suffocates native mussels by attaching to their shells in large numbers.

TOPEKA SHINER. Topeka shiners are small (less than 3 inches in length) minnows that have dark lateral and back stripes. Scales above the lateral stripe are edged in pigment, while below the stripe the scales appear silvery-white. During the breeding season, the shiner has a dark chevron at the base of the caudal fin; breeding males have orange fins.

Topeka shiner habitat is small streams and creeks that exhibit perennial or nearly perennial flow. Substrate usually is clean gravel, cobble, or sand although these shiners have been found in areas with bedrock and clay hardpan overlain by silt. The Topeka shiner may require open pools with cool, clean water.

Historically, Topeka shiners were abundant throughout the native prairie of South Dakota, Minnesota, Kansas, Iowa, and Missouri; these shiners still occur but exist in fragmented and isolated populations. The number of known occurrences has declined by 80 percent, and Topeka shiners have been eliminated from many watersheds. Topeka shiners have been adversely affected by degradation of stream quality, habitat destruction, siltation, channelization, dewatering of streams, and water impoundment.

Activities that increase sedimentation and reduce water quality, such as agriculture and grazing, contribute to the decline of the Topeka shiner. Although impoundments provide a refuge during droughts, impoundments prevent upstream movement, and shiners that use these impoundments are subject to predation by larger fish. Streams with watering ponds and other impoundments have eliminated this endangered shiner from the associated stream reaches. Spawning behavior is poorly understood for this species; it is thought that Topeka shiners spawn on silt-free substrates found in the quieter waters of stream pools. As a native prairie species, the Topeka shiner is adapted to taking refuge in pools during periods of drought. However, human activities that use and reduce ground and stream water create artificial drought conditions that result in death of Topeka shiners from anoxia or exposure. Population declines also are attributed to introduced predaceous fishes.

PALLID STURGEON. The pallid sturgeon was placed on the Endangered Species List in 1990. This endangered fish, which can weigh up to 80 pounds, has rows of bony plates that stretch from head to tail. It prefers the bottoms of large, shallow rivers with sand and gravel bars, but construction of dams and bank stabilization has damaged or destroyed much of that habitat.

The pallid sturgeon was fairly common in the Missouri and Yellowstone Rivers in North Dakota as late as the 1950s, but biologists believe fewer than 250 wild fish remain in this reach of the rivers. Since 1997, the Service, in cooperation with State fish and wildlife agencies in Montana and North Dakota, has stocked pallid sturgeon in compliance with the "1993 Pallid Sturgeon Recovery Plan." About 28,000 juvenile pallid sturgeon have been released in recovery priority area 2 (the Missouri River from Fort Peck Dam to the headwaters of Lake Sakakawea, including the Yellowstone River upstream to the mouth of the Tongue River). Releases into recovery priority area 2 occurred in 1997, 2000, 2002, 2003, and 2004.

The Service estimates that an isolated remnant population of less than 50 individuals remains in the Garrison Reach of the Missouri River (North Dakota part of the project area); there are no recent records (within the last 20 years) of successful pallid sturgeon reproduction in this reach. The Garrison Reach is outside of the recovery priority areas identified in the recovery plan. Although not excluded from implementation of recovery actions, river reaches outside the recovery priority areas are lower priority, because these areas have been altered to the extent that major modifications would be needed to restore their natural physical and hydrologic characteristics.

LEAST TERN. This 9-inch long bird is the smallest member of the gull and tern family. About 100 of the remaining 2,500 pairs of the interior population of least tern come to North Dakota each year. The least tern uses sparsely vegetated sandbars including those in the Missouri and Yellowstone River systems in North Dakota and South Dakota. This tern was listed as an endangered species in 1985. Its decline is due to the loss of habitat from dam construction and subsequent operation of the river system.

WHOOPING CRANE. At a height of 5 feet, the whooping crane is the tallest bird in North America. Equally impressive is its 7-foot wingspan. Most whooping cranes migrate through North Dakota each spring and fall, frequently in the company of sandhill cranes. Whooping cranes pass through North Dakota and South Dakota when migrating between their breeding territory in northern Canada and wintering grounds on the Gulf of México. Declared an endangered species in 1970, the decline of the whooping crane is blamed on loss of habitat and excessive shooting. This crane is making a slow, but steady, comeback. From a low of 21 birds in the 1940s, the current wild and captive whooping crane population is about 468.

