APPENDIX E-2

PRELIMINARY DRAFT BIOLOGICAL ASSESSMENT

Loup River Hydroelectric Project
FERC Project No. 1256

Preliminary Draft Biological Assessment

Loup Power District
Hydro Project

November 18, 2011

Serving You Electrically
LOUP POWER DISTRICT

Loup Power District
Hydro Project

Loup River Hydroelectric Project
FERC Project No. 1256

Preliminary Draft Biological Assessment

November 18, 2011

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ACRONYMS, ABBREVIATIONS, AND SHORT FORMS

AHZ	Active Habitat Zone
AMP	Adaptive Management Plan
BA	Biological Assessment
C	Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter(s)
CNPPID	Central Nebraska Public Power and Irrigation District
District	Loup River Public Power District (also Loup Power District)
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FR	Federal Register
Loup Power District	Loup River Public Power District (also the District)
MOU	Memorandum of Understanding
MSL	mean sea level
MW	megawatt(s)
NDEQ	Nebraska Department of Environmental Quality
NGPC	Nebraska Game and Parks Commission
NGP&PC	Northern Great Plains and Prairie Canada

NNHP	Nebraska Natural Heritage Program
NOAA	National Oceanic and Atmospheric Administration
NPPD	Nebraska Public Power District
NRC	National Research Council
NTU	nephelmometric turbidity units
OHV	Off-Highway Vehicle
PAD	Pre-Application Document
PCB	polychlorinated biphenyl
PPA	power purchase agreement
Project	Loup River Hydroelectric Project
RAFTMP	Region VII Ambient Fish Tissue Monitoring Program
RENEW	Recovery of Nationally Endangered Wildlife
RM	River Mile
RPMAs	recovery priority management areas
SMA	Sand Management Area
TPCP	Tern and Plover Conservation Partnership
UNL	University of Nebraska-Lincoln
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

PRELIMINARY DRAFT BIOLOGICAL ASSESSMENT

1. INTRODUCTION

The purpose of this Biological Assessment (BA) is to evaluate the potential effects of relicensing the Loup River Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 1256) on species listed as endangered or threatened under the Endangered Species Act (ESA) (16 United States Code [USC] 1531 et seq.). The Loup River Hydroelectric Project (Project) licensee, the Loup River Public Power District (Loup Power District or the District), is applying to FERC for a new license to continue to operate the existing 53.4-megawatt (MW) Project, located in Nance and Platte counties, Nebraska, as shown in Figure 1. Section 7 of the ESA requires a Federal agency to ensure that any action "authorized, funded, or carried out" by the agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat of such species" (16 USC 1536(a)(2)). The purposes of the ESA are "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" and "to provide a program for the conservation of such endangered species and threatened species" (16 USC 1531(b)). FERC's issuance of a new license for the Project requires Section 7 consultation with the agency responsible for Federally listed species in the vicinity of the Project.

The U.S. Fish and Wildlife Service (USFWS) is the agency charged with responsibility for the Federally listed wildlife, fish, and plant species designated as threatened, endangered, and candidate that could potentially be affected by the relicensing and, therefore, continued operation of the Project.

This BA documents the consultation conducted by the District with USFWS and other stakeholders (provided in Attachment A), and evaluates the effects of relicensing and continued operation of the Project, as described in the Draft License Application, on Federally listed species. The District intends this BA to satisfy ESA Section 7 consultation requirements between FERC and USFWS.

Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Location_and_Features_Figure_1.mxd

R-4-W
R-3-W
R-2-W
R-1-W
R-1-E
R-2-E
T-18-N
T-17-N
T-16-N

Looking Glass Creek
Dry Cherry Creek Siphon
Monroe Powerhouse
Shell Creek
Lost Creek Ditch
Lower Power Canal
Lake Babcock
Lake North
Intake Canal
Dry Cherry Creek
Upper Power Canal
Beaver Creek
916 Siphon
Oconee Siphon
Sawtooth Weir
Columbus Powerhouse
Monroe
Railroad Siphon
Looking Glass Creek Siphon
Beaver Creek Siphon
Genoa
Loup River
Columbus
Tailrace Canal
Lost Creek Siphon
Settling Basin
Lost Creek
Platte River
Skimming Weir
Platte County
Nance County
Merrick County
Polk County
Butler County
Outlet Weir
Diversion Weir

Project Location

Nance & Platte Counties, Nebraska

2 1 0 2
Miles

Aerial Imagery: 2010 National Agricultural Inventory Project, Nance and Platte Counties Mosaic.
Coporate Limits: 2010 Census Tiger Files
Waterway: 2011 National Hydrography Dataset (NHD)
Stream Areas/Lakes: 2000 Tiger Line Files, Platte and Nance Counties.

Legend

- Loup Power Canal
- Waterway
- Corporate Limits
- Township/Range
- County Line

Loup Power District Hydro Project

Project Location and Features

Loup River Hydroelectric Project
FERC Project No. 1256
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FIGURE
1

2. FEDERAL ACTION AND ACTION AREA

The Federal action to which this BA pertains is the issuance by FERC of a new license for continued operation of the Loup River Hydroelectric Project. The existing license for the Project will expire on April 15, 2014. The District began the relicensing process on October 16, 2008, when it filed its Pre-Application Document (PAD). Also on October 16, 2008, the District filed its request to be designated as FERC's non-Federal representative for purposes of ESA Section 7 consultation related to Project relicensing. FERC responded in the affirmative on December 16, 2008, and simultaneously initiated informal consultation with USFWS for relicensing.

The District's Application for New License is required to be filed no later than April 16, 2012.

The Action Area for purposes of ESA Section 7 consultation is shown in Figure 2 and includes the following:

- Area within and immediately surrounding the Project Boundary – The Project Boundary includes all lands owned by the District in conjunction with the Project and associated features, which are described in Section 3 and shown in Figure 1.
- Loup River bypass reach – The Loup River bypass reach is the portion of the Loup River from the Diversion Weir to the confluence with the Platte River.
- Platte River bypass reach – The Platte River bypass reach is the portion of the Platte River from the Loup River confluence to the Tailrace Return.
- Lower Platte River – For purposes of Project relicensing, the lower Platte River is defined as the reach between the confluence of the Loup and Platte rivers and the confluence of the Platte and Missouri rivers.

Within the Action Area, there could be direct or indirect effects on Federally listed species from continued Project operation under a new license in the following areas:

- North and South Sand Management Areas (SMAs), located adjacent to the Settling Basin
- Loup Power Canal, including Lake Babcock and Lake North
- Loup River bypass reach
- Lower Platte River

Path: Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_AssessmentAction_Area_Figure_2.mxd

06792500
Loup River Power Canal
Near Genoa, NE

06794000
Beaver Creek
At Genoa, NE

Loup Power
Canal

Lake Babcock and
Lake North

00082100
Tailrace Canal
Columbus, NE

North and South
Sand Management Area

06793000
Loup River
Near Genoa, NE

Loup River
Bypass Reach

06774000
Platte River
Near Duncan, NE

06794500
Loup River
At Columbus, NE

Platte River
Bypass Reach

Lower Platte
River

06796000
Platte River
At North Bend, NE

06796500
Platte River
Near Leshara, NE

06801000
Platte River
Near Ashland, NE

06805500
Platte River
At Louisville, NE

Missouri River

Boone
Beaver Creek
Platte
Genoa
Monroe
Columbus
Colfax
Dodge
North Bend
Platte River
Fremont
Elkhorn River
Washington
Missouri River
Cedar River
Nance
Duncan
Loup River
Douglas
Omaha
680
80
Saunders
Butler
Merrick
Polk
Sarpy
Ashland
Louisville
Cass
Salt Creek
Lincoln
Lancaster
York
Seward
Hamilton
Fillmore
Saline
Clay

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

8 4 0 8
Miles

Source: Stream Gage, Nebraska Department of
Natural Resources; Streams/Waterbodies, 2000 Tiger Files

Legend

- City
- Platte River Mile
- Stream Gage Locations
- Interstate
- Stream/River
- Loup Power Canal
- Waterbody
- County

Loup Power District
Hydro Project

Action Area

Loup River Hydroelectric Project
FERC Project No. 1256
Biological Assessment

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FIGURE
2

3. DESCRIPTION OF THE PROJECT

3.1 Project Location and Facilities

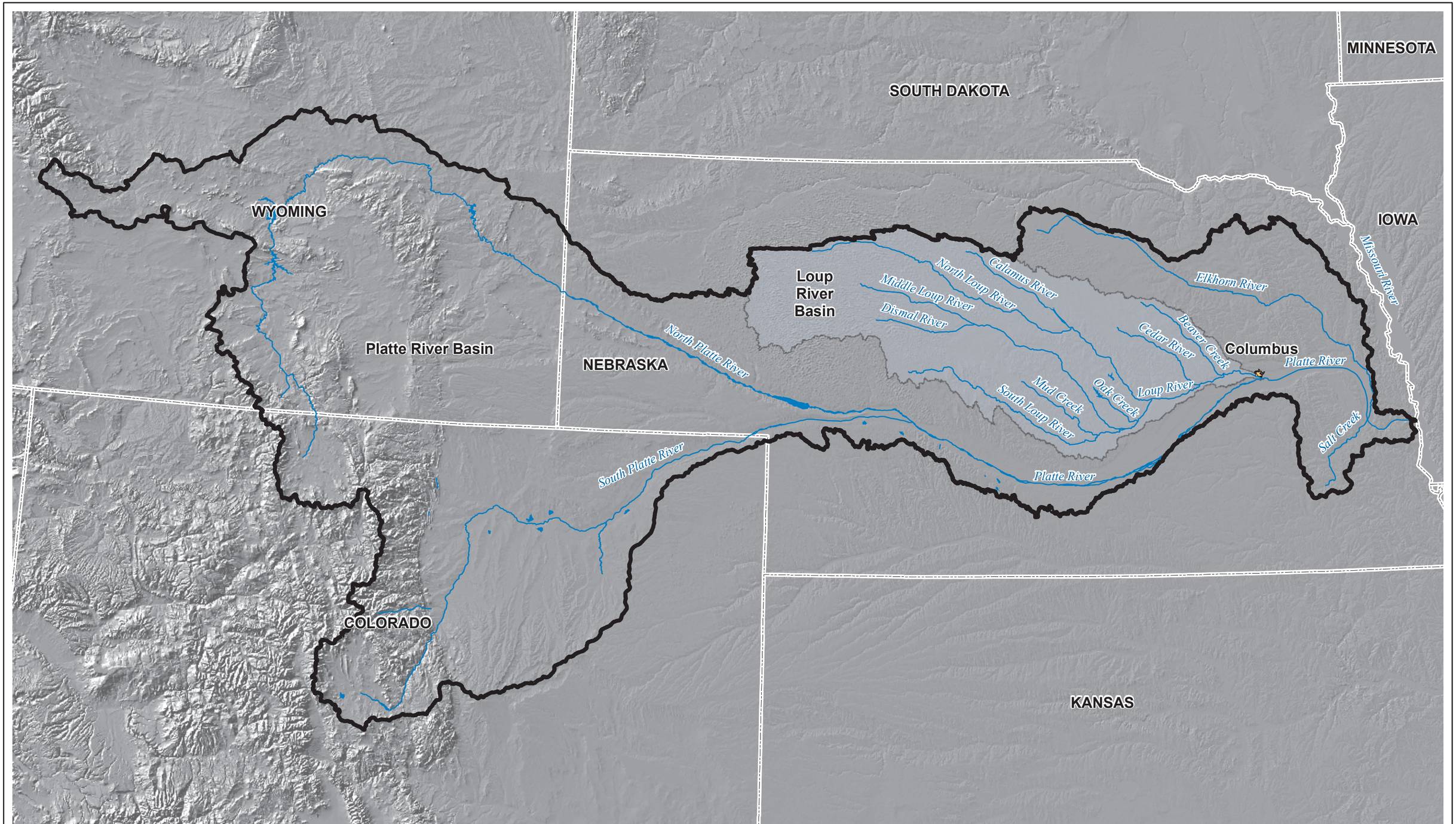
As stated previously, the Project is located in Nance and Platte counties, Nebraska. Specifically, the Project begins at the Headworks, which are located approximately 34 miles upstream of the confluence of the Loup and Platte rivers, near Genoa, Nebraska at Loup River Mile (RM) 34.2 (see Figure 1). In this location, often referred to as the point of diversion, a low weir is used to divert a variable portion of available water from the Loup River (not to exceed 3,500 cubic feet per second [cfs]) through a gated intake structure into the 35-mile-long Loup Power Canal. The diverted water is routed through the Upper Power Canal, which carries the water to the Monroe Powerhouse. Then the Lower Power Canal carries the water from the Monroe Powerhouse into two connected regulating reservoirs, Lake Babcock (in-channel) and Lake North (off-channel), which supply water to the Columbus Powerhouse via the Intake Canal. From the Columbus Powerhouse, water discharges to the Tailrace Canal, which in turn discharges Loup River water into the lower Platte River approximately 2 miles downstream of the confluence of the Loup and lower Platte rivers at Platte RM 101.5.

