

Chapter 4—Affected Environment



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Pallid sturgeon swarming.

This chapter describes the existing resource conditions within the analysis area and provides the background for analyzing the effects of the alternatives on the environment. The resources within the study areas have received extensive study and are fairly well documented except where noted.

4.1 Physical Environment

Physical environment refers to the nonliving elements of the environment that provide a home for people, plants, fish, and wildlife.

Climate

The climate of the analysis area is known for hot summers and extremely cold winters. Seasonal climate in the analysis area often changes from extreme drought to flood in relatively short periods. Similarly, abrupt changes in temperature occur sea-

sonally as well as daily. Climate data from the National Weather Service's Cooperative Stations in Nebraska; Pickstown, Vermillion, and Yankton, South Dakota; and Gavins Point Dam indicate that temperatures in these areas can range from -38 to 116 °F. The extreme lowest temperature was -38 °F in January 1912, and the extreme highest temperature was 116 °F in July 1939. Annual precipitation is highly variable and can range from 11 inches to more than 39 inches. The Gavins Point area on average receives the lowest average annual precipitation (24.17 inches), and Vermillion receives the highest average annual precipitation (25.31 inches). The average total snowfall for the analysis area ranges from 22.9 to 30.2 inches per year.

Climate Change

A report released by the U.S. Global Change Research Program, "The Global Climate Change Impacts in the United States" (Karl 2009), places the analysis area within the Great Plains ecosystem. According to this report, average temperatures in

the Great Plains will increase, especially during the winter months. Cold days will occur less often and warmer days more often. Precipitation is expected to increase, but with more frequent extremes of heavy rainfall and drought (National Oceanic and Atmospheric Administration 2013).

Over the next century, climate change could profoundly affect fish and wildlife populations and plant resources within the analysis area. These effects could be direct, such as changes in temperature and precipitation influencing species and their habitats, or indirect, such as falling reservoir levels because of reduced snowpacks or increased costs of responses to catastrophic storms.

Spring snowpack in the Rocky Mountains in Montana and Wyoming represents a reservoir of water that can sustain Missouri River flows throughout the summer. Warmer winters would result in more precipitation falling as rain instead of snow, reducing the spring snowpack and causing an early runoff and reduced flow in the summer, affecting fish and wildlife as well as recreation and agricultural activities. Climate change is likely to affect native plant and animal species by altering key feeding and nesting habitats such as emergent wetlands, emergent sandbars, shallow water, and prairie potholes or playa lakes.

Air Quality

Air quality directly affects all living things. Poor air quality can affect visibility and create objectionable odors, thus affecting visitor experiences. The Clean Air Act was amended in 1977 to ensure high air quality standards in national parks, refuges, and other nationally important areas. Under the act the MNRR was designated as a Class II clean air area, and this designation would also extend to the proposed PBCA and NCCA if they are adopted. There could be moderate, well-planned industrial growth in the vicinity of the PBCA and NCCA as long as the Class II maximum allowable increases for particulate matter, sulfur dioxide, and nitrogen dioxide are not exceeded. Hazardous air pollutants, also known as toxic air pollutants or air toxins, are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.

The EPA Office of Air Quality, Planning, and Standards has set National Ambient Air Quality Standards for six criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, lead, particulate material, and sulfur dioxide. Most air toxics originate from human-made sources, including mobile sources

(like cars, trucks, and buses), stationary sources (like factories, refineries, and power plants), and indoor sources (like building materials and from activities such as cleaning).

The project area is within the Nebraska Intra-state Air Quality Region. The air quality in this region is generally good and falls within all parameters for all the National Ambient Air Quality Standards (EPA 2012).

The Santee Sioux Tribe has developed a smoke management plan that addresses air quality in relation to prescribed burning activities on the reservation.

Visual Resources

Outstanding scenic character distinguishes national parks and other publicly owned natural areas, and it is often integral to their fundamental value. The proposed NCCA and PBCA abound with impressive natural, serene pastoral views. Both areas contain special scenic qualities that are a product of the area's regional combination of topography, geology, vegetation, and cultural history.

The proposed NCCA contains numerous stunning vistas that include chalkstone bluffs, rolling hills, pastoral settings, and dark night skies. Views of the untamed Missouri and Niobrara Rivers are also visual highlights. Notable scenery includes historic Fort Randall and Old Baldy, a site noted by Lewis and Clark.

Views within the proposed PBCA in the unchanneled portion of the Missouri River upstream of Ponca State Park contain a mix of open and forested lands, including old growth cottonwood forest and native prairie, rare pocket or goat prairies, hills, and chalkstone bluffs. This braided, driftwood-strewn stretch of river contains large expanses of picturesque bluffs and wooded hills. Spirit Mound, visited by Lewis and Clark, is a large and visually interesting geological feature within the area.

Acoustic Resources

Acoustic resources within national park and refuge units include natural sounds (such as wildlife, waterfalls, wind, and rain), cultural sounds (such as the drumbeat from a tribal dance), and historical sounds (such as the cannon shot in a battle reenactment). Noise—that is, unwanted sound—can obscure the soundscape for both visitors and wildlife. Noise is extremely perceptible in quiet, remote places; accord-

ingly, wildlife and visitors in these places are likely to be especially sensitive to noise.

In the wild, the ability to hear is so important for survival that no deaf vertebrate species are known to exist. Animals communicate through sound and continuously detect sounds, even when asleep. Intrusive or excessive noise can have serious consequences for wildlife, causing them to miss the footfall of a predator or fail to adequately compare songs from potential mates. The more effectively that human activities protect the integrity of acoustic resources in the wild, the better chance wildlife species have of surviving.

Additionally, a healthy soundscape is not limited to the sounds of nature; cultural and historical sounds are important acoustic resources in many national park and refuge units. Such sounds can bring the past into the present, provide insight into historic events, and elicit a sense of connection to people of the past.

In the proposed conservation areas, natural sounds include those of wildlife, wind, and flowing water. Cultural sounds that may be important in these areas have not been specifically studied nor defined, but they might include sounds associated with Native American ceremonies (for example, powwow drums).

Land Features, Soils, Vegetation, and Geology

The proposed NCCA lies within the Great Plains Steppe Province (Bailey et al. 2008). The region is characterized by glacial till deposits north of the Missouri River and sand and loess deposited from wind-blown sediment of the retreating glaciers south of the river. The proposed PBCA lies within the Prairie Parkland (Temperate) Province (Bailey et al. 2008), which is characterized by steep bluffs and rounded, rolling plains. Soils of the area are generally mollisols with dark upper horizons with wide variety in the amounts of sand and clay they contain.

The natural vegetation of both conservation areas generally consists of mixed-height prairie and deciduous forest with the exception of cottonwood forests within the floodplain. Historically, cottonwood forests inhabited the floodplain of the river and provided woody debris to the river that trapped sediment and led to the creation of habitat for countless species of fish, reptiles, and birds including the threatened piping plover and endangered least tern. Cottonwood forests are also the preferred nesting, wintering, and roosting habitat for the bald eagle in this area. The installation and operation of the Missouri River main

stem dam system have reduced the occurrence and severity of overbank flooding, reducing existing stands and preventing the establishment of new stands of cottonwood forest. Woodlands outside the floodplain are generally of bur oak and ash with some mulberry and walnut.

In the proposed PBCA and NCCA, native prairie occurs in draws and hilltops where moisture is less available. In the United States, less than 1 percent of the once extensive prairie remains due to conversion for homes, industry, and agriculture. This loss has been accelerating in recent years as farming has become more lucrative.

Invasion of red cedar, a native species, has become problematic throughout the proposed conservation areas. Salt cedar, leafy spurge, purple loosestrife, and a host of other noxious weeds are also present.

The geology is generally of shallow marine origin. The oldest rocks that can be found in the proposed Conservation Areas are the Graneros shale and rocks at the Ponca State Park. The bluff-forming chalky limestone of the Niobrara Formation and the Pierre Shale Formation are also some of the oldest rocks found in the proposed conservation areas. These deposits are covered with deposits from streams, winds, and glaciers.

Water Resources

Surface Hydrology

Upstream of the proposed conservation areas, the Missouri River originates in the Rocky Mountains and carries stream flow from drainages in Canada, Montana, Wyoming, North Dakota, South Dakota, and Nebraska. These drainages provide a snowmelt-dominated flow regime to the Missouri River.

The large dams constructed on the Missouri River under the Pick-Sloan Plan, a component of the Flood Control Act of 1944, attempt to minimize flooding and provide other benefits such as power generation, support for downstream navigation, recreation, fish and wildlife, water supply, water quality, and irrigation. The 2011 record flow through the proposed conservation areas has produced dramatic changes to the river channel. The net positive or negative effects on the aquatic ecosystem and riparian communities, and the persistence of those effects, are not yet known.

A substantial number of impoundments occur in the Missouri River basin above Fort Randall Dam, including four USACE main stem dams, two Bureau of Reclamation main stem dams, and seven Pacific Power and Light main stem dams. There are at least

70 dams (and diversions) on larger tributaries to the Missouri River. Additionally, there are many dams on small tributary drainages that create ponds for live-stock watering and other uses.

Because of the presence of dams and reservoirs, the river's flow, sediment, temperature, and nutrient regimes are highly altered from their natural condition. Generally speaking, flow regulation of the Missouri River results in:

- reduced high flows;
- increased low flows;
- shorter low-flow periods;
- more short-term fluctuations in flow levels.

Despite highly regulated flows from the various dams on the Missouri River, flow variability that mimics natural conditions as much as possible can yield many ecological benefits, even if the flow variability is artificially created through dam releases.

In addition, "hydro-peaking" from Fort Randall Dam to increase electricity output during periods of high consumer demand can create daily discharge variation in excess of 35,000 cubic feet per second in the 39-mile river segment in the proposed NCCA.

Notwithstanding the effects of dams outside the proposed conservation area reaches, there are no impoundments, diversions, or straightened segments of the river channel within the proposed conservation areas to alter the free-flow condition of the river. Parts of these segments have been modified by bank stabilization (for example, riprap) and the presence of infrastructure and facilities (for example, bridges, power line crossings, boat ramps, irrigation intakes, and buried pipeline crossings). There are also wells in the Missouri River alluvial aquifer supplying water to Yankton, South Dakota, and the Lewis and Clark Rural Water System.

The river has seven principal aquatic habitats: the main channel, main channel border, sandbar, pool, chute, backwater, and marsh. Due to flow regulation, many of these habitats are threatened in the Missouri River. Furthermore, decreased channel meandering reduces the amount of woody debris that enters the system (Mestl and Hesse 1993) and can lead to improved habitat conditions for least terns, piping plovers and pallid sturgeon, along with many game species.