GRAY WOLF. An infrequent visitor to North Dakota, the gray wolf occasionally comes across the border from neighboring Minnesota or the province of Manitoba, Canada. Once abundant in the State, the gray wolf was killed to near extinction by 1940 at the urging of western settlers who believed wolves caused widespread livestock losses. In 1978, the Service published a rule listing the gray wolf as an endangered species throughout the lower 48 States except Minnesota, where the gray wolf was reclassified as a threatened species. In April 2003, the gray wolf's listing status was downgraded to threatened. On February 1, 2005, a United States district court in Oregon overturned the April 2003 decision and ordered the Service to rescind the rule downgrading the listing status for the gray wolf. At this time, the gray wolf is listed as a threatened species in Minnesota and as an endangered species throughout the rest of its range including North Dakota.

Threatened Species

WESTERN PRAIRIE FRINGED-ORCHID. The plant, which may reach 3 feet in height, can be recognized by its large, white flowers on a single stem. The western prairie fringed-orchid is a perennial orchid of the native, North American, tallgrass prairie and is found most often on unplowed, calcareous native prairies and sedge meadows. In North Dakota, the orchid most frequently occurs in the sedge meadow community on the glacial Sheyenne Delta and in the moist, native, tallgrass prairie.

The western prairie fringed-orchid is restricted to west of the Mississippi River and is known from about 75 sites in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and Oklahoma and in Manitoba, Canada. The Sheyenne National Grasslands and adjacent native prairie in southeastern North Dakota contain one of three large populations of the orchid, two in the United States—Sheyenne Delta in North Dakota and Pembina Trail prairie complex in Minnesota—and one in Vita Prairies, Manitoba, Canada. On the Sheyenne Delta, about 95 percent of the orchids occur on the Sheyenne National Grasslands administered by the USDA Forest Service and 5 percent occur on private land.

The only North Dakota plant on the Endangered Species List, the western prairie fringed-orchid is classified as a threatened species, which means it is likely to become endangered. The major cause of the species' decline is the conversion of native prairie to cropland.

PIPING PLOVER. The piping plover is a small shorebird that inhabits barren sand and gravel shores of rivers and lakes; the plovers are attracted to the rare combination of windswept islands or peninsulas with a lack of adjacent tree cover. North Dakota is the most important State in the Great Plains for nesting piping plovers, with more than three-fourths of the plovers nesting on alkali lakes in native prairie and the remainder using the Missouri River. Lake Sakakawea and Lake Audubon are significant areas for piping plovers on the Missouri River system. The average adult census for piping plovers from 1998 through 2000 was 79 birds or 16.2 percent of the river system's total, the third highest of the Missouri River segments supporting plovers. While piping plovers are widely distributed over much of the Lake Sakakawea reservoir, important nesting areas include Steinke Bay, Douglas Creek Bay, the Van Hook Arm, Little Egypt, and Tobacco Garden Bay. From 1998 to 2003, survey crews with the U.S. Army Corps of Engineers recorded an average of 56 piping plover nests within 10 miles of the Snake Creek Embankment between Lake Sakakawea and Lake Audubon; in 2004, there were 141 nests in this area (unpublished Corps data). Piping plover nest initiation is similar to that observed on wetlands in the adjacent native prairie coteau, with the birds initiating nests in early to mid-May.

Mike Morel / USFWS

The piping plover is federally listed as a threatened species.

The piping plover was listed as a threatened species in 1985. Habitat loss and poor breeding success are major reasons for its population decline. In North Dakota, critical habitat for piping plover has been designated on the Missouri River, Lake Sakakawea, Lake Oahe, and selected alkali lakes and wetlands. On the Missouri River, critical habitat includes sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river. Critical habitat on Lake Sakakawea and Lake Oahe includes sparsely vegetated shoreline beaches; peninsulas; and islands formed of sand, gravel, or shale; and their interface with the water bodies. For alkali lakes and wetlands, critical habitat includes the following: (1) shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mudflats, or gravelly salt flats; and (2) springs and fens along edges of alkali lakes and wetlands and the adjacent upland grasslands that are 200 feet above the high-water mark of the alkali lake or wetland.

Candidate Species

DAKOTA SKIPPER. The Dakota skipper is a small butterfly with a 1-inch wingspan. Dakota skippers live in native prairie containing a high diversity of wildflowers and grasses. Habitat includes two native prairie types: (1) low (wet) native prairie dominated by bluestem grasses, wood lily, harebell, and smooth camas; and (2) upland (dry) native prairie on ridges and hillsides dominated by bluestem grasses, needlegrass, pale purple coneflower, upright coneflowers, and blanketflower. The skipper's current distribution straddles the border between the native, tallgrass and mixed-grass prairie ecoregions. The most significant remaining populations of Dakota skippers occur in western Minnesota, northeastern South Dakota, north-central North Dakota, and southern Manitoba. Dakota skipper populations have declined historically due to widespread conversion of native prairie. In addition, the remnant native prairie occupied by Dakota skippers is subject to a variety of threats.