The portion of Loup River flow that is not diverted into the Loup Power Canal passes over the Diversion Weir or through the adjacent Sluice Gate Structure and continues downstream. The portion of the Loup River below the point of diversion is referred to as the Loup River bypass reach. The portion of the lower Platte River from the Loup River confluence to the Tailrace Return is referred to as the Platte River bypass reach. The Project is located in the Loup River Basin, which part of the larger Platte River Basin, shown in Figure 3.

The Project consists of the following features:

1. Diversion Weir – Located on the Loup River at River Mile (RM) 34.2, approximately midway between Fullerton and Genoa, Nebraska, the Diversion Weir is founded on the sand and silt river bed and is approximately 1,320 feet long, and has a height of approximately 9 feet above grade. The fixed crest of the weir is at an elevation of 1,574 feet above mean sea level[1] (MSL), and wooden flashboards (or planks) are normally maintained along the top of the weir to create an effective crest elevation of 1,576 feet MSL.

[1] Throughout this BA, mean sea level references the U.S. Geological Survey National Geodetic Vertical Datum of 1929 (NGVD 29).



45 22.5 0 45
Miles

Source: Platte River Basin, River, National Hydrography Dataset: U.S. Geological Survey

Legend

- Platte River Basin
- River

Loup Power District Hydro Project

Platte and Loup River Basins

Loup River Hydroelectric Project
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FIGURE
3

Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Location_Map_BA.mxd

2. Intake Gate Structure – Located on the north bank of the river, the Intake Gate Structure is constructed of reinforced concrete and supports 11 steel radial gates that admit Loup River water into the Settling Basin. Each gate is 24 feet long with a maximum opening of 5 feet. The elevation of the concrete gate sills is 1,569.5 feet MSL.

3. Sluice Gate Structure – The Sluice Gate Structure spans the portion of river flowing between the downstream leg of the Diversion Weir and the Intake Gate Structure. The Sluice Gate Structure is constructed of reinforced concrete and supports three steel gates. Each steel gate is 20 feet long with a maximum opening of 6 feet. The elevation of the sluice gate sills is 1,568 feet MSL.

4. Settling Basin – Water diverted from the Loup River enters the Settling Basin. The Settling Basin is designed for very slow flow velocity to allow heavier sediment materials to settle out of the water before it enters the much narrower, faster flowing Upper Power Canal. The Settling Basin is approximately 2 miles long and has a bottom width of 200 feet and a nominal depth of 16 feet. Hydraulic capacity of the basin varies depending on the accumulation of sand, silt, and sediment within the basin. Maximum hydraulic capacity, when the basin is largely free of sediment, is 3,500 cfs. Maximum basin water surface elevation is 1,572 feet MSL. A floating hydraulic dredge is used to remove accumulated sediment from the Settling Basin.

5. Sand Management Areas – Located on either side of the Settling Basin, the North SMA is approximately 320 acres in size and is located north of the Settling Basin, away from the Loup River, and the South SMA is approximately 400 acres in size and is located south of the Settling Basin, adjacent to the Loup River. The District pumps dredged material from the Settling Basin to the North and South SMAs.

6. Skimming Weir – The Skimming Weir is located at the downstream end of the Settling Basin. Here, decanted water passes over the Skimming Weir into a narrower section of the Upper Power Canal, where the maximum flow velocity is 2.25 feet per second. The crest elevation of the Skimming Weir is 1,568.2 feet MSL.

7. Upper Power Canal – The Upper Power Canal has a hydraulic capacity of 3,500 cfs (6,942 acre-feet per day) and is 10 miles long. The Upper Power Canal flows through three inverted siphons. From the Settling Basin to the Looking Glass Creek Siphon, the Upper Power Canal has a bottom width of 73 feet and a normal water depth of 14.3 feet. From the Looking Glass Creek Siphon to the Monroe Powerhouse, the Upper Power Canal has a bottom width of 39 feet and a normal water depth of 19.5 feet. The canal bottom profile slopes only 3 inches per mile.

8. Monroe Powerhouse – The Monroe Powerhouse is a reinforced concrete structure that is 129 feet long, 39 feet wide, and 87 feet high. It contains three turbine generating units. The rated capacity of each generator is 2,750 kVA. At full load, each turbine generating unit can pass 1,000 cubic feet per second (cfs).

9. Lower Power Canal – The Lower Power Canal has a hydraulic capacity of 3,500 cfs (6,942 acre-feet per day) and is 13 miles long. The Lower Power Canal flows under two siphons. It has a bottom width of 39 feet and a water depth of 19.5 feet.

10. Sawtooth Weir – The Sawtooth Weir is a concrete weir structure located where the Lower Power Canal enters Lake Babcock, the in-channel regulating reservoir. Its purpose is to control the depth of water in the Lower Power Canal and to prevent Lake Babcock from back-flowing in the event of a canal breach.

11. Lake Babcock – Lake Babcock is an in-channel regulating reservoir. Its purpose is to temporarily pond water for later release through the Columbus Powerhouse during peak load periods. Lake Babcock covers 760 acres at its full pool elevation of 1,531 feet MSL, providing an estimated 2,270 acre-feet of storage capacity. The majority of the time, daily fluctuation of the reservoir surface is about 2 feet; however, during periods of low flow and high electrical demand, fluctuations often increase to 3 feet, with a maximum fluctuation of 5 feet.

12. Lake North – Lake North is an off-channel regulating reservoir. Lake North covers approximately 200 acres at an elevation of 1,531 feet MSL, providing an estimated 2,080 acre-feet of gross storage capacity.

13. Intake Canal – The Intake Canal is 1.5 miles long and carries water from Lake Babcock to the Columbus Powerhouse. The Intake Canal was designed for a capacity of 4,800 cfs, which is the hydraulic capacity of the turbine generating units in the Columbus Powerhouse. The bottom width of the Intake Canal is 108 feet when it leaves Lake Babcock. This width reduces to 94 feet as the Intake Canal approaches the Powerhouse Inlet Structure. Intake Canal water depth varies from 17.2 to 22.2 feet, depending on the reservoir stage and rate of flow.

14. Powerhouse Inlet Structure – The Powerhouse Inlet Structure is a three-bay reinforced concrete structure that is 60 feet long, 104 feet wide, and 40 feet high. A concrete tower structure for the gate hoists extends an additional 34 feet above the deck of the Powerhouse Inlet Structure. Canal flow is smoothly routed through vertical steel trash rack panels with 2.375-inch openings that are designed to exclude large items that could harm the turbines or mechanical equipment in the Columbus Powerhouse.

15. Penstocks – Three steel Penstocks connect the Powerhouse Inlet Structure with the Columbus Powerhouse. Each penstock is 20 feet in diameter and 385 feet in length.

16. Columbus Powerhouse – The Columbus Powerhouse is a reinforced concrete structure that is 180 feet long, 57 feet wide, and 115 feet high. It contains three turbine generating units. The rated capacity of each generator is 16,000 kVA. At full gate, each turbine generating unit can pass 2,060 cfs. However, total plant generation is limited by the 4,800-cfs hydraulic capacity of the Intake Canal. The Columbus Powerhouse is the primary power-generating element of the Project, generating approximately 80 percent of total Project power.

17. Tailrace Canal – The Tailrace Canal is approximately 5.5 miles long. It has a bottom width of 42 feet and a normal water depth of about 19 feet. The Tailrace Canal carries water from the Columbus Powerhouse to the lower Platte River. This canal segment was designed to carry a nominal 4,800 cfs at a velocity of 3 feet per second.

18. Outlet Weir – The Outlet Weir, also called the Tailrace Weir, is located at the confluence of the Tailrace Canal and the lower Platte River, at RM 101.5. This concrete overflow weir has a straight 700-foot-long crest. The transition from the narrower canal section to this width is 550 feet long. The weir crest was originally constructed at an elevation of 1,413 feet MSL. In late 1952, it was lowered approximately 18 inches to lower the tailwater at the Columbus Powerhouse and to increase the velocity of flow through the Tailrace Canal to carry sedimentation to the Platte River.

3.2 Project Purpose and Objectives

The purpose of the Loup River Hydroelectric Project is power generation. The District sells all power produced by the Project to Nebraska Public Power District (NPPD) in accordance with a negotiated power purchase agreement (PPA).

3.3 Current Project Operations

Water from the Loup River is diverted into the 35-mile-long Loup Power Canal. While water is being diverted, the Headgate Operator monitors flow and debris in the Loup River, and sediment accumulation at the intake gates. The operator adjusts flow diversion rates on a daily or even hourly basis to optimize the amount of water diverted into the canal in consideration of the following factors:

- River conditions, rising or falling flow
- Debris in the river and in the Settling Basin
- resence of slush or frazil ice

- Sediment accumulation at the intake gates and the need to sluice sediment
- Condition of the flashboards at the Diversion Weir
- Anticipated weather conditions, including temperature, wind, and precipitation

After passing through the Settling Basin, diverted flows are routed to the Monroe and Columbus Powerhouses to generate electricity. Project generation is dispatched from the Nebraska Public Power District (NPPD) Control Center in Doniphan, Nebraska. NPPD is the exclusive purchaser of Project power. The NPPD dispatcher will request that the District bring generation on- or off-line as demand changes within the NPPD system (typically in the morning). When the NPPD dispatcher issues an order, the Columbus Powerhouse Operator makes wicket gate adjustments, brings turbine generating units on-line, or takes turbine generating units off-line, depending on the order.

The Monroe Powerhouse operates in a traditional run-of-river mode, passing all water coming to it in the Upper Power Canal with no regulation. Water level sensors at the station intake are used to initiate minor adjustments to the turbine wicket gates to maintain a constant canal elevation. Control of the Monroe Powerhouse turbine generating units is normally dispatched remotely by the Columbus Powerhouse operator.

The Columbus Powerhouse is generally operated as a daily hydrocycling plant by the NPPD dispatcher. This involves ponding some of the canal inflow in the regulating reservoirs and then drawing the level of the reservoirs down generally about 2 to 3 feet during certain times of the day by generating more power during peak demand. In the off-peak hours, when there is less electrical demand, the turbine generating units are turned down or shut off, and the regulating reservoirs are allowed to refill for hydrocycling the following day.

The hydraulic capacity of the Loup Power Canal is 3,500 cubic feet per second (cfs), or 6,942 acre-feet per day. All river flow above 3,500 cfs continues down the Loup River bypass reach. During normal Project operations, the long-term average amount of flow diverted for the Project is 1,630 cfs, or 3,230 acre-feet per day.

3.3.1 High Flow Operations

During high flow operations, typically during the spring freshet (that is, the sudden high flow resulting from a thaw), the diversion of flows for the Project is reduced or curtailed, as needed, to protect the Project. When high flow events occur, the Loup River carries large amounts of trash, debris, and occasionally ice. These materials need to be passed down the river and not diverted into the Loup Power Canal. Most of the unwanted material will simply pass over the submerged Diversion Weir; the remainder can be passed downstream using the Sluice Gate Structure. The Headgate Operator resides on site and monitors both weather and river flow conditions.

3.3.2 Low Flow Operations

Low flow conditions on the Loup River can occur at any time of year but are most likely to occur during the summer months when river flow is often impacted by upstream irrigation withdrawals. During these periods, the Project continues to operate normally, albeit with reduced flow available for diversion and generation. An operating consideration regarding low flow in the canal is restricting flow in the canal for maintenance activities during hot weather conditions. The District has implemented a policy to defer non-emergency maintenance activities during high-temperature periods.

3.3.3 Cold Weather Operations

During cold weather operations, the entire 35-mile length of the Project is monitored for heavy slush, frazil ice formation, ice floes, and ice jams. Any of these conditions could create an emergency situation where flow diversion would need to be quickly adjusted or curtailed completely.