The Niobrara River within the proposed NCCA has a wide valley and spreads out in multiple meandering channels. It is naturally laden with silt, sand, and organic debris, thereby exhibiting relatively natural conditions. The highest flow recorded was 39,100 cubic feet per second in March of 1960. The

Nebraska Public Power District's Spencer Hydroelectric Dam at the border of the proposed NCCA currently has little effect on the flow of the Niobrara River as the reservoir has mostly silted in which requires periodic sluicing to maintain generating capacity. Water rights have been granted for surface withdrawals and wells for irrigation and other uses within the Niobrara basin. These water right appropriations may reduce flow in the Niobrara River, although the Wild and Scenic Rivers Act provides for Federal Reserve water rights in quantities necessary to accomplish the purposes stated in this act.

Floodplains

The Missouri River in both proposed conservation areas is affected by USACE main stem dams. The dams prevent the natural movement of sediment in the river, increasing erosion rates in some areas and accelerating deposition in others. The USACE regulates flows to prevent floods and to allow for navigation downstream. Historically, the Missouri River flows varied widely throughout the year, and low-lying areas 1 or more miles wide were covered with water for several weeks almost annually. The construction and operation of the main-stem dams has led to a deeper river channel and loss of the river's connection with its floodplain.

The Niobrara River braids across the floodplain much as it did before settlement of the area. Its banks are sandy and unstable and it meanders regularly. Owing to the undeveloped nature of the river and its floodplain, its water elevation changes little even during floods.

Sedimentation

In the proposed PBCA and NCCA, the dominant processes that determine the ecological conditions of a given reach are: erosion, transportation, and deposition of sediment; recruitment, storage, and transport of large wood; and the streams lateral and vertical interaction with the valley alluvium. Prior to the installation of the main stem dams, the river meandered widely in its floodplain, removing and depositing sediment regularly. The installation of the Missouri River main stem dam system has affected the river's ability to move sediment in two ways. First, the dams themselves physically prevent the movement of sediment downstream. Second, the operation of the dam system disrupts the erosion and deposition process by preventing high flows that would have flushed sediment and allowed the river to meander across the floodplain. These issues are particularly evident in the area near Niobrara, Nebraska. This area has changed dramatically since the installation of Fort Randall and Gavins Point



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Sandbars provide important nesting habitat for least terns and piping plovers.

Dams. The sediment-rich Niobrara River forms a large delta at its confluence with the Missouri River. The lack of high flows and the physical impediment of Gavins Point Dam have caused the delta to become massive and considerably raised the level of the river in this area. The river and its floodplain below Gavins Point Dam suffer from the opposite issue; because of the lack of sediment from upstream of the dam, the flow of water is constantly eroding the riverbed and riverbanks.

4.2 Biological Resources

Disturbance Factors Affecting Major Ecological Processes

Before Euro-American settlement, plants and animals within the project area adapted and evolved with the dynamic riverflows characteristic of a major river. Species like the pallid sturgeon have evolved in the distinctive environment provided by this large alluvial river system. The Missouri River was wide and meandered dramatically within the floodplain between the bluffs. Spring flooding due to snowmelt from the Great Plains and Rocky Mountains was the major ecological process that shaped river bottom plant and animal communities. These floods were the lifeblood of the project area. Early snowmelt in the lower elevations of the plains contributed to an early pulse of water into and down the river, as early as March continuing through April. This early pulse of water, depending on magnitude and duration, would

mobilize and redistribute sediment and large wood. These processes were both hydraulic and physical through the contribution of ice scour that would have stripped vegetation from the river's banks and sandbars. This initial early pulse would also stimulate the large river fish community to begin migrating, redistributing themselves throughout the river in preparation for spawning, reproduction, and utilization of the food base. This early pulse contributed to early forage base production and habitat-building events and provided nesting habitat for bird species such as the least tern and piping plover. It contributed to natural plant communities along the river; these included plains cottonwood, which would release its seed in the spring when the river was often at flood stage, so the water deposited the seeds at high river elevations. There they would germinate and grow with little competition on the flood-scoured sand and gravel of the receding floodwater. Many species of riparian plants and wildlife depend on cottonwoods for appropriate habitat. Snags provided in-channel structure, serving as depositional areas for sediments and providing diverse flowing water habitats and organic matter to the river system.

Today, the fluvial system is highly altered, both hydrologically and physically. The Flood Control Act of 1944 (also called the Pick-Sloan Plan) (Public Law 78-534), authorized a water development plan for the Missouri River basin that included the construction of five large dams on the main stem of the river. Authorized purposes of these dams were flood control, navigation, irrigation, hydropower generation, water supply, water quality, recreation, and fish and wildlife. The plan included a sixth dam that would operate with the other five dams as a system; this dam, the Fort Peck Dam, predates the Flood Control Act and was completed in 1940.

The ecological processes that are essential for fish and wildlife in the Missouri River have been significantly altered by construction of these six dams. The reservoirs and dams inundated 755 miles of river valley at flood control pool and 1.2 million acres when full (USACE 2000). The dams altered about 1,100 miles (totaling 3 million acres) of natural river habitat and flows; 51 of 67 native fish species are now rare, uncommon, or decreasing; reproduction of cottonwoods has largely ceased; and aquatic insects—a key link in the food chain—have been reduced by 70 percent (NRC 2002). The dams also prevent fish from migrating up the river.

Water management through the dam operations has changed the hydrology of the river by eliminating high flows and shifting the timing of flows from primarily spring and early summer to early fall and winter. The low flows that ordinarily occurred throughout the late summer, fall, and winter are largely nonexistent under many water-year types.

The timing, magnitude, and frequency of these altered flows, along with decreased floodplain connectivity, no longer provide the biological cues necessary for large river fish to respond to for successful reproduction. The altered flows also reduce slow, shallow water where fish can forage and escape predators. The suppression of flood events prevents floodplain inundation that provides forage and prey items for young, large river fishes at times when those benefits are most needed (at the larval and juvenile stages).

The dams have also considerably reduced the sediment in the lower river from about 229 million metric tons to 40 million metric tons (NRC 2002). Furthermore, bank stabilization along the river eliminates bank erosion and reduces sediment transport downstream. This lack of sediment, along with other hydrologic alterations, suppressed the ability of the river to create the high sandbars and shallow water areas that provide essential nursery and foraging areas for birds and fish. Because fewer sandbars are available for nesting terns and plovers, predation has become a major factor on tern and plover reproduction. When there are fewer sandbars, the birds tend to concentrate their nests, making it easier for predators to find the nests and feed on the young.

In contrast, the Niobrara River maintains relatively natural flows and is limited by a small-scale hydroelectric dam (Spencer Dam) at the western boundary of the NCCA. The Niobrara River therefore maintains high sediment loads, thus creating natural sandbars on which least terns and piping plovers nest. Shortly before the Niobrara River joins with the Missouri River, Verdigre Creek flows into the Niobrara River. Similar, Verdigre Creek is free-flowing and maintains relatively uninhibited flows. The confluence of the Niobrara River with the Missouri River presents a unique microcosm as where the sediment enriched Niobrara River meets the sediment lacking Missouri River.

Direct water withdrawals and returns to the river occur for agricultural, municipal, and industrial uses as well as for oil and natural gas production, which may take place on the floodplain or neighboring uplands. Oil and natural gas production includes withdrawals for use in hydraulic fracturing technologies for oil and gas wells. Return flows of treated wastewater from these activities are possible. Hydraulic fracturing is a key element in the development of natural “shale gas” fields, of which several are under development or forecast for development in the basin.

Pollutants entering the waterways within and upstream of breeding areas can negatively affect water quality and forage resources. Water and air pollutants in the watershed include upwind emissions from local, regional, and global sources. These pollut-

ants include compounds of nitrogen, sulfur, mercury, and pesticides that enter the atmosphere from burning fossil fuels, fertilizer use, livestock emissions, and airborne pollutant discharges (Hauer et al. 2003). Subsequent downwind deposition of these air pollutants can be captured in runoff. Bioaccumulation of pollutants could adversely affect maturation of eggs and embryos, the development of young, and the reproduction abilities of adult birds and fish as well as reptiles and amphibians. The main potential threat from oil and natural gas development would be from spills into the Missouri River from wells and pipelines. Active and abandoned mining and dredging operations contribute various pollutants to the Missouri River that can contribute to sediment toxicity and water pollution (Montana Department of Environmental Quality 2010, USACE 2010). Dredging the river channel can disturb contaminated sediments. Sand and gravel mining directly reduces the amount and availability of in-channel sands and gravels.

Domesticated livestock in the floodplain can affect native floodplain vegetation through improper intense grazing, as well as the trampling and compaction of floodplain soils (Kondolf et al. 1996). Also, non-native grazers and browsers commonly concentrate in floodplain areas because of a readily accessible drinking water source (Kondolf et al. 1996). When they have access to the reservoirs and river at low flows, cattle can trample tern and plover nests on sandy beaches and sandbars; however, this impact is estimated to be an uncommon occurrence.

The reservoirs experience thermal stratification in the summer with warmer water on the top (epilimnion) and colder water on the bottom (hypolimnion). This cold hypolimnion can be as much as 50 °F (10 °C) colder than the epilimnion. Hypolimnion is released from the dams and affects fish spawning and movements.

Snag removal in the main stem of the river has been undertaken since 1838 to facilitate increased boat traffic (Galat et al. 1996), with almost all the large woody debris in the main stem being removed by the early 1950s (Hesse 1996). Some snag removal still takes place. Mechanical removal of large logs, log jams, and wood debris piles simplifies aquatic habitat; reduces substrate surfaces for the attachment of algae and macroinvertebrates; and limits creation sandbars used by nesting least terns and piping plovers.

Introduced invasive species (discussed further below) are highly competitive and can colonize a wide variety of habitats, often displacing native vegetation and wildlife, causing alteration of the structure and composition of the existing plant and animal communities.

Fragmentation of the landscape through the permanent removal of floodplain vegetation to construct



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Invasive species like the Russian olive can displace native vegetation, altering the structure and composition of existing plant and animal communities.

roads, utility corridors, railroads, homes, and other structures had negative effects on biodiversity because of direct mortality, behavioral modification by animals, alterations of the physical and chemical environment, increased access by invasive species, and by interrupting the continuity of the floodplain corridor (Kondolf et al. 1996).