SPRAGUE'S PIPIT. Sprague's pipits require large patches of grassland habitat for breeding, with the preferred grass height between 4 and 12 inches. The pipit prefers to breed in well-drained, open grassland and avoids grassland with excessive shrubs. Sprague's pipits can be found in lightly to heavily grazed areas. Pipits avoid intrusive human features on the landscape, so the effect of a development can be much greater than the actual "footprint" of the feature. In 2010, the Sprague's pipit was added to the candidate species list. Migratory bird species that are candidate species, such as Sprague's pipit, are still protected under the Migratory Bird Treaty Act.

Invertebrates

The number of insect species and other invertebrate species in the project area is not currently known; however, the available information suggests a wide diversity. The Missouri Coteau is in an area that represents 15–19 percent of all insect species found in North America (Arenz and Joern 1996). A survey of just five wetlands found more than 50 species of insects. In addition, snails, shrimp, and amphipods are common invertebrates in prairie wetlands (Kantrud et al. 1989).

The regal fritillary and tawny crescent butterfly are two butterflies (other than the Dakota skipper described under candidate species) that occur in the project area and that are considered likely to become candidates under the Endangered Species Act without more conservation action (USFWS 2011b).

Mixed-vegetation stands such as native prairie are thought to be less prone to insect pest outbreaks than monocultures such as cropland (Curry 1994).

Amphibians and Reptiles

Turtles, snakes, toads, frogs, and salamanders all live in the project area (Hoburg and Gause 1992). The western hognose snake and the Great Plains toad are typical of grassland, whereas the northern leopard frog, western chorus frog, and tiger salamander are closely associated with prairie wetlands. Tiger salamander larva and adults are particularly important food items for some species of wetland birds (Kantrud et al. 1989).

Aquatic Species

Rivers and streams are some of the aquatic habitats of the Dakota Grasslands that are most affected by the conversion of native prairie to agricultural or urban purposes. There are literally thousands of miles of these riparian corridors throughout the grasslands that provide pathways for much more than just the fish that swim in the waters. Mussel species that rely on fish to distribute their larval stages upriver and migratory birds that use the riparian zones for nesting and feeding also use these systems. The effects of erosion on the watersheds can cause decreases in water quality and degraded habitat that affect the sustainability of many species found in this region.

Despite the best individual efforts of the management agencies involved with watershed decisions, aquatic habitat quality continues to decline across the Nation. Under the National Fish Habitat Action Plan, a strategy to focus and work with partners is beginning to develop across the nation (AFWA 2006). For the Dakota Grasslands region, several

fish habitat partnerships are involved with the conservation of aquatic habitats—from glacial lakes and reservoirs to rivers and streams. All of these aquatic habitats are affected by the land uses upstream, and aquatic habitat conservation can improve significantly through grassland easements (NFHB 2010).

Birds

The project area is in one of the areas of highest species richness for wetland and grassland birds in the United States and Canada, providing breeding habitat for at least 130 species of birds (Sauer et al. 1997, Stewart 1975). In addition to birds that breed in the project area, many species of birds migrate through or use the area as wintering ground (Ringelman 2005). Migrating geese, ducks, gulls, and shorebirds rest and feed on these wetlands. Warblers use the wooded and shrubby areas and raptors such as bald eagles and peregrine falcons use a variety of habitats.

The project area supports 27 of the Service's species of conservation concern (table 1) including ferruginous hawk, willet, short-eared owl, and loggerhead shrike (Berkey et al. 1993, USFWS 1995).

Table 1. Priority bird species of the Prairie Pothole Region.