3.4 Existing Resource Protection Measures

Since 1988, the District has voluntarily cooperated with USFWS, the Nebraska Game and Parks Commission (NGPC), and the Tern and Plover Conservation Partnership (TPCP) to protect nesting interior least terns (*Sterna antillarum athalassos*), which are Federally listed as endangered, and piping plovers (*Charadrius melodus*), which are Federally listed as threatened, within the Project Boundary. This has led to of the District's dredging activity during the nesting/fledging season.

Under normal Project operations, the District uses a floating hydraulic dredge to remove accumulated sediment from the Settling Basin. Each year, the hydraulic dredge removes approximately 1 million to 1.5 million cubic yards of sediment from the Settling Basin. Sediment (in the form of silt, sand, and gravel) pumped by the dredge is carried through an articulated steel pipeline to a series of fixed steel discharge pipes spaced along both sides of the Settling Basin. These pipes lead to the North and South SMAs, located on either side of the Settling Basin, as shown in Figure 4. The North SMA is approximately 320 acres in size and is located north of the Settling Basin. The South SMA is approximately 400 acres in size and is located south of the Settling Basin, adjacent to the Loup River.

Settling Basin

Skimming Weir

North Sand Management Area

Settling Basin

South Sand Management Area

Intake Gate Structure

Loup River

Sluice Gate Structure

Diversion Weir

25 30 29 28 31 32 33 36 01 06 05 04

22

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1,000 500 0 1,000
Feet

Aerial Imagery: 2010 National Agricultural Inventory Project, Nance and Platte Counties Mosaic

Legend

Project Boundary

Section Line

Loup Power District Hydro Project

Settling Basin Dredge Discharge Locations

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FIGURE
4

Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Figure_4_LoupRiver_SettlingBasinLocations.mxd, 11/17/2011

In 2006, the District was approached by a materials processing company that wanted to purchase, remove, and process stored sand from the North SMA. The District subsequently entered into an agreement with Preferred Sands[2] to remove sand from the North SMA and process it at Preferred Sands' facility located north of and immediately adjacent to the Nebraska Central Railroad line north of, and outside of, the Project Boundary. Preferred Sands currently processes approximately 125,000 tons of sand each month and has removed over 2 million tons of sand since the agreement has been in place. This has increased the capacity of the North SMA to receive additional dredged material.

As a condition of sand removal, the District required that Preferred Sands coordinate with USFWS and NGPC to ensure that sand removal operations would not adversely affect interior least terns and piping plovers. As a result, a Memorandum of Understanding (MOU) was developed by Preferred Sands, USFWS, and NGPC that includes an adaptive management plan (AMP) to protect the threatened and endangered birds. The District and TPCP are cooperating parties to the MOU. As a cooperating party, the District has no specific obligations under the MOU; however, the District works with Preferred Sands to monitor the arrival and departure of the birds and alter dredging operations as necessary for the protection of these species.

The MOU provides cooperative, proactive management strategies to avoid negative impacts on interior least terns and piping plovers from Preferred Sands' industrial operations. The MOU outlines obligations and expectations of all signatories and cooperators and has provided a formalized working relationship for all involved. The MOU remains in effect until Preferred Sands terminates sand removal from the North SMA or if any of the signatory parties formally withdraws from the MOU. Preferred Sands is able to assign its rights and obligations under the MOU to any entity that may succeed it in owning and operating the sand processing facility located on the District's property.

Each spring, District personnel watch closely for the arrival of interior least terns and piping plovers at the North SMA. When birds are identified, the District contacts USFWS and TPCP. At that time, the District restricts personnel vehicle traffic on the North SMA to a narrow strip along the top of the dike at the south end of the site. This dike is regularly monitored by personnel for breaches, erosion, and any potential problems with the dredging pipes. Particular care is taken by District personnel to avoid areas where birds may be congregating and nesting. Additionally, the District begins making plans to stop dredging to the North and South SMAs. Typically, dredging is stopped in early June and recommences in mid- to late August, allowing the birds to nest, forage, and raise young at the North SMA. Dredging and discharge

[2] The District's original agreement in 2006 was with Harwest. Through transfers and acquisitions, Preferred Rocks of Genoa and then Preferred Sands took over this operation. Each of these companies has accepted and abided by the conditions of the original agreement.

resume when the last young have fledged and the birds have begun their winter migration. By continuing dredging operations outside of the nesting/fledging season, the District continues to provide suitable, productive habitat for the interior least terns and piping plovers.

When TPCP arrives to begin monitoring the birds, they check in with both District and Preferred Sands personnel. After a monitoring visit is complete, TPCP briefs both District and Preferred Sands personnel about where the birds are nesting. Additionally, TPCP informs Preferred Sands about any measures that need to be taken to protect them. Communication throughout the nesting season continues among District personnel, Preferred Sands, and TPCP. If the District needs additional time to come to a reasonable location to stop dredging activities, District personnel work closely with TPCP to remain aware of nesting birds and protect the nests. All parties have indicated that a good working relationship has been established with respect to monitoring activities.

Under the MOU, USFWS and NGPC are required to provide technical support and counsel regarding compliance with Federal and state regulations pertaining to interior least terns and piping plovers. USFWS and NGPC are also required to advise Preferred Sands regarding site requirements and specifications found in the developed AMP. TPCP, on behalf of NGPC and USFWS, is in charge of monitoring the birds at the North SMA and providing annual reports to all MOU parties. In the event that TPCP is unable to conduct annual monitoring, USFWS and NGPC assume responsibility for monitoring these species. Preferred Sands is responsible for the implementation of the AMP and payment of all costs associated with the AMP and monitoring.

The AMP was first developed in 2008 and has undergone no major changes since its initial development. The AMP has four major goals:

1. Improve nesting habitat by creating an Active Habitat Zone (AHZ) that is conducive to nesting by piping plovers and interior least terns,
2. Monitor interior least tern and piping plover nesting,
3. Discourage nesting in industrially active areas, and
4. Protect nests and colonies outside of the AHZ.

During the first year of AMP implementation (2008), Preferred Sands performed the following activities: prior to the nesting season, vegetation was cleared from all areas that had appropriate nesting substrate; a protective berm was created around the designated AHZ of the North SMA where interior least terns and piping plovers nested and was kept clear of equipment. Although the majority of birds nested in the AHZ, a few birds also nested outside of this area. During final dredging operations in early June, the berm was eroded in one corner due to slurry water from the dredge pipes. Preferred Sands worked to restore the eroded portion while the District added

an extension hose to the associated pipe to divert slurry around the AHZ. No nests were lost or inundated as a result of these actions.

During 2009, it was determined that the protective berm was no longer needed and the AHZ changed to include all areas where the birds were nesting from dredge Pipe #13 southwest to the Headworks office (See Figure 4). Preferred Sands implemented nesting deterrent methods, such as windrowing. This method was effective in keeping birds from nesting in active sand removal areas. Additionally, Preferred Sands excavated several shallow ponds to provide water and food sources with appropriate slopes for young piping plovers. The ponds retain slurry water as it drains from the northeast to the southwest and remain wet throughout the summer.

In 2010 and 2011, Preferred Sands did not have a large amount of heavy equipment moving and was mostly stationary in their operations. The birds were able to use much of the southwest corner of the North SMA for nesting and foraging, therefore, intensive management actions were not necessary.

After 4 years of implementing the MOU and AMP, the plan and process appear to be addressing the goals of protecting the nesting birds while allowing for the continued operation of sand removal. Nest success and fledge ratios were considered high in 2008 and 2009 (Bomberger-Brown, 2010). In 2010, severe weather in June impacted the nesting colonies and decreased the ratios. The 2011 results were not yet available when this Preliminary Draft BA was developed. There is currently no formal review process for the AMP. Communication is shared among all parties, and no issues or discrepancies have been documented to date. The MOU is considered successful because there have been no incidences of "take" of either interior least terns or piping plovers on the North SMA since the inception of the MOU and commencement of sand removal activities commenced. Both the MOU and the AMP are currently being revised for updates due to personnel changes and company name revisions.

3.5 Description of Proposed Action

The District is seeking a new license for the continued operation and maintenance of the Loup River Hydroelectric Project. With the exception of new and improved recreation amenities, such as upgrading playground equipment, the District is proposing no new Project facilities and no changes to existing Project operations. Therefore, the Proposed Action to be considered in this BA is the issuance of a new license for the Project.

3.5.1 Proposed Project Operation

The District proposes no change to the current operation of the Project described above. Although the District is proposing recreation facility improvements, these improvements will not significantly alter or modify the impacts of the current facilities, daily operations, or maintenance activities. Other than the improved recreation amenities, the District has no plans for future generation capacity

development or other material expansion of the Project. Replacement of equipment will be on an as-needed basis determined by mechanical condition, safety issues, efficiency, or improvements to the operational control of the current facility.

The Project will continue to be run as a hydrocycling facility, depending on electrical demands and water availability. The District has no plans to make any substantive changes in its operation of the Project during the term of the new license. Thus, the footprint on the landscape and Project impacts will essentially remain as they currently exist.

3.5.2 Proposed Resource Protection, Mitigation, and Enhancement Measures

The District proposes to continue the cessation of dredging activities during the interior least tern and piping plover nesting season as a resource protection measure for Federally listed species. Furthermore, the District will continue to cooperate with USFWS, NGPC, TPCP, and Preferred Sands under the existing MOU.

At the time of the writing of this Preliminary Draft BA, USFWS, NGPC, and the District are consulting on potential conservation measures to address potential effects on Federally listed threatened and endangered species protected under the ESA as well as potential effects on fish and wildlife protected by the Fish and Wildlife Coordination Act (16 USC 661 et seq.). Mutually agreed upon conservation measures developed during this consultation will be included in this section and described, as appropriate, in Section 6, Effects of the Action on Listed Species, in the Draft BA.

4. ESA CONSULTATION

On July 21, 2008, USFWS provided the District with a list of threatened or endangered species that may occur in the Action Area or may be affected by proposed relicensing of the Project. The District has requested an updated species list from USFWS. The initial species list is provided in Attachment A. The Federally listed species that are known to occur or may potentially occur in the Action Area are discussed in Table 1.

Table 1. Federally Listed Species in the Action Area

Common Name	Scientific Name	Status[b]	Nearest County of Known Occurrence	Found in the Action Area
Birds				
piping plover	*Charadrius melodus*	T	Nance and Platte	Yes
interior least tern	*Sterna antillarum athalassos*	E	Nance and Platte	Yes
whooping crane[b]	*Grus americana*	E	Nance	No
Fish				
pallid sturgeon	*Scaphirhynchus albus*	E	Platte	No
Plants				
western prairie fringed orchid	*Platanthera praeclara*	T	Boone	No

Sources: NatureServe, 2008, NatureServe Explorer: An Online Encyclopedia of Life [web application], Version 4.6, Arlington, VA: NatureServe, retrieved on May 9, 2008, http://www.natureserve.org/explorer/.

USFWS Website: http://www.fws.gov/mountain%2Dprairie/endspp/CountyLists/Nebraska.pdf

Notes:

[a] E = endangered; T = threatened.

[b] The whooping crane was not included in the species list provided by USFWS on July 21, 2008. However, based on discussions between the District and USFWS during the Project relicensing process, the whooping crane is included in this Preliminary Draft BA. It is anticipated that USFWS will include the whooping crane in its updated species list in its pending letter to the District.

5. SPECIES AND CRITICAL HABITAT REVIEW

Five species of wildlife, fish, and plants that may potentially occur in the Action Area are protected as endangered or threatened species under the ESA (see Table 4) and are discussed in detail below. No candidate species were identified in the Action Area. The ESA affords protection to those species determined either endangered or threatened and their habitats. As defined by the ESA, an endangered species is "any species which is in danger of extinction throughout all or a significant portion of its range" (16 USC 1532(6)). A threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC 1532(20)). Under the ESA, it is illegal to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect listed endangered or threatened species. Violations of the ESA can result in substantial civil/criminal penalties, including fines and imprisonment.

Critical habitat is defined as specific geographic areas that are essential for the conservation and recovery of the species and that may require special management considerations (16 USC 1532(5)). A critical habitat designation does not create a preserve or refuge, and it affects only projects requiring a Federal decision (NOAA Fisheries, October 27, 2011). Critical habitat includes only those areas that contain the "principal biological or physical constituent elements" or the habitat components necessary for the essential life-cycle needs of the species (50 Code of Federal Regulations [CFR] 424.12(b)).