Uplands

Beyond the riparian forests and grasslands, bur oak becomes the dominant tree in protected valleys and hillsides (Weaver 1960). The undergrowth in these oak savannas and forests contained woody plants such as western snowberry, roughleaf dogwood, sumac, gooseberry, and poison ivy, along with prairie grasses and wildflowers (Weaver 1960). These oak savannas and forests likely burned less often than grasslands but more often than the floodplain forests. The thick bark of oak trees protected them from all but the hottest fires.

Beyond the oak trees lie the expansive Northern Great Plains. The eastern edge of the project area (Ponca Bluffs) is representative of tallgrass prairie, whereas the western side (Niobrara Confluence) is representative of northern mixed-grass prairie (Kuchler 1964). These prairies were maintained by low moisture and, more importantly, by frequent fires and grazing bison (Anderson 2006). The fires were generally started throughout the year by native peoples for hunting and communication purposes, although many were likely accidental as well (Higgins 1986). Natural fires, such as those started by lightning, generally occurred in summer and were less common (Higgins 1986). The fire return interval—that is, how frequently a given location was burned—is thought to have been 1–5 years in tallgrass prairie. Grazing by bison is thought to have

been intense but swift as large herds moved through a given location.

Tallgrass prairie is dominated by robust grasses such as big bluestem, switchgrass, Indian grass, Canada wildrye, and prairie cordgrass. These grasses can easily reach head height (6 feet) with adequate moisture. Mixed-grass prairie is dominated by knee-high (2-foot) grasses such as little bluestem, western wheatgrass, green needle grass, and porcupine grass; however, mixed-grass prairie gets its name because short grasses (such as blue grama and buffalograss) and tallgrasses can be locally dominant depending on grazing pressure and soil moisture.

While grasses dominate the prairie landscape, hundreds of wildflowers add incredible diversity and color to the prairie. Common among them are sunflowers such as annual, stiff, and maximilian sunflower; prairie and purple coneflower; blackeyed susan; compass plant; and Canada goldenrod, legumes such as purple prairie clover and breadroot scurf pea, and milkweeds such as swamp, showy, and plains milkweed.

River Bottoms (Floodplains), Riparian Area, Wetlands, and Shoreline

The pre-regulation Missouri River was a dynamic river, overflowing its banks and meandering through its floodplain. Side channels, backwaters, and floodplain lakes were formed as the channel shifted laterally across its floodplain. Each year this movement of the channel was influenced by two flood pulses, also known as spring rises. The first, often in April, represented local and regional snowmelt and rainfall, whereas the second, in June, represented the snowmelt from the Rocky Mountains. These flood pulses were the driving force behind river functions and processes such as floodplain maintenance and cottonwood forest formation.

The loss of the natural flow regime has drastically affected the floodplain, riparian areas, and wetlands within the analysis area. Although affected by reservoirs, flow regulation, and human alterations in some areas, the ever-changing Missouri River retains a diverse mosaic of channel habitats, including floodplains, side channels, backwaters, sandbars, pools, islands, and oxbow lakes.

The Missouri River also contains remnant wetlands, riparian cottonwood forests, bluff forests, and native prairies that provide habitat for many native species. Cottonwood forests, some of them over 100 years old, provide important nesting and migratory stopover habitats within the Great Plains for a diversity of rare woodland songbird species and nesting and wintering habitat for our national symbol, the bald eagle. These cottonwood forests tower over

grasses, forbs, and shrubs teeming with insects, small mammals, and other wildlife. Delta deposits near the confluence of the Missouri and Niobrara Rivers provide regionally important habitat for a wide variety of reptiles, amphibians, nesting and migrating waterfowl, and marshbirds.

The large presettlement riparian forests established on newly formed sandbars as the June floods receded. Cottonwoods typically set seed during the June flood; the floating seeds are deposited on barren sandbars with ample moisture to sustain the seedlings until they grew large root systems. If the cottonwoods survived future floods and ice scouring, they would eventually produce large forests with a dense undergrowth of willows, vines such as riverbank grape and green briar, and shrubs such as rough leaved dogwood and false indigo (Weaver 1960). As the forest matured, cottonwood seedlings could not reestablish in the shaded understory, so they would eventually be replaced by later successional tree species such as American elm, green ash, hackberry, box elder, and walnut (Weaver 1960). Intermixed with the riparian forests were large patches of prairie grasses, usually on higher ground (Weaver 1960). The grasses were generally coarse tallgrass species such as big bluestem, prairie cordgrass, and switch grass. Marshes and lake margins are often fringed by marsh grasses such as common reed and rice cutgrass, sedges, and rushes.

In 2011, of the 114 miles of total bankline within the 59-mile segment of the MNRR, 58 percent was unstabilized, 37 percent was stabilized, and 5 was not determined. Of the 83 miles of total bankline within the 39-mile segment, 71 percent was unstabilized, 23 percent was stabilized, and 6 percent was yet to be determined (Lisa Yager, MNRR biologist, personal communication).

Invasive Plant Species

In the uplands of the project area, invasive plants of concern include several species of noxious weeds, eastern red cedar, and exotic forage species. Noxious weeds are by definition introduced species that harm people, agriculture, or the environment; noxious weeds of the uplands include leafy spurge, several thistle species, and knapweeds, all of which are unpalatable to livestock and can be aggressive in natural and agricultural settings. Eastern red cedar, while native, also demonstrates aggressive growth which crowds out other native species. Historically this tree was kept at low population levels by fire, but the lack of fire has resulted in a population explosion in the last 100 years. Introduced forage species, such as smooth brome and sweet clover, were brought in by European settlers for pasture improvement, and these species' abilities to colonize unburned,

ungrazed land has reduced native species abundance throughout the area.

Several invasive plant species are found along the Missouri River. The worst invaders are the noxious weeds salt cedar, purple loosestrife and European common reed. They have invaded and colonized huge areas of riverbank, pushing out all other vegetation and reducing habitat conditions for the endangered least tern and threatened piping plover. The exotic Russian olive has become established in many riparian areas, displacing cottonwood seedlings. Within riparian forests, the lack of flooding has allowed the native eastern red cedar to invade to the near exclusion of deciduous species and displacing grasses and wildflowers.

Wildlife

Mammals

The proposed conservation areas support a wide variety of mammals. These include two deer—white-tailed and mule deer—as well as numerous furbearers and small predators like black-tailed jackrabbit, white-tailed jackrabbit, Virginia opossum, beaver, muskrat, coyote, red fox, gray fox, raccoon, least weasel, long-tailed weasel, mink, badger, striped skunk, mountain lion, and bobcat (Higgins et al. 2000). The project area supports a long list of small mammal species that thrive in a large variety of habitats. Bats include western small-footed myotis, northern myotis, little brown bat, silver-haired bat, big brown bat, eastern red bat, and hoary bat. Other species include eastern cottontail, woodchuck, Franklin's ground squirrel, Thirteen-lined ground squirrel, black-tailed prairie dog, Eastern fox squirrel, Northern pocket gopher, and plains pocket gopher, masked shrew, least shrew, northern short-tailed shrew, Hayden's shrew, and Pygmy shrew, northern grasshopper mouse, eastern mole, olive-backed pocket mouse, plains pocket mouse, hispid pocket mouse, Ord's kangaroo rat, Western harvest mouse, plains harvest mouse, white-footed mouse, deer mouse, meadow jumping mouse, meadow vole, prairie vole, and Southern bog lemming. A list of mammals that occur or may occur in the project area appears in appendix C.

Birds

The Missouri River serves as a major flyway for migratory birds. The unique habitats and bottomlands present in the proposed NCCA and PBCA serve as wintering, feeding, breeding, and staging

grounds for these migrating avian species; the project area also has many year-round resident avian species. In total, 154 species of land birds have been confirmed in the project area. A list of birds that occur or may occur in the project area appears in appendix C.

Fishes

Fish species diversity is a defining characteristic of the Missouri River. In this section of the Missouri River there are approximately 93 species of fish, 72 of which are native to the Missouri River (Berry and Young 2004). Native riverine species common in the Missouri River included paddlefish, sauger, channel and blue catfish, whitebass, shovelnose sturgeon, blue sucker, freshwater drum, shortnose and longnose gar, and gizzard shad.

Habitat diversity is a key driver of fish diversity in this unchannelized and unimpounded stretch of the Missouri River. Habitats found in this stretch include submerged sandbars, snags, chutes, and backwaters. The slack water found in backwaters contains key spawning and nursery habitats for many native non-river species such as largemouth bass, bluegill, and black and white crappie.

As discussed previously in this chapter, the Missouri River reservoir system has had a negative impact on native fish populations, native species diversity, and the economic importance of angling in the Missouri River (Berry et al. 2007). Fish adapted to the frequent flooding, high sediment load, and warm water of the Missouri River have been negatively affected by reduced migration range, flow dynamics, sediment load, and—in the case of Fort Randall Dam—cold water releases (averages 54 °C [12 °C]). The best known example is the pallid sturgeon, which the FWS listed as endangered in 1990. Pallid sturgeon typically prefer turbid, fast flowing water and sand substrate characteristic of the pre-dam Missouri River. It is also thought that the spring and June rises (floods) were cues for spawning. Along with pallid sturgeon, many native minnow species such as sicklefin chub, sturgeon chub, flathead chub, silver chub, and highfin carpsucker are declining for the same reasons.

This section of river is a popular destination for anglers to pursue game fish such as walleye, sauger, catfish, and paddlefish. In 2009, anglers from 18 different states spent approximately 372,382 hours fishing the Fort Randall reach, Lewis and Clark Lake, and the Gavins Point reach, accounting for a total of 117,750 fish harvested and \$8.14 million in local economic impact (Bouska and Longhenry 2009).

Many nonnative fish species have been introduced into the Missouri River system, mostly by accident but also intentionally. Some species have been par-

ticularly worrisome, such as Asian carp. Asian, silver, bighead, and grass carp were collectively introduced to North America in the 1970s for aquaculture purposes, but flooding on the Mississippi River allowed them to escape and invade the Mississippi, Ohio, and Illinois River basins (Kolar et al. 2007) and the Missouri River basin up to Gavins Point Dam. Asian carp affect the bottom of the food chain. Grass carp feed on aquatic vegetation and silver and bighead carp feed on plankton. All three carp species can reach high abundance, so there is a concern that they could lead to a collapse of the entire fishery. On the other hand, some intentional introductions, such as brown and rainbow trout, provide a unique fishery and likely cannot persist outside of the Fort Randall Dam tailwaters area.