	Species	*Prairie Pothole Joint Venture Priority Species*[1]	*Partners in Flight Priority Species*[2]	*U.S. Fish and Wildlife Service Birds of Conservation Concern*[3]
LANDBIRDS	Baird's sparrow	✓	✓	✓
	Sprague's pipit (candidate)	✓	✓	✓
	Chestnut-collared longspur	✓	—	✓
	Smith's longspur	—	—	✓
	Nelson's sharp-tailed sparrow	✓	✓	✓
	Bell's vireo	—	✓	—
	Le Conte's sparrow	—	✓	—
	Grasshopper sparrow	—	—	✓
	Sharp-tailed grouse	✓	—	—
	McCown's longspur	✓	✓	✓
	Swainson's hawk	✓	—	✓
	Greater prairie-chicken	✓	—	—
	Short-eared owl	✓	—	✓
	Red-headed woodpecker	✓	—	—
	Sedge wren	—	✓	✓
	Bobolink	—	✓	—
	Black-billed cuckoo	—	✓	✓
	Bald eagle	—	—	✓
	Peregrine falcon	—	—	✓
	Dickcissel	—	—	✓
WATERBIRDS	Horned grebe	✓	✓	✓
	Western grebe	✓	✓	—
	American bittern	✓	✓	✓
	Yellow rail	✓	✓	✓
	King rail	✓	✓	—
	Franklin's gull	✓	✓	—
	Black tern	✓	✓	✓
	Least tern (endangered)	✓	✓	—
	Whooping crane (endangered)	✓	✓	—
	Least bittern	—	✓	✓

Table 1. Priority bird species of the Prairie Pothole Region.

	Species	*Prairie Pothole Joint Venture Priority Species*[1]	*Partners in Flight Priority Species*[2]	*U.S. Fish and Wildlife Service Birds of Conservation Concern*[3]
SHOREBIRDS	Piping plover (threatened)	✓	✓	—
	Mountain plover	✓	✓	✓
	American golden-plover	✓	✓	—
	Semipalmated plover	✓	✓	—
	American avocet	✓	✓	—
	Upland sandpiper	✓	✓	✓
	White-rumped sandpiper	✓	✓	—
	Baird's sandpiper	✓	✓	—
	Pectoral sandpiper	✓	✓	—
	Buff-breasted sandpiper	—	—	✓
	Semipalmated sandpiper	✓	✓	—
	Solitary sandpiper	—	—	✓
	Stilt sandpiper	✓	✓	—
	Dunlin	✓	✓	—
	Marbled godwit	✓	✓	✓
	American woodcock	✓	✓	—
	Wilson's phalarope	✓	✓	—
	Hudsonian godwit	✓	✓	✓
	Long-billed curlew	—	✓	✓
	Lesser yellowlegs	✓	✓	—
	Long-billed dowitcher	✓	✓	—
	Short-billed dowitcher	—	—	✓
WATERFOWL	Mallard	✓	—	—
	Northern pintail	✓	—	—
	Gadwall	✓	—	—
	Northern shoveler	✓	—	—
	Blue-winged teal	✓	—	—
	Lesser scaup	✓	—	—
	Canvasback	✓	—	—
	Redhead	✓	—	—

[1] *Species designated a focal species, a species of concern, a species in an area important to migrants, or a species of high conservation assessment from the "Prairie Pothole Joint Venture Implementation Plan" (Ringleman et al. 2005).*

[2] *Species designated a criteria I species in the Partners in Flight physiographic areas (37 and 40) within the project area, a species of concern in the "Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan," or a species of high concern in the "Northern Prairie and Parkland Waterbird Conservation Plan" (Beyersbergen et al. 2004, Fitzgerald et al. 1998, Fitzgerald et al. 1999, Skagen and Thompson 2011).*

[3] *Species designated a species of conservation concern by the Migratory Bird Division of the U.S. Fish and Wildlife Service (USFWS 2008).*

Waterfowl

The duck population boom that began in 1994 is evidence of the potential capacity of the project area to recruit ducks when habitat conditions are suitable. The PPR of the Dakotas accounts for only 7 percent of the traditional waterfowl survey area of North America, yet carried far more than 20 percent of breeding ducks during the period 1994–2009 (USFWS 2009). Accordingly, the foundation of the PPJV implementation plan is to "keep the table set" for periodic booms in duck populations by making sure that important wetland and grassland habitats are

intact. This would require conserving an additional 1.4 million acres of wetland and an additional 10.4 million acres of grassland in the United States part of the PPR.

At least 12 species of waterfowl breed in the project area and most depend on upland grasslands for nesting, as well as wetlands for feeding and brood rearing. (Stewart 1975). Mallard, northern pintail, northern shoveler, gadwall, and blue-winged teal are the priority species of waterfowl in this project (table 1). In fact, parts of the project area support, on average, more than 100 pairs of breeding ducks per square mile—some of the highest densities recorded in North Dakota and South Dakota (Reynolds et al. 2006). The "North American Waterfowl Management Plan" identified the PPR as the continent's top priority for waterfowl conservation and has a goal of restoring wetland to accommodate an additional 492,000 pairs of breeding ducks and 393,000 acres more of restored grassland associated with high-density wetland communities (USFWS 1986).