5.1 Interior Least Tern

5.1.1 Background

The interior population of the least tern (*Sternula antillarum athalassos*) was Federally listed as endangered on May 28, 1985 (50 Federal Register [FR] 21784-21792). The interior population is defined as any least tern nesting greater than 50 miles from the coast. The published range of the interior population of least terns includes the states of Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana (Mississippi River and tributaries north of Baton Rouge), Mississippi (Mississippi River), Missouri, Montana, North Dakota, Nebraska, New Mexico, Oklahoma, South Dakota, Tennessee, and Texas (except within 50 miles of the coast).

In 1990, USFWS issued a recovery plan for the interior least tern (USFWS, September 1990). On April 22, 2008, USFWS initiated a 5-year review of this species (73 FR 21643-21645). The 5-year review for this species is ongoing, and no report has been published to date.

5.1.2 Current Status of the Species

Interior least terns reproduce in the summer months in North America. Historically, the interior least tern's breeding range extended from Montana to Texas and from southern Indiana to New Mexico, and this breeding range has not changed. This species breeds, nests, and forages along the Missouri, Mississippi, Arkansas, Ohio, Red, and Rio Grande river systems (USFWS, September 1990).

A range-wide census for this species was not implemented until 2005. However, least terns were previously counted during the International Piping Plover Census. In 2003, the population of the interior least tern across this species' entire range was estimated to be 12,000 individuals (USFWS, December 16, 2003). The 2005 range-wide census determined a population total of 17,591 across the interior least tern's entire range (Lott, November 2006). This number is considerably higher than the previous range-wide estimate. To meet the recovery goals set in the USFWS recovery plan, the aforementioned numbers of birds and their geographic distribution need to be maintained for over 10 years (USFWS, September 1990).

Lott found that the lower Mississippi River is the most important breeding area for this species, with approximately 62.3 percent of all interior least terns surveyed occurring on the lower Mississippi (Lott, November 2006). Four additional river systems accounted for 33.3 percent of the remaining interior least terns. The overall results of the census are as follows:

- Lower Mississippi River system – 62.3 percent
- Arkansas River system – 11.6 percent
- Red River system – 10.4 percent
- Missouri River system – 6.9 percent
- Platte River system – 4.4 percent

Less than 5 percent of the population was counted on the Ohio River system, the Trinity River system in Texas, the Rio Grande/Pecos River system in New Mexico and Texas, the Wabash River system, two reservoirs in east Texas, and the Kansas River system.

Many of the river systems known to be used by interior least terns, including some of the most populated such as the Missouri, Red, and Arkansas, have power or flood control facilities that practice hydrocycling operations or the manipulation of flows in a way that mimics hydrocycling.

Wintering habits and range are not well known for interior least terns, but this species has been documented wintering along the Central American coasts, specifically on the west coast of Costa Rica and the Pacific coast of Panama, as well as on South American coasts from Venezuela to northeastern Brazil. In addition, scattered sightings of interior least terns have been made in coastal Peru in all seasons (USFWS 2006). It is not known what mortality factors affect adult interior least terns in their wintering range, but incidental hunting and pesticides may pose threats to the survival of adults on their wintering grounds (Renken and Smith 1995).

Because a range-wide survey has been conducted only once, trends are not apparent in the overall population of interior least terns. When comparing previous estimates to the 2005 census data, it appears that interior least tern populations have increased overall. On most of the key river systems where this species is found, population numbers have reached or exceeded recovery plan goals. Several river systems are consistently monitored annually for interior least terns, including the lower Platte River and the Missouri River. Trends for interior least terns on the entire Missouri River system appear to be relatively stable, with significant increases in 2005 and 2007 but a recent downward trend from 2008 through 2010. Recent habitat construction by the U.S. Army Corps of Engineers (USACE) appears to have increased productivity in interior least terns from 2003 through 2009 (Missouri River Recovery Program, October 2010). Current interior least tern populations on the

lower Platte River are discussed in Section 5.1.4, Current Distribution in the Action Area.

Very limited information exists regarding the historic use of the Loup River by interior least terns prior to the 1980s. The little information that does exist does not describe much about the exact location of the sightings, nesting on- or off-river, or the historic density of these birds on the Loup River. Furthermore, it does not provide information on the type, density, physical aspects, or other characteristics of the sandbars and channel systems or on the "value" of the habitat during times of use.

In the 1850s, interior least terns were sighted near the confluence of the Loup and Platte rivers, although no count data were recorded (Ducey, 2000). On the Loup River system, very few early records exist on this species, the earliest being specimens of three interior least terns that were collected during the Warren Expedition (1875, as cited in Ducey, 1985 and 2000) that were attributed to the "Loup Fork." The exact locality was not given in the expedition narrative. Approximately 100 years later, in 1965, interior least tern nesting was recorded on the Middle Loup River, 3 miles south of St. Paul, Nebraska (Short, 1966, as cited in Ducey, 1985). These records show that historically, a large number of this species did not use the Loup River.

5.1.3 Life History and Habitat Requirements

General Description

Least terns (all currently recognized subspecies/populations) are the smallest members of the subfamily Sterninae and family Laridae of the order Charadriiformes. Adults measure approximately 8 to 9.5 inches long, with a 20-inch wingspan. The birds have a black cap, a white forehead, grayish back and dorsal wing surfaces, and a black-tipped bill (USFWS, September 1990). Males tend to have a bright orange bill and bright orange legs, while the female's bill and legs are more yellow in color. Least terns can be readily differentiated from other tern species by their small size and the white triangular marking on their forehead (Aron, 2005). Despite habitat instability and susceptibility to predation, least terns tend to be long-lived. The oldest known tern was 21 years old (Massey and Atwood, 1978, as cited in Mitchell, 1998). Banded terns as old as 15 and 17 years have been recaptured by Renken and Smith (1995).

Breeding Behavior

The interior least tern is a migratory species, breeding along large rivers within the interior of the United States. They typically begin arriving in Nebraska in early May to mid-June and spend approximately 4 to 5 months at their breeding sites (Faanes, 1983; USFWS, September 1990). Pairs form after arrival to the nesting areas. Courtship typically lasts approximately 2 to 3 weeks from late April to late May (Thompson et al., 1997). Arrival and courtship of interior least terns in the Northern

Great Plains region generally occurs later than in other areas due to high river water levels during this time period (Hardy, 1957, as cited in Thompson et al., 1997).

Interior least terns nest in shallow depressions with small stones, twigs, or other debris nearby. Interior least terns nest in colonies, or terneries, and nests can be as close as just a few feet apart or widely scattered up to hundreds of feet. Egg-laying typically begins in late May, with the female laying one to three eggs in a nest (Thompson et al., 1997; USFWS, September 1990; Szell and Woodrey, 2003). Incubation typically lasts 17 to 28 days (Thompson et al., 1997; USFWS, September 1990).

Interior least tern chicks are able to walk upon hatching, but are brooded for approximately 1 week and fledged after 3 weeks, although parental care continues until fall migration (USFWS, September 1990). Departure from colonies by both adults and fledglings varies, but is usually complete by early September.

Interior least terns are opportunistic feeders and feed on a variety of small fishes found in the shallow waters of rivers, streams, and lakes. Adult terns usually consume fish longer than 1.6 inches and bring smaller fish to the nest for the chicks (Mitchell, March 1998). Interior least terns are categorized as surface plungers because they search for prey while flying or hovering above the surface of the water and plunge into the water to capture detected prey (Mitchell, March 1998).

Interior least terns are associated with the piping plover (*Charadrius melodus*) at nesting sites in the Loup, Platte, Niobrara, Elkhorn, and Missouri rivers. Interior least terns typically use the same habitat for nesting and nest in the same areas as piping plovers; therefore, interior least terns and piping plovers are considered nesting associates.

Habitat Requirements

Meandering rivers with broad flat floodplains, high sedimentation rates, and slow currents resulting in the formation of sandbars and shallow water areas offer the most suitable habitat for nesting and feeding (Whitman, 1988, as cited in Lott, November 2006). Typical riverine nesting habitat for interior least terns is unvegetated or sparsely vegetated sand and gravel bars within a wide unobstructed river channel (USFWS, September 1990). The braided lower Platte River in Nebraska contains habitat that is consistent with these typical riverine nesting conditions and appears to be of a higher quality and suitability than other nesting locations in Nebraska (NGPC, December 2008). The Loup River, also braided below the diversion weir, while narrower in width than the lower Platte River, also provides sparsely vegetated sand and gravel bars that are used for nesting.

An important factor for nest site selection of interior least terns is continuous exposure of the site above water for at least 100 days during the nesting period from mid-May to early August (Smith and Renken, 1993) to allow sufficient time for nesting and fledging of young. The sandbar habitats in the lower Platte River used by

interior least terns are ephemeral (Kirsch, 1996; Thompson et al., 1997); thus, interior least tern nests are susceptible to loss of nests, eggs, or chicks caused by storm and flood events. Nesting is usually initiated during high-flow periods, causing interior least terns to nest on higher areas of sandbars.

Another important factor for nesting habitat for interior least terns is lack of vegetation at the nest site. Suitable nesting areas often contain little vegetation (less than 25 percent) (Ziewitz et al., 1992), and the vegetation that is present is typically less than 3.9 inches tall (Dirks et al., 1993). Wilson et al. (1993) and Dirks et al. (1993) found that nesting interior least terns on sand pits preferred areas of less than 10 percent vegetative cover. Smith and Renken (1993) found that a common feature of nesting habitat is the presence of large amounts of sticks, twigs, and bark (driftwood) deposited by receding river levels near nesting colonies.

Nesting sites on river sandbars are often found within relatively wide channels with a large area of dry, sparsely vegetated sand (Kirsch, 1996). Nest sites in the lower Platte River had an average of 3.58 acres of dry, sparsely vegetated sand (Ziewitz et al., 1992). Ziewitz et al. (1992) also found that birds nested in areas where the channel was wider with a greater area of sandbars. That study recommended that sandbars be at least 3.58 acres in size and be 2.99 feet above river level for maximum flooding protection and at a minimum 1.48 feet in height. In a preliminary study, Brown and Jorgensen (2008) looked at river nesting habitat used by interior least terns in the lower Platte River in Nebraska. They found that the average sandbar area used was 12.18 acres. The average elevation of sandbars selected by interior least terns for nesting was 2.29 feet above the surface of the water.

In some areas, sand/gravel pits and lakeshore housing developments provide the most suitable nesting habitat available when the interior least terns arrive in the spring (Lingle, 1988, as cited in NGPC, December 2008). These sand-pit lakes are often found in close proximity to the river and, if managed, produce a higher nesting-to-fledgling ratio than human-created river sandbars and unmanaged sand pits (Jenniges and Plettner, 2008); however, these habitats may be temporary as vegetation re-growth or reclamation occurs on abandoned pits and their suitability for nesting diminishes when no longer managed (Brown et al., 2008; Sidle and Kirsch, 1993).

Nesting areas at sand-pit sites have been characterized by expansive areas of sand with large areas of surface water (Kirsch, 1996). When Kirsch (1996) examined interior least tern preference of habitat between river sandbar habitat and man-made sand-pit habitat, four out of five criteria for judging habitat preference suggested that interior least terns did not prefer one habitat over the other. Additionally, mortality of young and productivity did not differ between these two habitats (Kirsch, 1996). The results of that study suggested that bare sand and proximity to other important resources may be enough for interior least terns to colonize a site, and interior least terns may not differentiate between sandbars and sand pits as suitable nesting habitat (Kirsch, 1996). Jenniges and Plettner (2008) found that interior least terns preferred

managed sand-pit sites over human-created river sandbars, with 473 birds observed at managed sand pits versus 49 birds observed at constructed river islands over a 15-year study period. Sidle and Kirsch (1993) found classified suitable sand pits on the Platte River as ranging in size from 1.48 to 496.79 acres. The sand and gravel areas of these sites ranged from 0.49 to 425.50 acres, and the surface area of water ranged from 0.99 to 149.75 acres. The Project's North and South SMAs, near the Diversion Weir on the Loup River, were considered as one site during that study, and this area was the largest site reviewed at 496.79 acres, with 425.50 acres of sand and gravel and 70.67 acres of water.