Invertebrates and Macroinvertebrates

Freshwater invertebrates are a diverse group of organisms ranging from aquatic insects to unionid mollusks. Certain aquatic invertebrates can act as indicators of poor water quality, habitat loss, and decline in substrate quality.

Mussel beds are generally found “in areas with clean, stable substrate consisting of cobble, gravel, and sand, whereas they are not typically found in unstable substrate because they are unable to maintain their natural position and may be buried or displaced during fluvial events” (Ecological Specialists 2005). High silt content and fast, frequent changes in discharge also appear to negatively affect mussel habitat (Ecological Specialists 2005).

Macroinvertebrates, primarily the Aufwuchs community, are also extremely important in the food web, representing a major food source for the federally endangered pallid sturgeon and piping plover. Macroinvertebrates generally require off-channel



Woody debris contributes to a dynamic riverine ecosystem.

areas, such as backwaters and chutes, both of which have seen extensive declines since the 1960s (Mestl and Hesse 1993, Yager 2010). In addition, bank stabilization has decreased river meanders, reducing the amount of woody debris introduced into the river system (Mestl and Hesse 1993) and preventing the river from creating and maintaining new off-channel features, such as side channels and backwaters. Overall, off-channel areas have seen a great decline in area (approximately 618 acres from 1941 to 2008 in the 59-mile segment) (Yager 2010), and aquatic insect production has decreased along with area (Mestl and Hesse 1993).

An invasive Asian clam has been discovered in the 59-mile segment of the MNRR (Shearer et al. 2005). Grohs (2008) found 192 Asian clams in the Gavins Point reach and 18 Asian clams in the Fort Randall reach in 2005. Asian clams were found in the Gavins Point National Fish Hatchery paddlefish rearing ponds (Grohs et al. 2010), which could be problematic as the hatchery-reared paddlefish are released in Lake Francis Case (Sloss et al. 2009, as cited in Grohs et al. 2010). This could result in the hatchery reared paddlefish releasing glochidia (larval mussels) in the upper reaches of the Missouri River. However, Grohs et al. (2010) found no Asian clams in Lake Francis Case. Asian clams compete with native species for limited resources, biofoul water intake pipes, and may alter benthic substrates. Asian clams cause many economic problems by clogging pipes and tubes (Foster et al. 2011) and threaten the natural environment because they alter benthic substrates and compete with native mollusks for the limited habitat available in the 59-mile segment (Sickel 1986, as cited in Foster et al. 2011; Devick 1991, as cited in Foster et al. 2011).

The potential introduction of zebra mussels poses a significant risk to native mussels, as well as the entire ecosystem. To date, no zebra mussels have colonized the project area. Zebra mussel veligers (larvae) were independently confirmed in 2003; however, despite increased sampling efforts, neither veligers nor adults have been detected since (Lisa Yager, MNRR biologist, personal communication).

Amphibians and Reptiles

Several species of turtles, snakes, toads, and frogs all live in the project area. The eastern hognose snake and the false map turtle, both threatened species in South Dakota, are common throughout the area.

Threatened and Endangered Species and Species of Concern

Seven endangered animal species listed under the ESA are known to have occurred within the NCCA and PBCA: American burying beetle, whooping crane, pallid sturgeon, least tern, Topeka shiner, Higgins eye pearl mussel, and scaleshell mussel. The endangered Eskimo curlew may occur in the project areas occasionally but is not listed for the states of South Dakota or Nebraska. One federally listed threatened animal species (piping plover) and one listed threatened plant species (western prairie fringed orchid) occur within the project area.

One candidate species for Federal listing, the Sprague's pipit, occurs in the proposed project area. Candidate species are plants and animals for which the FWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

American Burying Beetle (Endangered)

The American burying beetle was federally listed as an endangered species under the ESA on July 13, 1989 (54 FR 29652).

The American burying beetle is known or believed to occur in Rhode Island, Massachusetts, Ohio, South Dakota, Nebraska, Missouri, Kansas, Arkansas, Oklahoma, Texas, and Canada. Specifically for the proposed project area, the American burying beetle is believed to occur in Boyd, Knox, and Holt Counties in Nebraska and in Gregory and Union Counties in South Dakota (Panella 2012, SDGFP 2013). Historical locations for the beetle in South Dakota include Haakon, Union, and Brookings Counties.

Scaleshell Mussel (Endangered)

The scaleshell mussel was federally listed as an endangered species under the ESA on October 9, 2001 (66 FR 51322).

Scaleshell mussels historically occurred across most of the eastern United States. The scaleshell mussel once occurred in 56 rivers in the Mississippi River drainage but has undergone a dramatic reduction in range in the last 50 years and is believed to be extirpated from 9 of the 13 states where it historically occurred. Of the 55 historical populations, 14 remain scattered within the Mississippi River basin in Arkansas, Missouri, and Oklahoma. While the species has been documented from 18 streams in the last

25 years, it can only be found consistently in three streams in Missouri, where it is still rare (FWS 2010a).

In a 1983 study of unionids of the Missouri River, Hoke (1983) reported finding a single fresh dead specimen about 0.6 mile east of Gavins Point Dam in Yankton County, South Dakota. There have been at least three surveys conducted within the project area since that time, and no evidence of scaleshell mussels was found (Clarke 1996, Ecological Specialists 2007, Shearer et al. 2005).

Higgins Eye Pearlmussel (Endangered)

On June 14, 1976 (41 FR 24064), the Higgins eye pearlymussel was federally listed under the ESA as an endangered species wherever it is found.

The Higgins eye pearlymussel is known to occur in Illinois, Iowa, Minnesota, Missouri, South Dakota, and Wisconsin. It is known to occur in South Dakota but is not listed in that state; it is listed in Nebraska, but does not occur in that state. A single valve from a freshly dead Higgins eye pearlymussel was found on October 27, 2004, in the 59-mile segment of the MNRR (Shearer et al. 2005). No Higgins eye were found during a 2006 freshwater mussel reconnaissance survey conducted by the USACE in the 59-mile segment (Ecological Specialists 2007).

Topeka Shiner (Endangered)

The Topeka shiner was federally listed as an endangered species under the ESA (FWS 1990) throughout its range on December 15, 1998 (63 FR 69008). Critical habitat for the Topeka shiner was designated on July 27, 2004 (69 FR 44736). This rule designated critical habitat in Iowa, Minnesota, and Nebraska. Habitat in Kansas, Missouri, and South Dakota was excluded from the designation.

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.

Pallid Sturgeon (Endangered)

The pallid sturgeon was federally listed as an endangered species throughout its range under the ESA on September 6, 1990 (55 FR 36641–36647). The closely related shovelnose sturgeon is listed as



Rob Holm / FWS

A pallid sturgeon lurks in the river's depth.

threatened under the similarity of appearance provisions of the ESA because it is difficult to differentiate between the two species. This ruling is intended to avoid accidental harvesting of pallid sturgeon (FWS 2010b).

The pallid sturgeon is a large-river fish that is native to the Missouri River. It can weigh up to 80 pounds and has rows of bony plates that stretch from head to tail. Proper water velocity, turbidity, and temperature, along with a sufficient food source, are essential in providing a diverse and productive habitat for pallid sturgeon. Potential pallid sturgeon prey species include sicklefin, sturgeon chub, flathead chub, silver chub, speckled chub, plains minnow, and western silvery minnow (Berry and Young 2004).

Pallid sturgeon prefer the bottoms of large, long, shallow and free-flowing rivers with swift and turbid water, coarse sand substrate with sand and gravel bars, and small invertebrates and native chubs for feeding (Aaron DeLonay, ecologist, USGS, pers. comm. with the NPS). Braided channels, inside bends, outside bends, and large connected secondary channels appear to be the most common macrohabitats for pallid sturgeon from fall through spring, while only braided channels and outside bends are the most common locations for pallid sturgeon in the summer months (Stukel et al. 2009).

Adult pallid sturgeon are thought to prefer water that is deep, relatively fast, and has turbulent flow (DeLonay et al. 2009). The presence of coarse sand substrate appears to be important for spawning (Peters and Parham 2008; Aaron DeLonay, ecologist, USGS, pers. comm.). Gravid pallid sturgeon females migrate upstream to spawn once every three to ten years (Keenlyne and Jenkins 1993; Mayden and Kuhadja 1997, as cited in Reuter et al. 2009, DeLonay et al. 2009). The distance fertile pallid sturgeon migrate can be anywhere from tens to thousands of kilome-

ters (DeLonay et al. 2009). However, the construction of six major dams on the Missouri River do not allow for upstream migration of fish (Aaron DeLonay, ecologist, USGS, pers. comm.). These dams limit upstream migrations of pallid sturgeon to find suitable habitat for spawning within the project area.

Typically, pallid sturgeon larvae drift for 7 to 13 days; these larvae can drift a total distance of 152–329 miles (245–530 kilometers) over that time (Braaten et al. 2008). It is important that the water is turbid, because larvae are fairly easy to see in the water, so drifting into clear water could result in a poor chance of survival (Shuman et al. 2010, Stukel et al. 2009).

Surveys indicate most pallid sturgeon originated from hatcheries; this implies that neither wild nor hatchery-reared fish are sufficiently reproducing on their own to maintain a viable population (Aaron DeLonay, ecologist, USGS, pers. comm.). However, in 2007, two female pallid sturgeon were documented spawning in the 59-mile segment of the MNRR (USGS 2007). In addition, spawning pallid sturgeon were documented in 2008, 2009, and 2010, with at least one pallid sturgeon spawning twice (Aaron DeLonay, ecologist, USGS, pers. comm.). In total, 10–12 female pallid sturgeon have been documented spawning in the 59-mile segment, with half of hatchery origin and half of wild origin (Aaron DeLonay, ecologist, USGS, pers. comm.). Accordingly, a possible explanation for the lack of spawning (until 2007) is that many hatchery-reared fish have not yet reached sexual maturity (Sam Stukel, Fisheries Biologist, SDGFP, pers. comm.).

The historical range of pallid sturgeon once included the Yellowstone, Missouri, and middle and lower Mississippi Rivers, as well as the lower reaches of their major tributaries. According to catch records, pallid sturgeon were considered to be somewhat common in the 1950s and 1960s (USDA 2011). Today, wild pallid sturgeon are rare in the Missouri River, primarily because of the construction of dams, channelization, and bank stabilization that have together damaged or destroyed much of that habitat (Weeks et al. 2005). Wild adults are only occasionally found in a few selected areas of the river.