Other Waterbirds

Waterbirds constitute an important group of species in the project area. The PPR contains two-thirds of the continental breeding population of Franklin's gull; one-half of the continental population of pied-billed grebe, American bittern, sora, American coot, and black tern; and approximately one-third of the American white pelican and California gull populations (Beyersbergen et al. 2004).

The DGCA will benefit 13 species of breeding shorebirds, as well as many other shorebird species that use the area as stopover habitat during migration, such as 30 species that breed in the Arctic. As shown in table 1, priority waterbird species include marbled godwit, willet, Wilson's phalarope, American avocet, and piping plover (Ringelman 2005, Skagen and Thompson 2007).

USFWS

The gadwall is one of the priority waterfowl species.

Grassland Birds

Native prairie and untilled pastureland in the project area are habitat for many bird species including northern harrier, sharp-tailed grouse, willet, upland sandpiper, marbled godwit, common snipe, Wilson's phalarope, mourning dove, short-eared owl, burrowing owl, and common nighthawk.

Parts of the area provide habitat for a suite of grassland birds—the only group of bird species to experience consistent declines nationwide over the last 30 years (Sauer et al. 1995). Many species in this group have ranges limited to the grassland habitat represented in the project area, including Baird's sparrow, grasshopper sparrow, Sprague's pipit, lark bunting, and chestnut-collared longspur (Knopf 1996, Johnson et al. 1994, USFWS 1995). Destruction of habitat and mowing for hay production are two of the main reasons for the decline in grassland birds (Sauer et al. 1995).

Figure 4 shows the extent of the breeding range for 27 grassland birds throughout the United States, with the highest concentrations in the Midwest and the PPR. The 27 bird species represented follow:

- Upland sandpiper
- Long-billed curlew
- Mountain plover
- Greater prairie-chicken
- Sharp-tailed grouse
- Ring-necked pheasant
- Northern harrier
- Ferruginous hawk
- Common barn-owl
- Short-eared owl
- Horned lark
- Bobolink
- Eastern meadowlark
- Western meadowlark
- Chestnut-collared longspur
- McCown's longspur
- Vesper sparrow
- Savannah sparrow
- Baird's sparrow
- Grasshopper sparrow
- Henslow's sparrow
- Le Conte's sparrow
- Cassin's sparrow
- Dickcissel
- Lark bunting
- Sprague's pipit
- Sedge wren

In many cases, the project area represents a refuge for birds that are suffering population declines elsewhere. For example, over the last 30 years, 21 species of birds have experienced major declines nationwide, while populations in the DGCA have remained stable (Sauer et al. 1997). Included in this group are several grassland species such as Wilson's phalarope, bobolink, western meadowlark, and clay-colored sparrow. However, populations of the loggerhead shrike, vesper sparrow, and American goldfinch actually have increased over the last 30 years in the project area, while decreases occurred nationwide.