5.1.4 Current Distribution in the Action Area

In the Loup River system, breeding interior least terns occur as far west as Valley and Howard counties, Nebraska (Sharpe et al., 2001). Currently, interior least tern use of the Loup River in relation to use of other Nebraska rivers is minimal. For example, during the 2005 range-wide census of interior least terns, only 7 percent of the total number of interior least tern adults counted in Nebraska were recorded on the Loup River (Lott, November 2006). Based on nest counts from 1983 to 2006, obtained from the NGPC Nongame Bird Program's Nebraska Least Tern and Piping Plover database, relatively few interior least terns have been recorded nesting on the Loup River (NGPC, 2009). On average, 10 interior least tern nests are recorded along the entire 69-mile stretch of the Loup River in a year. In 2010, USFWS recorded 17 interior least tern nests on the Loup River, eight of which were located in an area where the river had migrated into an abandoned sand and gravel mine (USFWS, 2010). Most recorded nesting along the Loup River system occurs at off-river sites (NGPG, 2009). In 2010, TPCP recorded 22 interior least tern nests at the North SMA alone (Bomberger-Brown, 2010).

Consistently, one of the largest colonies of nesting interior least terns along the Loup River is located within the Project Boundary on the North SMA. This site is where sand dredged from the adjacent Settling Basin is stockpiled, creating a large sandy area with adjacent wetted areas. Although only a few years of productivity data are available for this site, fledge ratios in 2008 and 2009 were at or above the fledging rate of 0.71, which is currently recommended for population maintenance (TPCP, 2009 and January 8, 2010). Interior least terns also use other sand and gravel pits and lakeshore housing developments along the Loup and North Loup rivers (NGPC, February 23, 2009). However, very little data have been gathered on the Loup and North Loup rivers because the Loup River system has rarely had large numbers of interior least terns and therefore has not been surveyed regularly. Sand and gravel mines and housing developments adjacent to the Loup River system were last surveyed by NGPC and TCPC in 2011. The Loup River was last surveyed for interior least terns by USFWS in 2010. Prior to these most recent surveys, the Loup River system was surveyed for interior least terns in 2005 during the range-wide survey (Lott, November 2006).

The Loup River adult census numbers for interior least terns during the 2005 range-wide survey (Lott, November 2006) are compared to the overall population total and the Platte River and tributaries group total in Table 2. As shown in this analysis, the significance of the Loup River system to the overall recovery of the species appears minimal. Consistent surveys on the Loup and Elkhorn rivers are conducted only in years of the International Piping Plover Census, which began in 1991 and is conducted every 4 years. Survey coverage of sand pits and lakeshore housing developments has improved in recent years on the Loup, North Loup, and Elkhorn rivers, with assistance from TPCP.

Table 2. Comparative Analysis of Interior Least Tern Range-wide Survey Data

	2005	
	Adults	Colonies
Total[1]	17,591	489
Nebraska Total[2]	1,071	51
Loup River[3]	73	2
North Loup River[4]	14	2
Lower Platte River[5]	381	15
Loup River % of Total Population	0.42%	0.41%
Loup River % of Nebraska Total	6.82%	3.92%

Source: Lott, C.A., November 2006, Distribution and Abundance of the Interior Population of the Least Tern (*Sternula antillarum*), 2005. U.S. Army Corps of Engineers. EDRC/EL TR-06-13.

Notes:

1 Total bird numbers are for breeding population surveys only. For more information, see summaries in Lott, November 2006.

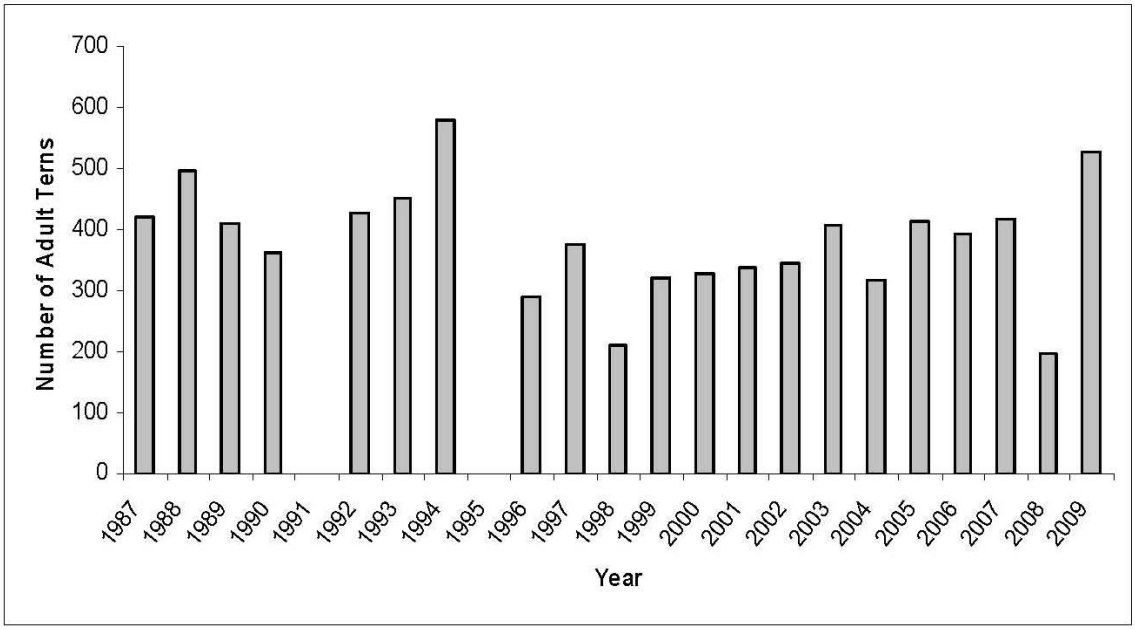
2 Nebraska total includes birds counted at both on- and off-river habitat throughout Nebraska, but does not include birds counted on the Missouri River within the Nebraska boundaries.

3 Loup River total includes birds counted at both on- and off-river habitat.

4 North Loup River total includes only birds counted at off-river habitat. No birds were documented on-river.

5 Lower Platte River total includes birds counted at both on- and off-river habitat.

Interior least terns are routinely seen on the lower Platte River. A review of adult count survey information from 1987 to 2009 indicates that interior least tern numbers have remained relatively stable along the lower Platte River during this period, as shown in Figure 5 (Brown and Jorgensen, 2009). These numbers include both on-river and off-river sites along the lower Platte River.



Note: No data are included for 1991 and 1995 because those surveys were not conducted during the standardized June summer survey window.

Figure 5. Total Number of Adult Interior Least Terns Recorded During the Lower Platte River Mid-Summer Survey, 1987 – 2009

The statistical studies conducted by the District during the relicensing process reviewed nest count data on the lower Platte River for all river miles downstream of the confluence with the Loup River. These analyses demonstrated substantial variability in nesting numbers and locations throughout the 24 years that nesting data have been collected on the lower Platte River. However, during that same time period, Project operations have been unchanged; therefore, it is determined that variability in nesting numbers on the lower Platte River are likely caused by a combination of factors such as suitable habitat, mid-summer flooding, recreational disturbance, predation, nesting success in other locations, and threats in the wintering locations.

5.1.5 Critical Habitat

Critical habitat, as defined by the ESA, has not been designated for the interior least tern.

5.2 Piping Plover

5.2.1 Background

The piping plover (*Charadrius melodus*) was Federally listed as threatened throughout most of the species range on December 11, 1985 (50 FR 50726-50734) and Federally listed as endangered throughout the Great Lakes region. The published range of the Federally listed threatened population of piping plovers is along rivers, lakes, and wetlands in the following states: Alabama, Colorado, Connecticut, Delaware, Florida, Georgia, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Texas, Virginia, and Wisconsin.

In 1988, USFWS issued a recovery plan for the piping plover (USFWS, 1988). On September 30, 2008, USFWS initiated a 5-year review of this species (73 FR 56860-56862), and the results were published on September 29, 2009. The review concluded that no change is warranted in the listing status of the piping plover and that the species should remain listed as endangered in the watershed of the Great Lakes and listed as threatened in the remainder of the species' range (USFWS, September 2009).

5.2.2 Current Status of the Species

Piping plovers reproduce in the summer months in the northern U.S. and Canada. The piping plover breeding range includes: 1) the Northern Great Plains from Alberta to Manitoba and south to Nebraska; 2) the Great Lakes beaches; and 3) Atlantic coastal beaches from Newfoundland to North Carolina. The most recently published results of the International Piping Plover Breeding Census (2006) indicated that over half of these birds were found in the U.S. and Canada Northern Great Plains and Prairie Canada regions (Elliott-Smith et al., 2009).

Piping plovers winter along the southern Atlantic coast in the U.S., the Gulf of Mexico coast in the U.S. and Mexico, and the Caribbean islands. Only 40.2 percent of the known breeding population of piping plovers has been observed on wintering grounds, so it is evident there are other wintering locations that have not yet been located (Ferland and Haig, 2002).

Piping plovers are relatively short-distance migrants that spend up to 70 percent of their annual cycle on wintering areas. During the nonbreeding period (approximately early September to early April), piping plovers use beaches, sandflats, and dunes along the Gulf of Mexico coastal beaches, adjacent off-shore islands (Haig and Oring, 1985), and the southern Atlantic coast (Nicholls and Baldassarre, 1990). Spoil piles in the Intercoastal Waterway are also used. Despite their broad winter distribution, more than 50 percent of the piping plovers counted during the 2006 International

Piping Plover Winter Census (the most recent for which data have been published) occurred along the Texas coast (Elliott-Smith et al., 2009).

The International Piping Plover Census, which coordinates attempts to locate all piping plovers at both breeding and wintering locations, has been conducted in 1991, 1996, 2001, and 2006. The 2011 census was being conducted at the time of the writing of this Preliminary Draft BA, and no preliminary reports were available. Trends in overall piping plover populations were decreasing between 1991 and 2001, but increased substantially between 2001 and 2006, likely due to an increased survey area and standardized survey methods. Roche et al. (2010) looked at range-wide piping plover survival and found that apparent survival increased and was generally highest among Great Plains populations. The results of this study indicated that shared overwintering or stopover sites may influence annual variation in survival among the geographically separated breeding populations (Roche et al., 2010).

In Nebraska, piping plovers nest along the Loup, Platte, Niobrara, Elkhorn, and Missouri rivers. Piping plover populations have been monitored annually by USACE along the Missouri River since 1986 and along the Niobrara River by the National Park Service since 2003. Overall Missouri and Platte river trends of piping plover populations fluctuate depending on river flow and available habitat. Trends for piping plovers on the Missouri River increased significantly from 2000 to 2005 but have recently declined from 2006 through 2010 (Missouri River Recovery Program, October 2010). Recent habitat construction and conservation efforts by USACE appear to have increased productivity in this species from 2003 through 2009 (Missouri River Recovery Program, October 2010).

Very limited information exists regarding the historic use of the Loup River by piping plovers prior to the 1980s. The little information that does exist does not describe much about the exact location of the sightings, nesting on- or off-river, or the historic density of these birds on the Loup River. Furthermore, it does not provide information on the type, density, physical aspects, or other characteristics of the sandbars and channel systems or on the "value" of the habitat during times of use.

In the 1850s, piping plovers were sighted near the confluence of the Loup and Platte rivers, although no count data were recorded (Ducey, 2000). On the Loup River system, very few early records exist on this species, the earliest being specimens of five piping plovers that were collected during the Warren Expedition (1875, as cited in Ducey, 1985 and 2000) that were attributed to the "Loup Fork." The exact locality was not given in the expedition narrative. These records show that historically, a large number of this species did not use the Loup River.

5.2.3 Life History and Habitat Requirements

General Description

The piping plover is a small migratory shorebird with a short, stout bill, pale underparts, and orange legs. Both sexes are sand-colored. During the breeding season, adults acquire single black forehead and breast bands, and orange bills (USFWS, 1988). Adult birds weigh between approximately 1.5 and 2.2 ounces, are approximately 6.7 to 7 inches long, and have a 4.3- to 5-inch wingspan (NGPC, December 2008). Juvenile plumage is similar to adult nonbreeding plumage. Juveniles acquire adult plumage the spring after they fledge (USFWS, 1988).

Breeding Behavior

The piping plover is a migratory species, breeding along large rivers within the interior of the U.S. and Canada, and along the Atlantic coast. Piping plovers typically begin arriving at their breeding areas in the northern U.S. and southern Canada in mid- to late-April and early May (Sharpe et al., 2001); however, they have been known to arrive as early as late March (TPCP, 2009). Once the birds arrive, the males begin establishing territories with aerial displays and calls (Aron, 2005). Courtship behavior includes aerial flights, digging of several nest scrapes, and a ritualized stone-tossing behavior (Cairns, 1982; Haig, 1992). Nest scrapes may appear in territories up to 2 weeks before a female selects a scrape and lays eggs (Cairns, 1982). Piping plovers spend approximately 3 to 4 months at their breeding sites (Sharpe et al., 2001).