The Niobrara Confluence segment is one of the recovery–priority areas for the species (Dryer and Sandoval 1993). The pallid sturgeon population in this segment is dependent on hatchery augmentation programs for recruitment. Shuman et al. (2010) found a total of 177 pallid sturgeon in the 39-mile segment of the MNRR, with 94 percent of hatchery origin. The Fort Randall reach currently has no confirmed wild pallid sturgeon (FWS 2005). However, Shuman et al. (2010) identified two potentially wild pallid sturgeon, though the origin of these individuals has not been genetically confirmed. The last time a wild pallid

sturgeon was identified in this reach was around 1991 (FWS 2007). Despite the concerns about no truly wild fish existing in this reach, Shuman et al. (2005) found that the hatchery-reared fish are surviving and individuals are growing in size. USGS ecologist Aaron DeLonay (pers. comm.) suggests that pallid sturgeon can survive in the Fort Randall segment, but that the segment is likely not conducive (and likely will not be conducive) to pallid sturgeon spawning for several reasons: the water in the Fort Randall segment is too cold and there are extensive power peaks from the hydroelectric Fort Randall Dam. However, the proximity of the riverbank to shale bluffs likely fosters the creation of large substrates for historical spawning habitat.

Least Tern (Endangered)

On May 28, 1985, the interior population of the least tern was determined by the FWS to be endangered (50 FR 21784–21792). The least tern measures 9 inches long with a 20-inch wingspread, making it the smallest member of the gull and tern family, Laridae. The sexes look alike, with a black-capped crown, white forehead, grayish back and dorsal wing surfaces, snowy white undersurfaces, legs of various orange and yellow colors depending on the sex, and a black-tipped bill whose color also varies depending on sex (Boyd and Thompson 1985, Watson 1966). Immature birds have darker plumage than adults, a dark bill, and dark eye stripes on their white foreheads.

Interior least terns spend about 4–5 months at their breeding sites from late April to early June (Faanes 1983, Hardy 1957, FWS 1987, Wilson 1984, Wycoff 1960, Youngworth 1930) to early September (Bent 1921, Hardy 1957, Stiles 1939). The nest is a shallow and inconspicuous depression in an open sandy area, gravelly patch, or exposed flat. Small stones, twigs, pieces of wood and debris usually lie



Least tern is one of the Federal trust species that depends on this vital ecosystem.

near the nest. The birds usually lay two or three eggs (Anderson 1983; Faanes 1983; Hardy 1957; Kirsch 1987, 1988, 1989; Smith 1985; Sweet 1985). Both sexes share incubation which generally lasts 20–25 days but has ranged from 17 to 28 days (Faanes 1983; G.R. Lingle, personal communication; Hardy 1957; Moser 1940; Schwalbach 1988).

The precocial behavior of interior least tern chicks is similar to that of other least terns. They hatch within 1 day of each other, are brooded for about 1 week, and usually remain within the nesting territory but wander further as they mature. Fledging occurs after 3 weeks, although parental attention continues until migration (Hardy 1957; Massey 1972, 1974; Tomkins 1959). Departure from colonies by both adults and fledglings varies but is usually complete by early September (Bent 1921, Hardy 1957, Stiles 1939).

The interior population of least tern is widely distributed in the Missouri River watershed and along the Mississippi River downstream from the Missouri confluence. Lott (2006) reported a grand total of 17,591 terns (in association with 489 different colonies) were counted in 2005 in a comprehensive, range-wide survey covering about 4,700 river miles, 22 reservoirs, 62 sand pits, 12 industrial sites, 2 rooftop colonies, and over 16,000 acres of salt flats.

The average number of adults least terns on the Missouri River over 26 years has been 645 adults. The adult numbers have varied from a record 26-year low of 273 in 2011 to a high of 1,010 in 2007. Most of the estimated 273 adult least terns on the Missouri River in 2011 were on a sandbar in the headwaters of Lewis and Clark Lake. This was probably due to the flood conditions that year.

The natural and free-flowing 25-mile segment of the Niobrara River within the project area produces a high sediment load, creating a delta at its confluence with the Missouri River in the 39-mile segment of the MNRR. This delta provides important primary sandbar nesting for the Missouri River population of least terns, supporting a 3-year average (2010–2012) of 13.7 percent of the adults in the Missouri River ecosystem. The natural and free-flowing 59-mile Ponca Bluffs segment of the Missouri River provides important primary sandbar nesting for the Missouri River population of least terns, supporting an average of 36.4 percent of the adults in the Missouri River ecosystem.

Whooping Crane (Endangered)

The whooping crane was listed as threatened with extinction in 1967 (32 FR 4001) and endangered in 1970 (35 FR 8491–8498); both listings were “grandfathered” into the ESA. At a height of 5 feet, the whooping crane is the tallest bird in North America

with a 7-foot wingspan. From a low of 15 birds in 1941, the current wild and captive whooping crane population is about 535. Whooping cranes pass through North Dakota and South Dakota in the company of sandhill cranes when migrating between their breeding territory in northern Canada and wintering grounds on the Gulf of Mexico between October 1 and December 1 in the fall and March 15 and May 16 in the spring. They are known to utilize shallow areas of rivers, lakes, and ponds along their migration route. The whooping crane has been documented in the project area as a stopover point during migration. Twenty percent of the 2012 spring whooping crane stopover sites were in Nebraska and South Dakota (USGS 2012a).

Eskimo Curlew (Endangered)

The Eskimo curlew was originally listed as endangered under the Endangered Species Preservation Act of 1966 on March 11, 1967 (32 FR 4001). The FWS is now conducting a 5-year status review of the Eskimo curlew (76 FR 36491). The Eskimo curlew had been one of the most abundant shorebirds until the late 1880s, and some fear that it may now be extinct. The endangered Eskimo curlew is a medium-sized shorebird in the Scolopacidae family and the smallest of the North American curlews. Their confirmed nesting grounds are on the treeless tundra in the Northwest Territories, Canada, and likely in northern Alaska and Siberia. They winter in the Pampas of Argentina, southern Brazil, Uruguay, and Chile. During migration, they are thought to move through midwestern United States feeding on grasshopper egg cases and emerging nymphs, other insects, and earthworms in undisturbed prairie and agricultural fields. The last confirmed sighting was in Nebraska in 1987. The Eskimo curlew had been known to occur in Yankton County, South Dakota, but is not listed for the states of South Dakota or Nebraska.

Piping Plover (Threatened)

The Great Lakes population of the piping plover was listed as endangered and threatened in the rest of its range on December 11, 1985 (50 FR 50726–50734). South Dakota and Nebraska are among the States in which piping plovers of threatened status are known or are believed to occur.

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 nearby tree cover. Lake Sakakawea and Lake Audubon are significant areas for piping plovers on the Missouri River system.

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 the interface of these lands with the water bodies. For alkali lakes and wetlands, critical habitat includes:

- shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mudflats, or gravelly salt flats;
- 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. (FWS 2002.)

According to the International Census, the northern Great Plains population of piping plover in the United States declined from 1991 to 1996, but has increased since then (2,959 individuals counted in 2006). Piping plovers are widely distributed in the Missouri River and in the Mississippi River downstream from the Missouri confluence; however, the Missouri River population appears to be declining. The 2009 estimates of the Missouri River population were 897 adults and 425 fledglings.

The 2011 piping plover population in the Missouri River was estimated to be 182 adult breeding birds. Most of the birds were on a sandbar located in the headwaters for the Lewis and Clark Lake due to flood conditions. In the past, piping plover adult numbers on the Missouri River have varied from a low of 82 in 1997 to a high of 1,764 in 2005. The average number over 26 years has been 729 adults. Piping plover adults on the Missouri River have decreased in each of the past 3 years. The 2011 adult census of 182 piping plovers represents the second lowest adult census for the species in 26 years of censuses on the Missouri River.

The Niobrara Confluence segment of the Missouri River provides important primary sandbar nesting and chick-rearing habitat for the Missouri River population of piping plovers, supporting an average of 3.2 percent of the adults in the Missouri River ecosystem. The Ponca Bluffs segment of the Missouri River provides important primary sandbar-nesting and chick-rearing habitat for the Missouri River population of piping plovers, supporting an average of 23.6 percent of the adults in the Missouri River ecosystem.

Western Prairie Fringed Orchid (Threatened)

The western prairie fringed orchid was determined by the FWS to be of threatened status on September 28, 1989 (54 FR 39857–39863). This perennial 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 native of the North American tallgrass prairie flower that is found most often on unplowed, calcareous native prairies and sedge meadows.

The western prairie fringed orchid is known or believed to occur in Holt County, Nebraska and nearby Pierce County, Nebraska (Scott Wessel, personal communication). Historically, the western prairie fringed orchid was found in the Big Sioux Valley in Minnehaha County in South Dakota. It is not known to grow in South Dakota, although potential habitat exists.

Sprague's Pipit (Candidate)

On September 15, 2010 (75 FR 56028), the FWS found that, after review of all available scientific and commercial information, listing the Sprague's pipit as endangered or threatened is warranted under the ESA. However, listing the Sprague's pipit is currently precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants; consequently, 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.

The Sprague's pipit is a small passerine endemic to the Prairie Pothole region of North America. It has a plain buff colored face with a large eye ring. The bill is relatively short, slender, and straight, with a blackish upper mandible. The lower mandible is pale with a blackish tip. The Sprague's pipit is a ground-nester that breeds and winters on open grasslands. It feeds mostly on insects and spiders and some seeds.

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.

Sprague's pipit is known to or is believed to occur in Nebraska and South Dakota. Sprague's pipit may occur in the project area during migration.

4.3 Special Management Areas

National Park Service—Missouri National Recreational River

The MNRR is operated under both the National Park Service Organic Act and the Wild and Scenic Rivers Act. The national river has management authority, regulatory authority, and land purchase and easement authorities associated with its establishment. The boundary of the national river lies within the proposed conservation areas' boundaries. Interest in lands within the national river boundary that might be purchased for the proposed conservation areas would be subject to Wild and Scenic River Act regulations. The establishment of the proposed conservation areas would result in the protection of the values Congress required the NPS to protect and would accordingly be compatible with the operation of the National Recreational River designation.