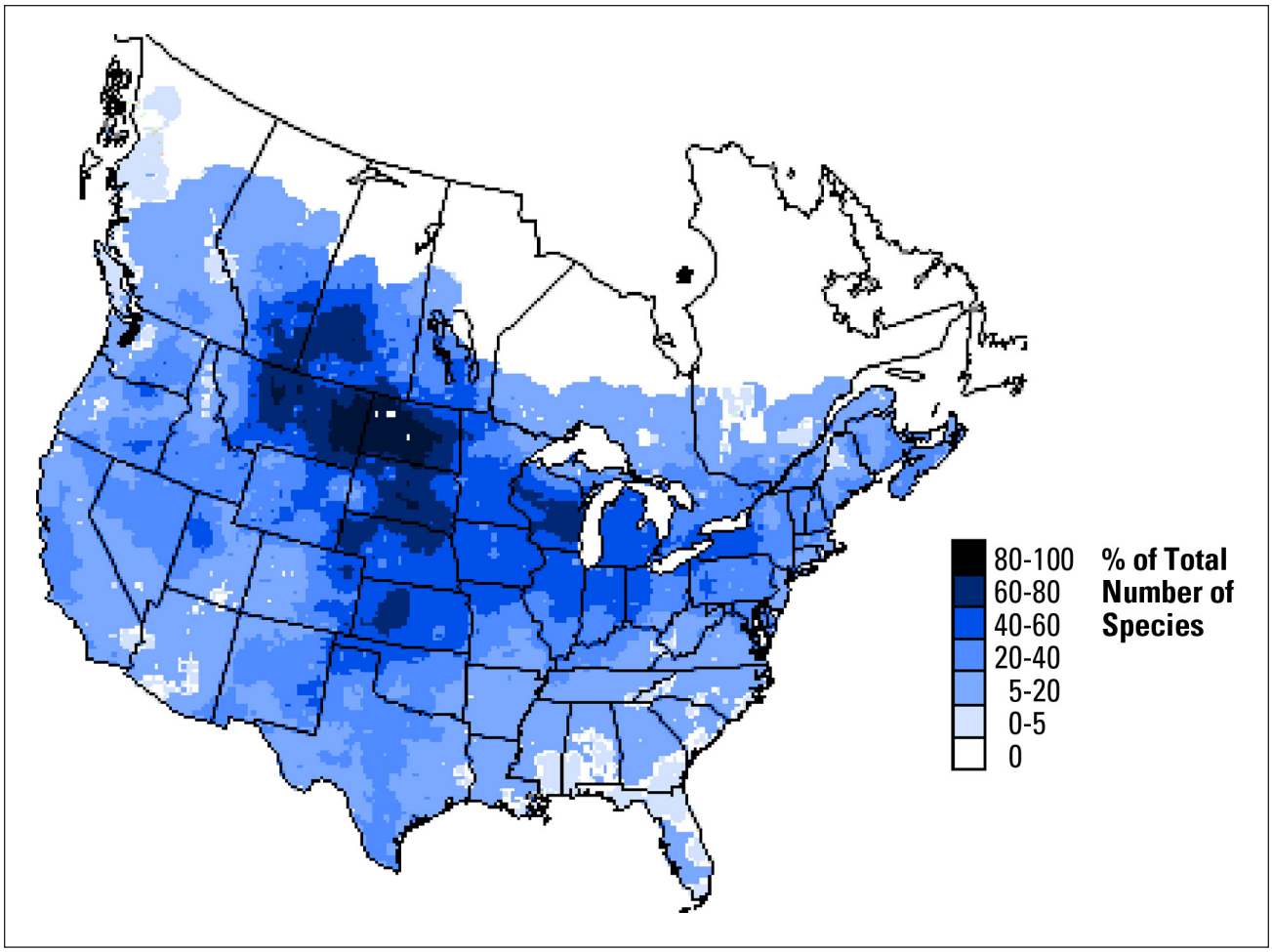

Figure 4. Map of the North American breeding ranges of 27 grassland birds. *Source: U.S. Geological Survey.*

Mammals

The project area includes the ranges of approximately 50 mammal species (Burt and Grossenheider 1964, Grondahl 2011).

Native prairie uplands are habitat for many small mammals including shrews, mice, and voles. In addition, three species of ground squirrels (Richardson's, Franklin's and thirteen-lined) rely on grassland habitat found in the project area. These ground squirrels provide critical food sources, and their burrows provide nesting habitat, for raptors such as ferruginous hawks and short-eared owls (Berkey et al. 1993). Big game animals including white-tailed deer and pronghorn also use the upland habitat.

Wetlands provide cover or food, or both, for at least 17 species of terrestrial or semiaquatic mammals such as muskrat, beaver, and mink (Kantrud et al. 1989).

Coyote, red fox, badger, skunk, and weasels are examples of furbearing animals that are widespread throughout the area.

Cultural Resources

Archeologically, all of the DGCA is within the Northeastern Plains subarea of the Northern Plains area (Wood 1998). There have been five cultural traditions or lifeways recognized by archeologists for the American Indians in the Northeastern Plains: from earliest to latest these are paleo-Indian, Plains Archaic, Plains Woodland, Plains Village, and Equestrian Nomadic. During any time in history, existing groups of peoples could be found living different lifeways in different parts of the project area (Gregg et al. 2008).

This section also describes the more recent history of the area. Modern historical records for the project area are contained in the 1790s' journals of explorers and traders.

Paleo-Indian Tradition

The paleo-Indian tradition (9500–5500 B.C.) was based on big game hunting during a time of a relatively warm and comfortable climate. As the ice

age ended, these peoples within the project area could be identified by the distinctive Clovis points attached to their lances or spears. Clovis peoples hunted now-extinct animals including mammoths, mastodons, horses, and American camels. By 11,000 years ago, these animals were gone, and then the paleo-Indian hunters relied on hunting giant bison (*Bison antiques*) with beautifully crafted Folsom points. For a thousand years, these peoples continued to hunt the giant bison using regional variations of spear or dart points with names such as the Agate Basin, Hell Gap, Eden, and Cody points (SDARC 2011).

As the paleo-Indian tradition ended, there was increased evidence of plant collection and food storage. Sites of the paleo-Indian tradition include camps, Knife River flint quarry sites, other stone procurement areas, stone workshops, and isolated artifact finds (NDSHPO 2009).