Piping plovers exhibit high variability in site fidelity, with estimates ranging from approximately 25 to 70 percent of adults returning to the same location (Aron, 2005). Haig and Oring (1988) noted that first-year breeding birds rarely return to their natal site. Brown and Jorgensen (2008) observed seven color-banded piping plovers on the lower Platte River during a summer interior least tern and piping plover survey. The seven birds were originally banded along the Gavin's Point Dam reach of the Missouri River. All seven birds were at least 2 years old when recaptured. Annual survival for adult piping plovers is estimated at 0.634 to 0.737, with 0 being no survival and 1 indicating that all birds survive (Larson et al., 2000; Root et al., 1992). Because of the typically low site fidelity rate, first year survival is difficult to estimate. Limited information exists on the lifespan of these birds in the wild; however, birds have been documented to live as long as 8 to 11 years of age (Haig, 1992).

Similar to interior least terns, piping plovers nest on sparsely vegetated sandbars and reservoir shorelines. Suitable nesting habitat may also exist at pits created by sand and gravel mining operations and housing developments adjacent to the Loup, Platte, Niobrara, and Elkhorn rivers in Nebraska (Brown et al., 2008; Kirsch, 1996; Lott, 2006; Sidle and Kirsch, 1993; Wilson et al., 1993). These habitats are often temporary as vegetation re-growth or reclamation occurs on abandoned pits and their

suitability for nesting diminishes when no longer managed (Brown et al., 2008; Sidle and Kirsch, 1993).

Nesting habitat on the Loup, Platte, Niobrara, Elkhorn, and Missouri rivers typically consists of dry sandbars located midstream in wide, open channels with less than 25 percent vegetative cover (Faanes, 1983; Ziewitz et al., 1992). Nests are small scrapes or shallow depressions frequently lined with small pebbles or shell fragments (Cairns, 1982; USFWS, 1988). Egg-laying typically begins the second or third week of May. Piping plovers lay three to five eggs (generally four) (Greer, 2003), and incubation lasts 25 to 31 days (Wilcox, 1959; Cairns, 1982; Haig and Oring, 1988a, as cited in NGPC, December 2008; USFWS 2000). Both males and females actively share incubation duties (Cairns, 1982; Wilcox, 1959, as cited in Aron, 2005). If the early nesting attempts fail, piping plovers will attempt to renest up to three times; however, they will typically raise only one clutch per season (Haig, 1987). A study done by Bottitta et al. (1997) documented several cases of Atlantic piping plovers successfully fledging young from two nests in one breeding season; however, there have been no documented cases of this in the Northern Great Plains population that nests in Nebraska. Renesting efforts have been noted to typically result in fewer than four eggs being produced (USFWS, 1988).

Piping plover chicks are precocial, leaving the nest almost immediately. The chicks begin foraging and feeding themselves within a few hours of hatching and leaving the nest (Cairns, 1982). Adults have been observed leading the chicks to and from foraging locations, providing shelter during inclement weather, and attempting to protect the chicks from predators (Cairns, 1982; Wilcox, 1959). Adult females will typically leave the brood within a few days of hatching, while the adult males have been observed to remain with the brood until after fledging and have been frequently sighted moving into nonbreeding flocks with their chicks (Haig, 1992). Fledging typically occurs approximately 28 days after hatching in Nebraska; however, it may vary with location. In Manitoba (Haig and Oring, 1988a, as cited in USFWS, June 28, 1994) and in North Dakota (Prindiville, 1986, as cited in USFWS, 1988), fledging was observed 21 days after hatching. Wilcox (1959, as cited in USFWS, 1988) documented fledging on Long Island, New York, between 30 and 35 days after hatching. Departure from nesting areas by both adults and fledglings varies, but is usually complete by early August (Cairns, 1982; Prindiville Gaines and Ryan, 1988).

Piping plovers are breeding associates of the interior least tern (*Sternula antillarum athalassos*) in the Loup, Platte, Niobrara, Elkhorn, and Missouri river systems. Nesting piping plovers are commonly found within or near nesting interior least tern colonies at sand and gravel pits and on riverine sandbars.

Diet

Little is known about the diet or foraging habits of piping plovers during any phase of their annual cycle (USFWS, 1988). Piping plovers forage visually for invertebrates in shallow water and associated moist substrates (Cuthbert et al., 1999; Whyte, 1985, as cited in NGPC, December 2008). Bent (1929, as cited in USFWS, 1988) reported the stomach contents of four piping plovers from Alabama as containing marine worms, insects (fly larvae and beetles), crustaceans, mollusks, and other small marine animals and their eggs. Cairns (1977, as cited in USFWS, 1988) observed piping plovers in Nova Scotia feeding on marine worms averaging approximately 1 to 3 inches in length. Piping plovers have been observed feeding on grasshoppers and spiders in the grass near nest sites in Manitoba and Nebraska (Haig, Lingle as cited in USFWS, 1988). Cuthbert et al. (1999) identified a variety of prey species including Hymenoptera (sawflies, wasps, bees, and ants), Coleoptera (beetles), and Diptera (mosquitoes, gnats, midges, and flies). Along the Platte River, piping plovers primarily feed on beetles and small soft-bodied invertebrates from the riverine waterline (Lingle, 1988, as cited in NGPC, December 2008).

Habitat Requirements

The piping plover nests on open to sparsely vegetated sand and gravel beaches along the Atlantic coast, the Great Lakes, and throughout the Great Plains of North America (Cairns, 1982; Prindville Gaines and Ryan, 1988; Haig and Elliot-Smith, 2004). In north-central North America, piping plovers nest on sand and gravel shores and islands of rivers and lakes in the Great Plains (USFWS, 1988). Factors that contribute to optimal habitat conditions are described below. In times of drought or other adverse conditions, piping plovers will use less than optimal habitat; however, productivity may suffer (Weber and Martin, 1991).

Inland Lake and Reservoir Habitat

Inland lakes and reservoirs include the large inland lakes of the Northern Great Plains (for example, Lake McConaughy in Nebraska and Lake Oahe in South Dakota). Also included are the small prairie sloughs and saline wetlands. Along large inland lakes, piping plovers nest on open sand and gravel beaches on islands (Powell and Cuthbert, 1992) or the mainland. Beaches may be adjacent to dunes and are surrounded by prairie parkland (for example, Lake of the Woods) or northern hardwood/coniferous forest (for example, Great Lakes). In the Northern Great Plains, permanent to seasonally flooded, palustrine wetlands are used by breeding birds. Typically, nests are placed on dry salt flats or gravel beaches. Surrounding habitat may be pasture or rangeland composed of short or mixed-grass prairie. Although the preference of piping plovers for open beaches has been repeatedly noted in the literature, quantitative data on habitat characteristics, evidence of habitat selection, and information on the relative quality of inland lake habitats remain scarce (USFWS, 1988).

Studies have suggested that beach width and distance from water to upland vegetation may affect habitat use by breeding piping plovers. Lambert and Ratcliff (1981, as cited in USFWS, 1988) found that beaches were wider in territories of mated pairs (an average of 101.71 feet) than in territories of unmated males (an average of 85.30 feet). In a Saskatchewan study area, Whyte (1985, as cited in USFWS, 1988) recorded minimum nest-to-water distances of 131.23 feet and suggested that beaches less than 65.62 to 98.43 feet in width were not likely to be used by piping plovers. In a North Dakota study, it was reported that mean beach width was larger on occupied beaches (an average of 108.27 feet) than in unoccupied beaches (an average of 44.62 feet) (Prindiville Gaines and Ryan, 1988). Narrow beaches may be low quality breeding habitat for piping plovers because predators may be more successful at locating nests along narrow strips (less than 65.62 feet) of beach than on wider areas (Prindiville Gaines and Ryan, 1988). Nests on narrow, gently sloping beaches are likely to be destroyed by increasing water levels and wave action during storms (Haig and Oring, 1985, as cited in USFWS, 1988).

Habitat selection and reproductive success are often affected by amount and distribution of vegetation. In a Lake Superior study, Niemi and Davis (1979, as cited in USFWS, 1988) searched beaches and found six of ten piping plover nests on beaches with the least vegetative cover (5 percent). They also reported that occupied beaches with the greatest percent cover (42 percent) had vegetation clumped in bands. Prindiville Gaines and Ryan (1988) found no difference in vegetative cover between occupied and unoccupied sites; however, vegetation was more clumped in areas where birds were nesting. It was also documented in this study that in areas where nesting birds were successful, there was either less vegetation or more clumped vegetation than areas where nests had failed (Prindiville Gaines and Ryan, 1988).

Substrate composition may affect habitat selection by piping plovers and influence nest success. Cairns (1977, as cited by USFWS, 1988) found the majority of nests in Nova Scotia on mixed sand and gravel and stated that these nests were less conspicuous than those on sand alone. Whyte (1985, as cited in USFWS, 1988) reported that piping plovers were more likely to establish nests on gravel. Prindiville (1986, as cited by USFWS, 1988) found that gravel was more evenly distributed and in greater concentration in piping plover nesting areas in North Dakota than in the unoccupied areas. Greater nest success for nests placed on gravel than on alkaline substrates was also reported.

In summary, evidence from wetland and deep water habitats in the Northern Great Plains and Great Lakes suggests that beach width as well as abundance and distribution of vegetation and gravel are important factors affecting piping plover habitat selection. Wide beaches (greater than 65.62 feet) with less than 5 percent vegetative cover, highly clumped vegetation, and/or extensive gravel create large blocks of homogenous substrate that provide a suitable habitat for breeding piping plovers in these regions (USFWS, 1988).

River Habitat

Piping plovers nesting on the Missouri, Platte, Niobrara, Yellowstone, and other Great Plains rivers use beaches and dry, barren sandbars in wide open channel beds (Kirsch, 1996; USFWS, 1988). Suitable nesting areas often contain minimal vegetative cover of less than 25 percent (Ziewitz et al., 1992). The optimum range for vegetative cover on nesting habitat has been estimated at 0 to 10 percent (Armbuster, 1986, as cited in NGPC, December 2008). Prindville Gaines and Ryan (1988) noted that nests in vegetation can experience a higher rate of predation than those in open areas. Dirks et al. (1993) documented piping plovers nesting with interior least terns in sites with less than 10 percent vegetation coverage, and most vegetation was less than 3.94 inches tall. Plant species most common near nesting areas included eastern cottonwood (*Populus deltoides*) (25 to 58 percent), sandbar willow (*Salix exigua*) (12 to 15 percent), and grasses or slender flatsedge (*Cyperus rivularis*) (10 to 28 percent). The average distance from the piping plover nest to the nearest plant was approximately 4.21 inches. The average height of the nearest plant was 9.21 inches. Piping plovers on New York beaches nested in less than 47 percent vegetative cover. In this study, nest plots were more likely to be vegetated than paired random plots (Cohen et al., 2008).

Piping plovers often express a strong preference for nests to be initiated near objects, such as driftwood, stones, or plant debris (Haig and Elliot-Smith, 2004). Warnock et al. (2002, as cited in Cohen et al., 2008) hypothesized that such objects may serve as windbreaks or nest markers for the birds. Piping plovers initiated 72 percent of their nests near an object, with 55 percent of these being initiated near driftwood (Dirks et al., 1993). Substrate size has also been documented to play an important role in nest site selection. Cohen et al. (2008) found most piping plover nests (59.4 percent) on pure sand. Coarse substrate was associated with high hatching success in North Dakota, most likely through camouflage of adults and eggs (Prindville Gains and Ryan, 1988).

Sandbar area and height are important factors in nesting habitat selection. Faanes (1983) studied 28 Platte River sandbars occupied by nesting piping plovers. This study found the occupied sandbars averaging 938.32 feet in length and 180.45 feet in width (approximately 3.89 acres). Piping plover nests averaged 52.49 feet from the water's edge, with the average height above the river level measuring 0.66 foot. Ziewitz et al. (1992) found similar results with nest site sandbars on the lower Platte River averaging 3.58 acres. Nests on the central Platte River were initiated at lower elevations (an average of 1.28 feet) than nests on the lower Platte River (1.61 feet) (Ziewitz et al., 1992). Recommendations based on this study suggest that sand bars should be at least 3.58 acres in size and greater than 1.48 feet in height to be suitable for piping plover nesting.