National Park Service—Lewis and Clark National Historic Trail

The Lewis and Clark National Historic Trail was established by Congress in an amendment to the National Trails System Act in 1978. The trail follows the route of the Lewis and Clark expedition from Wood River, Illinois, to the mouth of the Columbia River in Oregon and includes trail sites, trail segments, and motor routes. Portions of the trail that lie within the proposed conservation areas include a water-based trail along the Missouri River, historic sites Ionia Volcano and Old Baldy, and auto tour routes in Nebraska and South Dakota. The NPS administers the trail in cooperation with other Federal, State, and local agencies, private organizations, and private landowners. The purpose of the trail and its management is to identify, protect, and interpret the historic route, sites, landscapes, and resources associated with the Lewis and Clark expedition for public use and enjoyment. Management of this nationally significant historic trail is consistent with the purposes of the proposed conservation areas.

Nebraska State Parks

The Nebraska State Parks are managed according to park type. The proposed conservation areas contain both State parks and State recreation areas:

- State parks are public use areas of significant scenic, scientific, or historical values and of sufficient size to allow adequate development without infringing on the area's primary values.
- State recreation areas are areas that possess resource values primarily associated with active outdoor recreation pursuits, day-use activities, and camping. All of Nebraska's major water-oriented areas fall under this classification.

Niobrara State Park is situated at the confluence of the Niobrara and Missouri Rivers on Nebraska's northeastern border. It is managed for its natural resource values, scenic vistas, and high levels of visitor use. The management of the State park would not conflict with the purposes of the proposed conservation areas.

Lewis and Clark Recreation Area is located on Lewis and Clark Lake about 7 miles north of Crofton, Nebraska. The lake is about 16 miles long and 3 miles wide, with a maximum depth of 45 feet. This State recreation area includes five distinct units on the south side of the lake: Weigand-Burbach, Miller Creek, Bloomfield, South Shore and Deep Water. The recreation area is outside of the proposed conservation areas' boundaries but offers a high level of visitor use that should be considered during planning for the proposed conservation areas.

Ponca State Park is the eastern gateway to the 59-mile section of the MNRR, containing one of two unchannelized stretches of the Missouri River bordering Nebraska. The park is 2 miles from the town of Ponca. Ponca State Park encompasses nearly 2,400 acres of heavily forested rolling hills and Missouri River bottomland, including Ponca State Park's North Addition, which is next to the Elk Point Bend Wildlife Management Area. The scenic park offers visitors all the amenities of a modern State park while protecting and enhancing natural resource values. Management of Ponca State Park would support the principles of the proposed conservation areas.

South Dakota State Parks Division of Parks and Recreation

The South Dakota Division of Parks and Recreation provides diverse outdoor recreational opportunities and preserves the resources with which the division is entrusted. The agency strives for efficient, responsive, and environmentally sensitive management. The management of the South Dakota State parks within or next to the proposed conservation areas is consistent with the purposes of the proposed conservation areas.

Springfield Recreation Area is located on the north bank of the Missouri River near Springfield, South Dakota. The park is managed for both natural resource and recreational values.

Lewis and Clark State Recreational Area, Pierson Ranch, and Chief White Crane form a recreational complex on the north shore of Lewis and Clark Lake. The areas are managed primarily for recreational use within a natural setting. The recreation area is outside of the proposed conservation areas' boundaries but supports high levels of visitor use that should be considered during planning for the proposed conservation areas.

Adams Homestead and Nature Preserve contain 1,500 acres along the Missouri River, near North Sioux City, Iowa. The preserve is managed primarily for natural resource values and is also committed to environmental education.

U.S. Army Corps of Engineers—Fort Randall Dam and Lake Francis Case, Gavins Point Dam and Lewis and Clark Lake

The USACE manages Lake Francis Case and Lewis and Clark Lake for eight Congressionally authorized purposes: flood control, navigation, irrigation, fish and wildlife, hydropower, recreation, water supply, and water quality control. The installation of the main stem dams interrupts ecological processes along the Missouri River and its floodplain. The USACE has completed numerous studies and others are still in progress to restore or mediate processes that are inconsistent with the ESA. Current management of the Missouri River dams is not in direct conflict with the goals of the proposed conservation areas. Rather, the management of the dams and lakes requires that land be protected in order to protect and restore the river's ecological processes and species.

4.4 Visitor Services

A wide range of opportunities for learning and recreating exist within the proposed NCCA and PBCA. Recreation, access, and education build an appreciation for the importance of resource protection within the proposed conservation areas. All educational and recreational activities and facilities listed are compatible with the purposes of the NCCA and PBCA.

Existing Recreational and Educational Facilities in the Proposed Niobrara Confluence Conservation Area

Educational and recreational opportunities are readily available in or nearby the NCCA and support a variety of outdoor activities including modern camping (in campgrounds and cabins), boating, fishing, swimming, and trail rides. Many sites offer cultural interpretation of historic sites and educational talks and exhibits.

- Niobrara State Park offers visitors an opportunity to sample a wide range of outdoor experiences. Facilities include cabins, campsites, picnic sites, horseback trails, hiking trails, and are areas for fishing, boating, and swimming. The park also offers unique opportunities for solitude, artistic pursuits, and enjoying scenic vistas. Niobrara State Park does not offer boat access to the Missouri River. Educational opportunities include both wayside exhibits and formal interpretive programs focused on both cultural and natural history.
- Fort Randall Historic Site is listed on the NRHP. It commemorates the military presence in the area from 1856 to 1892 and preserves remaining structures including the remains of the chalkstone chapel. The site has numerous wayside exhibits that interpret the fort's role in the westward migration of that time period.
- Karl Mundt National Wildlife Refuge, located on the southwest side of the Missouri River, is managed by the FWS. The refuge is home to many nesting bald eagles, migratory birds, and other wildlife. The ref-

uge offers both exhibits and formal interpretive programs.

- Fort Randall Dam Visitor Center is managed by the USACE. Interpretive displays and programs at the site focus on the operation of the dam and powerhouse. A boat ramp is also nearby.
- Sunshine Bottom boat ramp is a concrete and stone ramp managed by the NGPC and offers year-round public access to the Missouri River.
- Verdel Landing boat ramp near the town of Verdel, Nebraska, is managed by the State of Nebraska and offers year-round public access to the Missouri River from a double concrete ramp. The site also has public restrooms.
- Niobrara boat ramp is a concrete public ramp managed by the State of Nebraska. It is generally unusable because of heavy sediments in the vicinity. It also has a picnic area.
- Running Water boat ramp is managed by the City of Running Water and offers a public concrete ramp.
- Bazile Creek Wildlife Management Area is a 4,500-acre site managed by the State of Nebraska. Fishing and hunting for deer and waterfowl are popular activities. This site also offers river access from a concrete ramp.
- Santee Sioux Recreation Park is located on the Santee Sioux Indian Reservation in Knox County, Nebraska. It has a boat ramp managed by USACE and provides access to the Missouri River. In addition, it provides some limited, primitive camping.

Besides the sites listed above, both Nebraska and South Dakota manage areas specifically for hunting that are within the proposed NCCA (table 5).

Existing Recreational and Educational Facilities in the Proposed Ponca Bluffs Conservation Area

Educational and recreational opportunities are readily available in or nearby the PBCA and support a variety of outdoor activities including modern camping (in campgrounds and cabins), boating, fishing, swimming, and trail rides. Many sites offer cultural interpretation of historic sites and educational talks and exhibits.

- Lewis and Clark State Recreation Area (Nebraska) includes five areas on the south side of the lake: Weigand–Burbach, Miller Creek, Bloomfield, South Shore, and Deep Water. The recreation area offers house-keeping cabins, campsites, scenic views of the lake and the bluffs, fishing, skating, snowmobiling, and cross country skiing. Interpretive waysides and formal educational programs focus on both cultural and natural resources.
- Lewis and Clark State Recreation Area (South Dakota) is a popular tourist attraction. The recreation area has a sand beach, marina, resort, cabins, campsites, bicycling routes, trails, a boat ramp, and fishing areas. Limited interpretation at the recreation area educates the public on natural resources, local history, and Yankton Sioux culture and history through both programs and wayside exhibits.

Table 5. Existing public hunting areas in the proposed Niobrara Confluence Conservation Area, Nebraska and South Dakota.

<i>Name</i>	<i>State</i>	<i>County</i>	<i>Acres</i>
Running Water Game Production Area	South Dakota	Bon Homme	1,441
Redbird Wildlife Management Area	Nebraska	Holt	433
O. John Emerson Wildlife Management Area	Nebraska	Holt	160
Bohemia Prairie Wildlife Management Area	Nebraska	Knox	680
Bazile Creek Wildlife Management Area	Nebraska	Knox	4,500

- Gavins Point Dam Visitor Center and Lewis and Clark Visitor Center are managed by the USACE. They provide interpretive exhibits, wayside exhibits, powerhouse tours, and formal interpretive programs focused on both natural and cultural history at the site. The USACE also manages two campgrounds near the dam, a concrete boat ramp on both sides of the river, fishing piers, fish cleaning stations, and a beach.
- Dakota Territorial Museum is located in Yankton, South Dakota, and has numerous historic exhibits. Occasionally formal educational programs are offered.
- Yankton, South Dakota, through the chamber of commerce, offers self-guided walking and driving tours of the historic capital of the Dakota Territories. The annual Riverboat Days festival draws visitors to the riverfront for food and entertainment. Riverside Park offers two double concrete boat ramps with ample parking.
- St. Helena County Park in Cedar County, Nebraska, offers a public boat ramp, picnic shelter, and restrooms.
- Myron Grove Wildlife Management Areas, managed by the State of South Dakota, has a public boat ramp and restroom.
- Brooky Bottom Landing is a Cedar County Park and has a double-wide concrete boat ramp, picnic area, and restroom.
- Clay County State Recreation Area in South Dakota offers a boat ramp, picnic shelter, fishing pier, fish cleaning station, and overlook.
- Clay County Park, which is next to the Clay County State Recreation Area, has a 3-mile paved nature trail, volleyball and horseshoe courts, horse trails, and a campground with showers and restrooms. The park occasionally offers interpretive programs.
- Spirit Mound in Clay County, South Dakota, is managed by the Spirit Mound Trust, which protects and manages the site for natural resource values. Wayside exhibits detail the Lewis and Clark's visit to the site and natural history. Formal programs are provided occasionally.
- Mulberry Bend Wildlife Management Area is a 6-acre site in Dixon County, Nebraska, with concrete boat ramp access to the Missouri River and a restroom facility.
- Mulberry Bend Scenic Overlook is managed by the NPS and provides accessible trails to sweeping views of the Missouri River and its floodplain.
- Bolton Game Production Area in Union County is managed by the State of South Dakota for boat ramp access to the Missouri River.
- Ponca State Park in Nebraska provides boat access to the Missouri River from a concrete ramp. It offers a wide range of visitor services and activities. The Missouri National Recreational River Resource and Education Center has high-quality exhibits to engage and inform visitors about the history and natural resources of the area. It also has a conference center. The park offers a variety of cabins and campgrounds, a swimming pool, 20 miles of hiking trails, and equestrian trails. The park is home to the annual Missouri River Expo, a weekend of outdoor activities that draws crowds from the tri-state area.