Plains Archaic Tradition

Plains Archaic tradition lifeways (5500–400 B.C.) were based around gathering plants and hunting bison during a drier climate period that had many long and frequent droughts. Reliance predominantly on the hunting of big game seems to have shifted to the opportunistic hunting of bison when available and small game, even rodents, when necessary. The Archaic peoples used the atlatl with dart points for hunting.

The dry climate slowly changed until about 1000 B.C., when conditions became much the same as today (SDARC 2011). Plant gathering was a very important component of the Archaic peoples' daily activities and diet. Sites include animal kill sites, camps, Knife River flint quarry sites, stone workshops, and burial sites (NDSHPO 2009).

G.R. Zahm / USFWS

Blending in with shortgrasses, a sharp-tailed grouse performs a mating display for a hen.

John and Karen Hollingsworth / USFWS

The western meadowlark is a common grassland bird.

Plains Woodland Tradition

The Plains Woodland tradition lifeway (400 B.C.–A.D. 1200) was primarily based on hunting and the gathering of modern plants and animals. During this tradition, the bow and arrow came into use (NDSHPO 2009). In addition, the Plains Woodland peoples began to garden and use ceramic pots as a result of contacts with eastern peoples. Trade goods from other regions of North America were common to these peoples. After A.D. 900, farming crops of corn, beans, squash, and sunflowers in gardens along river bottoms supplemented the hunting and gathering (SDARC 2011).

The farmers lived in earthlodge villages fortified by ditches and log palisades. Sites include burial mounds and other burial sites, occupations, camps, quarries, stone procurement areas, and bison kill sites (NDSHPO 2009). Great social and religious changes became part of these peoples' lifeways as observed in the archeological record—hundreds and maybe thousands of burial mounds were constructed as a new and more elaborate way of burying their dead (Gregg et al. 2008, SDARC 2011).

Plains Village Tradition

Plains Village tradition lifeways (A.D. 1200–1780) adapted to hunting and gathering with full-scale gardening and with ceramic pots common in everyday life. These peoples had a dependable supply of stored food, primarily dried corn, which made possible the large and more permanent village communities of earthlodges. The Plains Village peoples were living all along the Missouri River Valley and its uplands, and their seasonal hunting camps occur throughout the project area. After A.D. 1700, European contacts and trade items became part of the lifeway, as did the introduction of the horse from the Southwest.

The Mandan, Hidatsa, Arikara, and Cheyenne may be the most recognized of these Plains Village tradition peoples. Sites include occupations (fortified and unfortified earthlodge villages), winter villages, hunting camps, flint quarries, eagle-trap-

Jackie Jacobson / USFWS

Pasqueflower is a native prairie plant.

ping sites, conical timber lodges, burial sites, lithic (stone) workshops, bison kill sites, and rock art sites (NDSHPO 2009).

This tradition ended when the 1780 epidemics decimated the villages, after which the nomadic Sioux became the dominant cultural force in the Northern Plains (Gregg et al. 2008).

Equestrian Nomadic Tradition

The Equestrian Nomadic tradition (A.D. 1780–1880) was dependent on the horse to focus narrowly on bison hunting, with seasonal rounds of plant gathering. A diversified group of cultures such as the Cheyenne, Dakota, Nakota, Lakota, Assiniboine, and Plains Cree took up the Equestrian Nomadic lifeway (DeMallie 2001). This horse culture lifeway greatly increased the capacity to hunt bison and to transport it and family goods over vast areas (Gregg et al. 2008). Known sites include camps, battle sites, and animal kill sites (NDSHPO 2009). It could be said that this lifeway terminated with the surrender of Sitting Bull at Fort Buford, North Dakota.

Modern History

As they explored the Louisiana Purchase, the Lewis and Clark expedition traveled through or wintered in the project area in 1804, 1805, and 1806. The 1800s were a period of cultural turmoil. Based on the United States' Indian policy, the Government made acts and treaties with American Indian tribes in response to the immigration of Europeans into the Northwestern Plains subarea. In the late 1870s, these policies led to settlement of the American Indians on reservations. Today there are eight reservations in the project area (Schneider 2002).

The Dakota Boom began in the late 1870s. During this period, there was large growth in emigrant populations as new railroads opened eastern markets to the wheat from farms within the project area. The Territory of Dakota was an organized, incorporated territory of the United States from 1861 until 1889, when the territory was divided into the present States of North Dakota and South Dakota as they were admitted into the Union (Schell 1975).