Along with interior least terns, piping plovers will use alternative habitats such as sand and gravel mine pits and lakeshore housing developments. Operating sand and gravel mines provide a barren to sparsely vegetated substrate suitable for nesting habitat (Sidle, 1993). Sidle (1993) found that most sand pits examined ranged in size from 1.48 to 196.70 acres and averaged 56.83 acres. The sand and gravel component of the sand pits ranged from 0.49 to 92.17 acres, and the water component ranged from 0.99 to 104.53 acres. The Project's North and South SMAs were approximately 496.79 acres (425.50 acres of sand and gravel and 70.67 acres of water) (Sidle, 1993).

Due to recent trends in management of the piping plover, including directing nest sites, monitoring, and excluding and controlling predators, many sand-pit lakes are successfully being used by piping plovers. Brown and Jorgensen (2008) reported a steady increase in both interior least terns and piping plovers nesting on off-river habitat over the past 20 years.

Feeding Habitat

The proximity of feeding habitat to nesting habitat is especially important for young piping plovers. Piping plovers feed primarily on exposed beach substrates by pecking for invertebrates at or less than 0.39 inch below the surface (USFWS, 1988). In Saskatchewan, Whyte (1985, as cited in USFWS, 1988) noted that adults concentrated foraging efforts within 16.40 feet of the water's edge. Whyte also noted that broods fed most often near the shore, but their use of upland beach habitats was greater than that of adults. Cairns (1977, as cited in USFWS, 1988) reported that piping plover chicks tended to feed on firmer sand at greater distances from the shoreline than adults. LeFer et al. (2008) observed piping plover chicks foraging on the Missouri River in a warm water reach, in a cold water reach, and on alkali flats adjacent to the river. The researchers concluded that piping plovers adapted to a variety of prey densities.

Wintering Habitat

Piping plovers are relatively short-distance migrants that spend up to 70 percent of their annual cycle on wintering areas. During the nonbreeding period (approximately early September to early April), piping plovers use beaches, sandflats, and dunes along the Gulf of Mexico coastal beaches, adjacent off-shore islands (Haig and Oring, 1985), and the southern Atlantic coast (Nicholls and Baldassarre, 1990). Spoil piles in the Intercoastal Waterway are also used. Despite their broad winter distribution, more than 50 percent of the piping plovers counted during a recent winter census occurred along the Texas coast (Elliot-Smith et al., 2009). Zonick et al. (2000) found that piping plovers seldom using tidal flats adjacent to development areas. The majority of locations used by piping plovers consisted of algal flats (51 percent) and lower sand flats (23 percent). Other habitats used included washover passes (9 percent), upper sand flats (7 percent), mud flats (6 percent), beach (3 percent), roadside ditches (less than 1 percent), and dredge material placement areas (less than

1 percent). Piping plovers used wet substrates at 88 percent of the locations and dry substrates at 12percent of the locations (Zonick et al., 2000). The average distance of piping plovers to the nearest water was 68.24 feet.

5.2.4 Current Distribution in the Action Area

In the Loup River system, breeding piping plovers occur as far west as Valley and Howard counties, Nebraska (Sharpe et al., 2001). Currently, piping plover use of the Loup River in relation to use of other Nebraska rivers is extremely minimal and occurs during only the breeding and nesting season (that is, late-April to late-July). For example, during the 2006 International Piping Plover Census, only 2 percent of the total number of piping plover adults counted in Nebraska were recorded on the Loup River system (Elliott-Smith et al., 2009). Based on nest counts from 1983 to 2006, obtained from the NGPC Nongame Bird Program's Nebraska Least Tern and Piping Plover database, relatively few piping plovers have been recorded nesting on the Loup River (NGPC, 2009). On average, four piping plover nests are recorded along the entire 69-mile stretch of the Loup River in a year. Most recorded nesting along the Loup River system occurs at off-river sites. In 2010, USFWS recorded three piping plover nests on the Loup River, all of which were located upstream of the Diversion Weir (USFWS, 2010). In 2010, TPCP recorded seven piping plover nests at the North SMA alone (Bomberger-Brown, 2010).

Piping plovers along the Loup River consistently use the North SMA within the Project Boundary for nesting, breeding, and foraging. Piping plovers also use other sand and gravel pits and lakeshore housing developments along the Loup and North Loup rivers (NGPC, February 23, 2009). However, very little data have been gathered on the Loup and North Loup rivers because the Loup River system has rarely had large numbers of piping plovers and therefore has not been surveyed regularly. Sand and gravel mines and housing developments adjacent to the Loup River system were last surveyed by NGPC and TPCP in 2011. The Loup River was last surveyed for piping plovers by USFWS in 2010. Prior to these most recent surveys, the Loup River system was surveyed for piping plovers in 2006 for the International Piping Plover Census (Elliott-Smith et al., 2009). The Loup River was also surveyed in 2011 for the International Piping Plover Census, but preliminary results were not yet available when this Draft License Application was written.

The Loup River adult census numbers for piping plovers during years of the International Piping Plover Census (1991, 1996, 2001, and 2006) are compared to the overall population total, the Northern Great Plains and Prairie Canada (NGP&PC) population total, and the State of Nebraska group total in Table 3. As shown in this analysis, the significance of the Loup River system to the overall recovery of the species appears minimal.

Table 3. Comparative Analysis of International Piping Plover Census Data

	1991		1996		2001		2006	
	Adults	Pairs	Adults	Pairs	Adults	Pairs	Adults	Pairs
Total[1]	5,482	2,441	5,913	2,668	5,945	2,747	8,092	3,516
NGP&PC[2] Total	3,467	1,486	3,284	1,377	2,953	1,291	4,662	1,879
Nebraska Total[3]	398	139	366	155	308	133	909	341
Loup River	14	5	29	6	21	7	19	3
North Loup River	10	5	4	1	2	1	12	0
Lower Platte River	67	20	53	23	62	21	52	2
Loup River % of Total Population	0.26%	0.20%	0.49%	0.22%	0.35%	0.25%	0.23%	0.09%
Loup River % of NGP&PC Total	0.40%	0.34%	0.88%	0.44%	0.71%	0.54%	0.41%	0.16%
Loup River % of Nebraska Total	3.52%	3.60%	7.92%	3.87%	6.82%	5.26%	2.09%	0.88%

Sources: Dinan, John J., 2001, "2001 Piping Plover and Least Tern Census – Nebraska," NGPC.
Elliott-Smith, E., S.M. Haig, and B.M. Powers, 2009, Data from the 2006 International Piping Plover Census, U.S. Geological Survey Data Series 426.
Ferland, C.L., and S.M. Haig, 2002, 2001 International Piping Plover Census, USGS, Forest and Rangeland Ecosystem Science Center, Corvallis, Oregon.
Haig, S.M., and J.H. Plissner, 1993, "Distribution and Abundance of Piping Plovers: Results and Implications of the 1991 International Census," *Condor* 95:145-156.
Plissner, J.H., and S.M. Haig, 2000, Status of a Broadly-Distributed Endangered Species: Results and Implications of the Second International Piping Plover Census, *Canadian Journal of Zoology* 78:1-12.

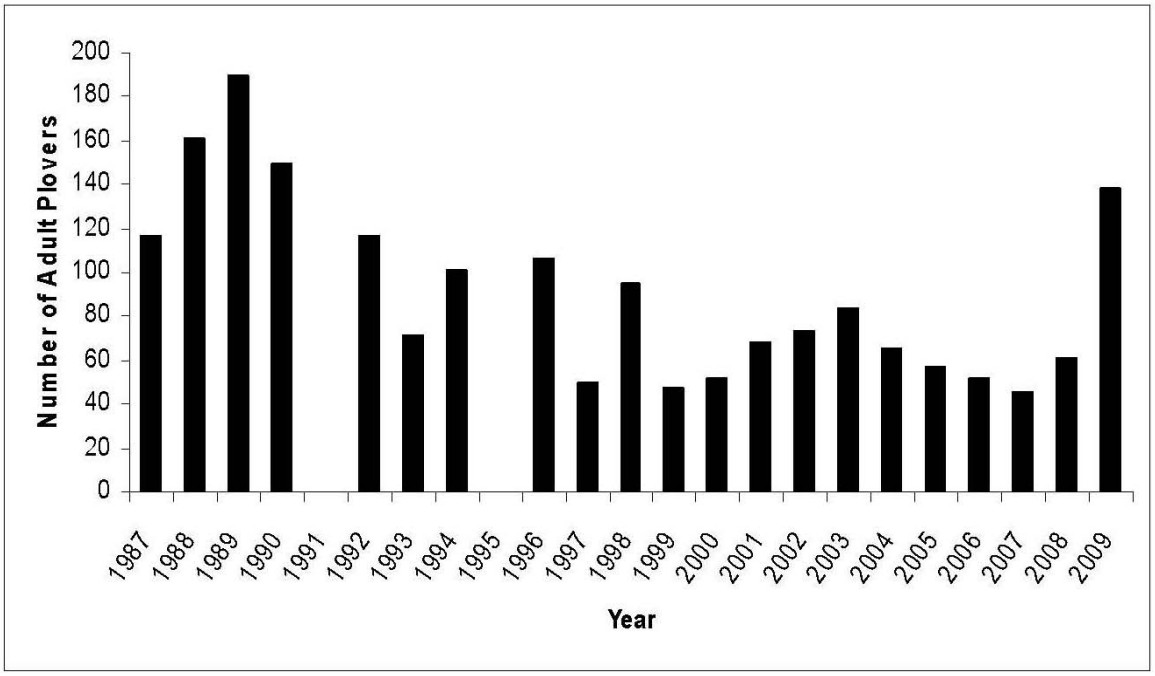
Notes:

[a] Total bird numbers are for breeding population surveys only. For more information, see Piping Plover Census summaries (Haig and Plissner, 1993; Plissner and Haig, 2000; Ferland and Haig, 2002; Elliott-Smith et al., 2009).

[b] NGP&PC = Northern Great Plains and Prairie Canada.

[c] Nebraska total includes birds counted in both on- and off-river habitat throughout Nebraska and includes the Missouri River within the Nebraska boundaries.

Piping plovers are routinely seen on the lower Platte River. A review of adult count survey information from 1987 to 2009 indicates a slight decline in piping plover numbers along the lower Platte River during this period; however, after 2009 monitoring efforts, the numbers spiked in 2009, as shown in Figure 6 (Brown and Jorgensen, 2009). These numbers include both on-river and off-river sites along the lower Platte River. While no definitive explanation for the spike in 2009 has been made, 2008 was a productive year on the Missouri River below Gavins Point Dam and it is possible that this productivity, in connection with other factors, lead to an increase in piping plover numbers in 2009 on the lower Platte River.



Note: No data are included for 1991 and 1995 because those surveys were not conducted during the standardized June summer survey window.

Figure 6. Total Number of Adult Piping Plovers Recorded During the Lower Platte River Mid-Summer Survey, 1987 – 2009

5.2.5 Critical Habitat

On September 11, 2002, USFWS designated critical habitat for the Northern Great Plains breeding population of the piping plover (67 FR 57638-57717). Included were approximately 106,030 acres largely associated with lakes in Minnesota, Montana, and North Dakota, about 440 miles associated with rivers in Nebraska, and 77,370 acres and 768 miles (438 miles associated with reservoir habitat and 330 miles associated with riverine habitat) on the Missouri River in Montana, North Dakota, South Dakota, and Nebraska. The final rule reported that for piping plovers breeding in the Northern Great Plains in the U.S., about 69 percent used lake habitat and the remaining 31 percent were found on habitat associated with Missouri River reservoirs, tributaries to the Missouri River (such as the Loup, Platte, and Niobrara rivers), and the Missouri River. Critical habitat was not designated for Northern Great Plains piping plovers breeding in Canada.

The critical habitat designation in Nebraska included the Platte River from Lexington, Nebraska, to the confluence with the Missouri River (252 miles), the Loup River (68 miles), and the eastern portion of the Niobrara River (120 miles). The shoreline of Lake McConaughy was excluded because USFWS maintained that it was adequately managed under plans developed by the Central Nebraska Public Power and Irrigation District (CNPPID). USFWS also excluded sand pits because they do not meet the physical and biological requirements of critical habitat (National Research Council, 2005).