Besides the sites listed above, both Nebraska and South Dakota manage areas specifically for hunting that are within the vicinity of the proposed PBCA (table 6).

4.5 Human History and Cultural Resources

The legacy of human interaction with the landscape and natural resources is evident throughout the region in the form of structures, archeological sites, and changes in vegetation. The proposed conservation areas together have a long history of human use because of the abundant resources and travel routes provided by the two major riverways.

Prehistory

Evidence of prehistoric use abounds in the proposed conservation areas. However, full systematic

Table 6. Existing hunting areas in the proposed Ponca Bluffs Public Conservation Area, Nebraska and South Dakota.

<i>Name</i>	<i>State</i>	<i>County</i>	<i>Acres</i>
Chalkrock Wildlife Management Area	Nebraska	Cedar	130
Wiseman Wildlife Management Area	Nebraska	Cedar	380
Mulberry Bend Wildlife Management Area	Nebraska	Dixon	6
Buckskin Hills Wildlife Management Area	Nebraska	Dixon	340
Elk Point Bend Wildlife Management Area	Nebraska	Dixon	627
Bow Creek Recreation Area	Nebraska	Cedar	220
Myron Grove Game Production Area	South Dakota	Clay	62
Frost Wilderness Game Production Area	South Dakota	Clay	112
Donnelley Game Production Area	South Dakota	Clay	66
Cusick Game Production Area	South Dakota	Union	181
Bolton Game Production Area	South Dakota	Union	25
Rosenbaum Game Production Area	South Dakota	Union	10
Warren Wilderness Game Production Area	South Dakota	Union	160

surveys for archeological sites have not been completed. Many of the known sites have been fully or partially collected, and the artifacts reside in regional curation facilities or private collections. The known sites within the boundaries of the MNRR are well documented; information on neighboring sites is less complete, although it is reasonable to assume the entire analysis area contains archeological sites.

Paleo-Indian

Paleo-Indians were hunter-gatherers who were present on the North American continent between 11,500 and 7,000 years before present (B.P.). These people hunted large game along the margins of ice sheets that blanketed North America. The paleo-Indian period is generally divided into three cultural complexes—Clovis, Folsom, and Plano—and each had distinct differences in the tools or “points” they produced. At least one paleo-Indian site has been documented in the proposed NCCA and includes what may be a short-term campsite where hunters killed and processed game animals. At least three sites are also known from the proposed PBCA.

Archaic

The Archaic Period dates from 8,000 to 1,500 B.P. It is differentiated from the paleo-Indian period by an increase in the variety of plants and animals used by people as big game went extinct; it is also the time during which people began manipulating the environment more extensively. Several Archaic sites are known from or near the PBCA analysis area and

include a quarry, burial sites, animal bone, and projectile points. The NCCA contains four documented Archaic sites. Both proposed conservation areas have a high potential for additional sites.

Plains Woodland

The Plains Woodland period (2,000–800 B.P.) is well represented within the study area with over 60 documented sites. Plains Woodland people are differentiated from earlier people by their increased use of technology including the manufacture and use of ceramic vessels, domestication of plants, and the development of the bow and arrow. The period is also marked by the development of semipermanent villages and the exploitation of local resources. Social advances during the Plains Woodland period include the development of mortuary rituals and formal burials along with the use of symbolic items that may suggest ritualistic or religious behavior. The potential for additional sites is high within the proposed conservation areas.

Great Oasis

Great Oasis (1150–850 B.P.) is considered a distinct cultural group that evolved during the Plains Woodland period. The Great Oasis people traded extensively with other groups from the east for shells and perhaps corn. Great Oasis sites contain distinctive pottery, campsites, village sites, burials, and evidence of small scale cultivation of foods.

Plains Villager and Coalescent Tradition

The Coalescent Tradition occurred from 900 to 1500 and reflects cultures with a less nomadic lifestyle, as suggested by semipermanent and permanent dwellings, greater population sizes, and improvements in small scale farming. The Missouri River bounds two distinct Plains Villager subareas, the Central Plains tradition and the Northern Plains tradition. The Central Plains tradition (Nebraska) is broken into six distinct cultural units including the St. Helena phase, which occupied major watersheds in the Great Plains and is well represented within the proposed PBCA. Known sites contain evidence of earthlodges, gardening tools made from animal bones, and advanced pottery. A reliance on farming seemingly led to a more sedentary lifestyle, which in turn led to technological and social advances. Both conservation areas contain numerous sites from this time period; many are on the national register.

Protohistoric

The Protohistoric period began around 1500. Distinct tribes had developed by this time, and their presence in the area is documented in the writings of early explorers. Many tribes are known to have used the land in both the proposed NCCA and PBCA; these tribes include the Omaha, Ponca, Santee Dakota, Pawnee, Arikara, Ioway, and the Brule and Oglala Lakota.

The Omaha and Ponca are closely related and are believed to have been part of the same tribe at one time. The Omaha are known to have participated heavily in the fur trade. They settled in the proposed PBCA in the 17th century and relocated south in the late 1700s. The Ponca homelands are located in the NCCA near the confluence of the Missouri and Niobrara Rivers and the Ponca Fort Village is a well-known and well preserved site. The Ponca lost their land to the government and the Lakota Sioux through treaty. They were forced to relocate to the Oklahoma Indian territory in 1877, and many of them perished on the long journey. One of the dead was the son of Chief Standing Bear who, along with 65 other tribal members, returned to his homeland to bury his son. He was arrested and—in a landmark case that confirmed that American Indians are people and citizens of the United States—released. Standing Bear was then able to live wherever he chose. He, along with a few others from his tribe, returned to the Niobrara River confluence. The Ponca Tribe of Nebraska now owns roughly 700 acres of their former homeland that is within the proposed NCCA.

The Pawnee and Arikara may have been part of the Coalescent Tradition of the Dakotas and could have an association with the St. Helena Phase. How-

ever, there is no archeological evidence to suggest they used the area in historic times other than for bison hunts. There is also evidence of a short Ioway presence between 1700 and 1730 within the proposed conservation areas. The Santee Dakota arrived by forced relocation following the Minnesota Sioux uprising of 1862 to the area that is now the Santee Reservation in Knox County, Nebraska.

The Yankton Sioux moved west to the area near present-day Greenwood, South Dakota, in the late 1700s. The Yankton Sioux reservation was established by the 1858 Fort Laramie Treaty in this same area.

Historic Period

Euro-American exploration of the middle Missouri River began in the early 1700s when the Mallet brothers explored the river in search of trade routes. Spanish traders followed, and by 1739 both traders and explorers had built encampments at the mouth of the Niobrara River. The entire area was part of the Louisiana Purchase, which prompted the Lewis and Clark expedition in 1804. Numerous Lewis and Clark sites are commemorated within the proposed conservation areas as part of the Lewis and Clark National Historic Trail.

A series of military expeditions to seek transportation routes followed in the mid-1800s. A series of military forts was also erected across South Dakota and Nebraska including Fort Randall, the main U.S. outpost on the Missouri River. The fort was continuously occupied for 36 years, and its remains have been preserved by the USACE and the NPS.

During this time, Euro-American presence increased as settlers and gold seekers came to the region. Government policies regarding American Indians including treaties, assimilation, and removal to reservations, effectively allowed for settlement of the area by Euro-Americans.

Numerous historic sites, both regionally and nationally recognized, are found within the proposed conservation areas. The sites include archeological sites, Lewis and Clark sites, bridges, structures, and landscapes.

Ethnographic Resources

Archeological and historical evidence confirms that the areas in and around the proposed PBCA and NCCA were places of spiritualistic and ritualistic use for indigenous people and those who settled the area. Given this long history, the proposed conservation

areas may contain ethnographic resources. An ethnographic resource is any landscape, object, plant, animal, site, or structure important to a people's sense of purpose. They are resources that are integral to a people's identity or way of life, are essential to their continued existence, or which at some point in time made them occupationally distinct. This association must have lasted for at least two generations, or 40 years, and the resource is generally regarded differently by the identifying group than it is by the general public. It is highly likely that both American Indians and the descendants of Euro-American settlers identify with the resources of the proposed conservation areas. An NPS study of ethnographic resources from an American Indian perspective is underway.

Traditional Cultural Properties

A traditional cultural property is a property that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community (NPS 1998). The entire Missouri River and the property along its banks have a long history of use by American Indians that continues through the present. The lands in the proposed conservation areas have not been assessed nor evaluated for eligibility for inclusion on the National Register as traditional cultural properties.

Sacred Sites

A sacred site, as defined in Executive Order 13007, is a "specific, discrete, narrowly delineated location... identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to or ceremonial use by, an Indian religion." To date, no tribe or authoritative individual has alerted the Secretary of the Interior or the Secretary's representative of any sacred sites within the proposed conservation areas. Continued government-to-government consultation will take place throughout the planning process to ensure no unknown sacred sites are compromised by the establishment of the proposed conservation areas.

4.6 Paleontological Resources

In 2011, the NPS produced a literature review and summary of paleontological resources in the region. The resulting report (Tweet 2011) details the high potential for undiscovered fossil resources within the study area—this conclusion is supported by site-specific field research. Both study areas contain numerous documented sites rich with fossils from the Cretaceous (145.5 to 65.5 million years ago) and the Cenozoic (65.5 million years ago to present) time periods. The Greenhorn limestone and Niobrara formation are more or less completely comprised of fossil materials (Maher et al. 2003, Watkins and Diefendal 1997). The most common visible fossils in the other rock formations are mollusks, fish, and large marine reptiles dominated by mosasaurs (related to monitor lizards) (Voorhies and Corner 1993), sharks, and bony fish (Witzke 1981).