Even after the effects of the Dust Bowl and Depression era of the 1930s, farms still covered the vast majority of land within the project area. The Service's Refuge System grew out of the attention given to conservation by President Franklin D. Roosevelt and his administration during this Depression Era. Today, the project area includes 62 national wildlife refuges and 16 wetland management districts.

Socioeconomic Environment

The project area includes parts of 52 counties within North Dakota and South Dakota:

North Dakota Counties

Barnes	Grand Forks	Ramsey
Benson	Griggs	Renville
Bottineau	Kidder	Rolette
Burke	LaMoure	Sheridan
Burleigh	Logan	Steele
Cass	McHenry	Stutsman
Cavalier	McIntosh	Towner
Dickey	McLean	Trail
Divide	Mountrail	Walsh
Eddy	Nelson	Ward
Emmons	Pembina	Wells
Foster	Pierce	Williams

South Dakota Counties

Aurora	Edmunds	McPherson
Brule	Faulk	Potter
Buffalo	Hand	Sully
Campbell	Hughes	Walworth
Charles Mix	Hyde	
Douglas	Jerauld	

The North Dakota cities of Bismarck, Fargo, Grand Forks, Jamestown, and Minot and the South Dakota cities of Aberdeen, Huron, Mitchell, and Pierre are some of the largest cities in or near the project area. These larger cities are considered travel designa-

tions from the surrounding rural communities for their shopping and entertainment. A limited amount of industrial activity is associated with the larger communities.

The project area is rural in nature. Many small, rural communities with a population of less than 10,000 people lie within the project area and are generally supported by the local agricultural and ranching industries. With the exception of the areas near cities and towns, the rural lands are mostly zoned for agriculture. Medium to large farming operations emphasize (1) high-value cropland mainly consisting of corn, wheat and beans, and (2) livestock beef agriculture. Because of the highly desirable soils, the high precipitation, and the topography, the project area has a higher percentage of cropland operations as compared with livestock operations. The USDA's National Agricultural Statistics Service reports that land values within the project area range from more than $3,000 per acre for cropland (eastern South Dakota) to a low of near $300 per acre for pastureland (north-central North Dakota) (USDA–NASS 2008). These mostly family-owned operations range from a few hundred acres to several thousand acres in size.

Oil development in the northwestern part of North Dakota has seen tremendous growth over the last 10 years. There are 5,199 active wells, with 174 active drilling rigs, in North Dakota, and most of them are within the project area. Oil production for September 2010 was more than 10 million barrels. The local media reported that 2010's revenue to the State from oil extraction taxes will exceed $530 million and will likely exceed $1 billion in 2011. The discovery of new oil reserves and the advancement of drilling technology have resulted in a significant interest in drilling new wells for oil. Furthermore, a recently released survey conducted by the North Dakota Geological Survey showed that 52 of the 53 counties in North Dakota have shallow natural gas reserves, which will likely result in added interest in natural gas exploration (NDGS 2010).

Landownership

Most land in the project area is in private ownership. An unpublished report entitled "Summary of Lands, North Dakota Counties," shows that approximately 88 percent of North Dakota landownership is in private agricultural ownership, with the balance in towns, cities, roads, and State and Federal ownership.

South Dakota personnel estimate that approximately 90 percent of the State is privately owned. The ratio of private ownership is assumed similar within the project area. Less than 7 percent of the land in the project area was purchased primarily for wildlife production.

Property Tax

Currently, landowners pay property tax on their private lands to the counties. Since the project is a conservation easement program, the land remains in private ownership. Easement properties remain on the tax rolls, and landowners will continue to pay property taxes to the counties. Since lands in both North Dakota and South Dakota are assessed based on soils, which the conservation easements will not affect, no changes to the tax base are anticipated.

Public Use and Wildlife-Dependent Recreational Activities

Opportunities for wildlife observation, nature photography, hunting, and fishing attract visitors to the project area. Because the project area encompasses part of the PPR, waterfowl hunting is a major attraction. Grassland species such as ring-necked pheasant and sharp-tailed grouse are abundant and are highly sought after by hunters.

The 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation found that $539 million were spent on equipment and various trip expenditures for hunting and fishing in North Dakota and South Dakota (U.S. Census Bureau 2008). In 2010, the sale of hunting and fishing licenses in North Dakota and South Dakota generated nearly $42 million in revenue. An additional $206 million were spent on wildlife observation activities in both States.

There is increasing interest in developing wildlife-related tourism opportunities in the project area. Several communities have developed self-guided, wildlife-viewing routes in conjunction with local landowners. Control of public access to easement lands remain under the control of the landowners.