4.7 Socioeconomic Environment

Population, Ethnicity, and Education

Table 7 lists population statistics for the 12-county area surrounding the NCCA and PBCA. These counties have a combined population of about 2.6 million people (U.S. Census Bureau 2012). While both the States of Nebraska and South Dakota have experienced an increase in the number of residents since 2000, eight counties in the 12-county area (5 in Nebraska and 3 in South Dakota) have experienced a decline in growth (U.S. Census Bureau 2010). In Nebraska, four of the five counties showing a population decrease have experienced declining populations since 1930, with only Holt County showing some fluctuation in population growth during the late 20th century (Nebraska Department of Economic Development 2010a, 2010b). Dakota County is the only Nebraska county in the 12-county area that has experienced population growth, and this may be because of its location near Sioux City, Iowa. Three of the South Dakota counties have experienced a steady decline in population since 1920 (Brooks et al. 2008). In both South Dakota and Nebraska, the overall decline in county populations may reflect low birth-rates in the counties as well as a migration of residents from rural counties to more urban areas.

Table 7. Population statistics for the 12-county area near the Niobrara Confluence and Ponca Bluffs Conservation Areas, Nebraska and South Dakota.

	<i>Residents (2010)</i>	<i>Persons per square mile</i>	<i>Percentage population change since 2000</i>	<i>Percentage of population with bachelor's degree or higher</i>
Nebraska	1,826,341	23.8	7	28
Boyd County	2,099	3.9	-14	13
Cedar County	8,852	12.0	-8	15
Dakota County	21,006	79.5	4	11
Dixon County	6,000	12.6	-5	13
Holt County	10,435	4.3	-10	16
Knox County	8,701	7.9	-7	18
South Dakota	814,180	10.7	8	25
Bon Homme County	7,070	12.5	-3	15
Charles Mix County	9,129	8.3	-2	16
Clay County	13,864	33.6	2	40
Gregory County	4,271	4.2	-11	15
Union County	14,399	31.3	14	29
Yankton County	22,438	43.1	4	27

Source: U.S. Census Bureau 2010.

While the overall populations of both Nebraska and South Dakota are expected to grow, population decline is expected to continue in 8 of the 12 counties. The only counties that are expected to see an increase in population by the year 2020 are Dakota and Dixon Counties in Nebraska and Clay and Yankton Counties in South Dakota. The increase in population in these four counties may be because of their locations near Sioux City, Iowa, and the Interstate 29 corridor as well as Vermillion, South Dakota, home of the University of South Dakota. In both South Dakota and Nebraska, much of the population growth is expected to occur near Interstate 29 (Brooks et al. 2008, Nebraska Department of Economic Development 2010c).

Relative to the other counties in the 12-county area, Dakota County, Nebraska, has the largest percentage of individuals who identified themselves as Hispanic or Latino on the 2010 Census (36 percent of the population) (U.S. Census Bureau 2012). Dakota County also has the lowest percentage of individuals who identified themselves as white (55 percent of the total population). Charles Mix County, South Dakota, had the highest percentage of individuals who identified themselves as America Indian and Alaska Native (32 percent of the population). Cedar County, Nebraska, has the highest percentage of individuals who identified themselves as white (98 percent of the population) (U.S. Census Bureau 2012).

As shown in table 7, within the proposed area and compared to South Dakota, Nebraska has a higher

percentage of individuals who earned at least a bachelor's degree (28 percent of the population) (U.S. Census Bureau 2012). Among the counties in Nebraska, Knox County has the highest percentage of the population to have earned at least a bachelor's degree (18 percent), while Dakota County has the lowest percentage (11 percent of the total population). Among the counties in South Dakota, Clay County has the highest percentage of individuals who have earned at least a bachelor's degree (40 percent of the population), while Bon Homme and Gregory Counties have the lowest percentage (each with 15 percent of the population).

Regional Employment and Income

Table 8 shows median household income and poverty rates for both Nebraska and South Dakota. Nebraska had a higher median household income in 2010 than South Dakota (\$49,342 and \$46,369, respectively) (U.S. Census Bureau 2010). Both South Dakota and Nebraska have poverty rates above 10 percent, with South Dakota having 13.7 percent of individuals below the poverty line and Nebraska having 11.8 percent of individuals below the poverty line. Within the 12-county area, Charles Mix and Clay Counties, South Dakota, both had poverty rates of 24 percent, the highest in the 12-county area, while Union County, South Dakota, had the lowest poverty

Table 8. Income, unemployment, and poverty rates for the 12-county area near the proposed Niobrara Confluence and Ponca Bluffs Conservation Areas, Nebraska and South Dakota.

	<i>Median household income (2010)¹</i>	<i>Percentage unemployed 2011^{2,3}</i>	<i>Percentage unemployed 2008^{2,4}</i>	<i>Percentage of individuals below poverty (2010)¹</i>
Nebraska	\$49,342	4.4	3.3	11.8
Boyd County	\$34,906	3.6	3.1	8.3
Cedar County	\$40,497	3.1	2.5	10.6
Dakota County	\$43,729	6.3	4.1	15.5
Dixon County	\$42,388	4.8	3.1	10.3
Holt County	\$43,452	3.1	2.7	7.8
Knox County	\$36,798	3.7	3.1	13.7
South Dakota	\$46,369	4.7	3.0	13.7
Bon Homme County	\$41,107	5.7	3.4	12.4
Charles Mix County	\$35,808	4.8	3.5	24.0
Clay County	\$37,198	4.0	2.7	24.0
Gregory County	\$33,940	4.2	3.4	16.0
Union County	\$59,889	4.8	3.4	4.9
Yankton County	\$47,124	4.6	2.7	11.2

Sources: ¹ U.S. Census Bureau 2010, ² Norton 2012, ³ Ingraham and Foster 2008, ⁴ Mestl et al. 2000.

rate within the 12-county area (4.9 percent). Three counties in South Dakota had poverty rates that fell below the state average and four counties in Nebraska had rates that fell below the state average (U.S. Census Bureau 2010)

Table 9 shows employment by sector within the 12-county area. The combined 12-county area had a total employment of 85,581 individuals in 2010 (Bureau of Economic Analysis 2012). Farm employment accounted for nearly 10 percent of the workforce. The highest percentage of total employment was found in the public administration sector (16.1 percent of nonfarm employment). This sector includes both local and nonlocal government agencies. The second and third highest percentage of total employment was in manufacturing (11.7 percent) and retail trade (9.6 percent). Forestry, fishing, mining, and related activities accounted for less than 1 percent of the total employment by sector.

Agricultural Sector

The States of South Dakota and Nebraska are highly productive regions in the United States for both crops and livestock. In 2007, farmland accounted for at least 90 percent of the total land in Nebraska and South Dakota (92.5 percent and 90 percent, respectively) (United States Department of Agriculture 2007). In 2007, Nebraska and South

Dakota had an output of nearly \$27 billion and \$11 billion in the agriculture sector, respectively. The top five commodities produced by each state in 2007 were cattle and calves, corn, soybeans, hogs, and wheat.

According to the 2007 Census of Agriculture, the 12-county area was home to nearly 7,500 farms, with over 3.3 million acres in agricultural production. Holt County, Nebraska, led the 12-county area in the greatest number of farms and acreage under production (1,171 farms and 667,581 acres), while Boyd County, Nebraska, had the fewest farms and land in production (259 farms and 90,271 acres) (Economic Research Service 2012).

Tourism and Recreation

Angling, hunting, and wildlife-viewing are popular recreational activities across Nebraska and South Dakota and within the 12-county area. According to the 2011 “National Survey of Fishing, Hunting, and Wildlife-Associated Recreation,” approximately 1.2 million participants engaged in wildlife-associated recreation activities in Nebraska and South Dakota in 2011 (FWS 2012b). These resident and nonresident participants spent over \$2.5 billion on wildlife-associated recreation activities in the two States combined. Approximately 73 percent of expenditures were related to hunting and fishing activities while the remaining 27 percent were related to wildlife-watch-

Table 9. Percentage employment by sector for the 12-county area near the proposed Niobrara Confluence and Ponca Bluffs Conservation Areas, South Dakota and Nebraska.

<i>Employment sectors</i>	<i>Percentage of 12-county area employed</i>
Farm employment	9.2
Nonfarm employment ¹	90.8
Forestry, fishing, mining and related activities	0.5
Construction	4.9
Manufacturing	11.7
Wholesale trade	3.1
Retail trade	9.6
Transportation and warehousing, utilities	2.4
Information	0.9
Finance and insurance, real estate and real estate leasing	7.1
Professional, scientific, management, administrative, and waste-management services	6.2
Educational services, healthcare, social assistance	5.4
Arts, entertainment, and recreation; accommodation and food services	6.3
Accommodation and food services	5.0
Other services, except public administration	5.4
Public administration	16.1

Source: Bureau of Economic Analysis 2012.

¹ Not every sector category for every county was fully disclosed because of confidentiality requirements; the table reflects the best and most correct information available.

ing activities (FWS 2012b). The 12-county area provides many wildlife-related recreational and educational opportunities for many residents of South Dakota and Nebraska and attracts visitors from across the United States and from other countries. Recreational opportunities are widely varied and include hunting, fishing, wildlife viewing, boating, camping, paddling, photography, and snagging.

Recreation Areas in the Analysis Area

The NPS-managed MNRR, which receives over 167,000 recreation visits annually, lies within the boundaries of both proposed conservation areas. Ponca State Park (Nebraska) is within the proposed PBCA boundary at the eastern gateway to the 59-mile section of the MNRR boundary. In 2010, Ponca State Park was fourth in terms of most visited attractions in Nebraska with approximately 747,000 visits. Other recreational lands within the proposed PBCA include the Clay County State Recreation Area (South Dakota), Adams Homestead and Nature Preserve (South Dakota), Spirit Mound (managed by the Spirit Mound Trust in South Dakota), Dakota Territorial Museum (Yankton, South Dakota), as well as several wildlife management areas managed by the NGPC.

Niobrara State Park is located within the proposed NCCA at the confluence of the Niobrara and

Missouri Rivers. In 2010, Niobrara State Park received a total of 157,000 visits. Other recreational lands within the proposed NCCA include several wildlife management areas managed by the NGPC, Running Water Game Production Area managed by the South Dakota Division of Parks and Recreation, and several boat ramps operated by the State of Nebraska and one operated by the City of Running Water, South Dakota, that provide access to the Missouri River.

Recreation Areas outside the Analysis Area

The USACE manages Lake Francis Case and Lewis and Clark Lake. These lakes along with associated recreational areas, including Lewis and Clark State Recreation Area (Nebraska), Lewis and Clark State Recreation Area (South Dakota), Gavins Point Dam Visitor Center and Lewis and Clark Visitor Center (the USACE), and Springfield Recreation Area (South Dakota Division of Parks and Recreation), annually attract a large number of visitors to the area. While considered outside of the boundaries of the proposed conservation areas, management activities at these areas can influence recreation within the proposed conservation areas.