On February 14, 2003, the Nebraska Habitat Conservation Coalition filed a lawsuit against USFWS before the U.S. District Court in Nebraska. The lawsuit was filed to invalidate the designation of critical habitat for piping plovers in Nebraska. On October 13, 2005, U.S. District Judge Lyle Strom vacated and remanded all critical habitat designations in Nebraska (that is, on the Loup, Platte, and Niobrara rivers). The critical habitat designation on the Missouri River along the Nebraska/South Dakota border still stands. Judge Strom ordered USFWS to re-conduct the economic analysis and re-assess the critical habitat designation for the piping plover in Nebraska (U.S. District Court for the District of Nebraska, October 13, 2005). Because of this decision, there is currently no Federally designated critical habitat for piping plover within the state of Nebraska and in the Action Area.

5.3 Whooping Crane

5.3.1 Background

The whooping crane (*Grus americana*) was Federally listed as an endangered on March 11, 1967 (32 FR 4001). A revised recovery plan was finalized for this species on May 29, 2007 (72 FR 29544). On March 29, 2010, USFWS initiated a 5-year review of this species (75 FR 15454-15456). The review is ongoing, and no results have been published to date.

5.3.2 Current Status of the Species

Today, most whooping cranes migrate from Wood Buffalo National Park in Canada to Aransas National Wildlife Refuge on the Texas coast. This route passes southeast through northeastern Alberta, south-central Saskatchewan, northeastern Montana, western North Dakota, western South Dakota, central Nebraska and Kansas, west-central Oklahoma, and east-central Texas. Scattered occurrences have been reported in adjacent states and provinces (Canadian Wildlife Service and USFWS, March 2007).

The migration path of the Aransas-Wood Buffalo flock that nests in northern Canada and migrates to the Gulf of Mexico passes through central Nebraska, mainly in the Platte River basin. Whooping cranes can be found in Nebraska during spring and fall migrations. Whooping cranes migrate through Nebraska between early October and late November in the fall and mid-March to late May in the spring (Austin and Richert, 2001). Nance and Platte counties are on the eastern edge of the main whooping crane migration corridor (see Figure 7).

Whooping cranes occur throughout North America, and the total wild population was estimated at 343 birds in 2011 (Stehn, August 30, 2011). This estimate included birds in the only self sustaining Aransas-Wood Buffalo National Park population that winters in coastal marshes in Texas and migrates through Nebraska on its way to Canada to nest in the Wood Buffalo National Park and adjacent areas, as well as captive-raised birds that have been released in Florida and a migratory population between Florida and Wisconsin. Currently, the Aransas-Wood Buffalo flock population is estimated at 278 birds (Stehn, August 30, 2011). Overall, whooping crane population trends throughout the range appear to be experiencing a gradual positive trend.

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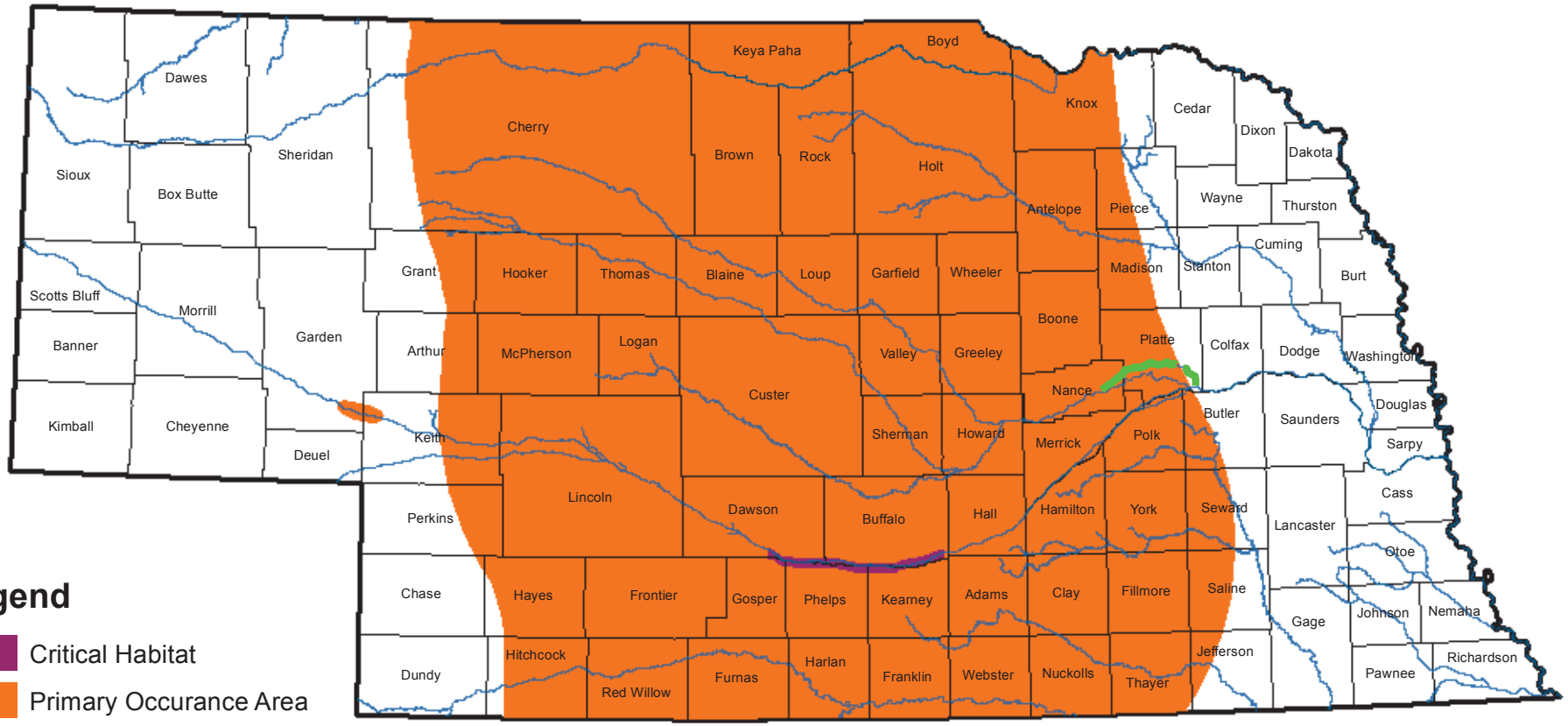


Legend

- Critical Habitat
- Primary Occurance Area
- Loup Power Canal

0 25 50 100
Miles

Source: Range maps for listed species in Nebraska,
compiled and edited by the Nebraska Natural Heritage Program, September 2011

Loup Power District Hydro Project

Whooping Crane Mitigation Corridor in Nebraska

Loup River Hydroelectric Project
FERC Project No. 1256
Biological Assessment

DATE
November 2011

FIGURE
7

5.3.3 Life History and Habitat Requirements

Whooping cranes utilize a variety of habitats for breeding, migrating, wintering, and foraging throughout the United States and Canada. Habitats include coastal marshes and estuaries, inland marshes, ponds, lakes, wet meadows, rivers, and agricultural fields. This species breeds and nests in the wetland habitat in Wood-Buffalo National Park in Canada. Whooping cranes are monogamous, forming pairs and laying eggs as early as 3 years of age. Fidelity to breeding areas is documented and this species normally nests in the same vicinity each year. Eggs are typically laid between late April to mid-May and incubation lasts approximately 30 days. Whooping cranes typically produce clutches of two eggs and share incubation and brood-rearing duties (USFWS, September 27, 2011). Whooping cranes are a long-lived species and current longevity in the wild estimates at least 30 years of age. This species in captivity has been known to live 30-40 years (Canadian Wildlife Service and USFWS, March 2007).

The whooping crane is a bi-annual migrant, traveling between summer habitat in central Canada and wintering grounds in Texas, across the Great Plains of the central U.S., in the spring and fall of each year. The migratory corridor stretches approximately 2,400 miles long and 220 miles wide. This corridor encompasses 95% of known sightings of whooping cranes, although occasionally this species may be sighted outside of the main corridor. This species stops daily during migration to feed and rest, unless local weather conditions dictate otherwise. Whooping cranes are omnivorous, mainly feeding on insects, frogs, rodents, small birds, minnows, berries, blue crabs, clams, snails, crayfish, and agricultural grains (USFWS, September 27, 2011).

Whooping cranes can be found in Nebraska during spring and fall migrations. Whooping cranes migrate through Nebraska between October 1 and December 1 in the fall and March 15 and May 15 in the spring. A variety of habitats are used during migration, such as croplands and wetlands for feeding and shallow portions of rivers, lakes, and streams for roost sites (Austin and Richert, 2005). Overnight roosting requires shallow water over submerged sandbars on which the cranes stand and rest. This species has shown a preference for unobstructed channels that are isolated from human disturbance (Armbruster, 1990, as cited in Canadian Wildlife Service and USFWS, March 2007). Large palustrine wetlands are used for roosting and feeding during migration. Table 4 lists habitat measurements identified at whooping crane roosting sites on Nebraska rivers.

Table 4. Habitat Characteristics Noted at Nebraska Riverine Roost Sites for Whooping Crane

Habitat Parameter	Observed Measurements of Habitat Parameters[1]	References
Channel width (bank to bank)	≥180 feet, usually >508 feet; average 764±276 feet	Johnson, 1982; Austin and Richert, May 2001
Channel inundated (percent)	>80%	Faanes et al., 1992
Unobstructed channel width (feet)	≥1,165 feet, <2,625 feet	Faanes, 1992; Austin and Richert, May 2001
Depth of water for roosting	0 to 0.82 foot, approximately 40% of channel area <0.7 foot	Johnson, 1982; Faanes, 1992; Farmer et al., 2005; Austin and Richert, May 2001; PRRIP, October 24, 2006

Note:

[a] Values were converted from centimeters and meters to feet.

Potential Habitat in the Action Area

Submerged sandbars that exist within the Loup River could be used for roosting by whooping cranes. Use of this area would be migratory in nature. The District's aerial imagery review of whooping crane habitat parameters above and below the Diversion Weir yielded detectable differences in the measured parameters (channel widths, shallow water/wet sand areas, and unobstructed channel widths). Greater areas of shallow water/wet sand were located below the Diversion Weir, while above the Diversion Weir there were less areas of shallow water/wet sand, which is a preferred roosting characteristic of whooping cranes. In general, the unobstructed widths above and below the Diversion Weir were consistent with active channel widths (bank to bank), with the exception of one location above the Diversion Weir. This location had an elevated vegetated sandbar, decreasing the unobstructed width of this section of the channel.

All unobstructed widths, both above and below the Diversion Weir, generally fall within the noted range for this habitat parameter. On average, the channel is wider above the Diversion Weir than below the Diversion Weir; however, all channel widths fall within the generally accepted habitat preferences of whooping cranes, so little difference of potentially suitable channel widths and unobstructed widths exists when comparing above to below the Diversion Weir.

5.3.4 Current Distribution in the Action Area

The Project is located along the eastern edge of the main whooping crane migration corridor (see Figure 7). The majority of whooping crane sightings in Nebraska occur along the central Platte River. Three sightings have been confirmed greater than 3 miles upstream of the Project in the past 20 years (USFWS, April 15, 2009) and one sighting was documented during the fall migration in 2010 downstream of the Project on the lower Platte River in Butler County. This is considered a very rare occurrence since no other sightings have been documented on the lower Platte River. No sightings have been documented within the Project Boundary.

5.3.5 Critical Habitat

There is no critical habitat designated for this species within the Action Area. The critical habitat for this species is located along a 56-mile-long, 3-mile-wide stretch of the central Platte River between Lexington and Shelton, Nebraska (Canadian Wildlife Service and USFWS, March 2007).

5.4 Pallid Sturgeon

5.4.1 Background

The pallid sturgeon (*Scaphirhynchus albus*) was Federally listed as an endangered species on September 6, 1990 (55 FR 36641-36647). The published range of this species includes the states of Arkansas, Illinois, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Tennessee. In 1993, the USFWS issued a recovery plan for the pallid sturgeon. The recovery plan outlined species recovery objectives and criteria and divides the species' range into six Recovery-Priority Management Areas (RPMA). These areas were identified as having recent pallid sturgeon records of occurrence, with the least degradation, highest habitat diversity, and the greatest potential for successfully returning the areas near to their pre-settlement conditions (Aron 2006). The USFWS initiated a 5-year review of this species (70 FR 39326-39327) which was completed and published on June 13, 2007. The results of this recent review recommended that no change is needed for the current listing status of the pallid sturgeon. It was recommended that the pallid sturgeon should remain Federally-listed endangered.

5.4.2 Current Status of the Species

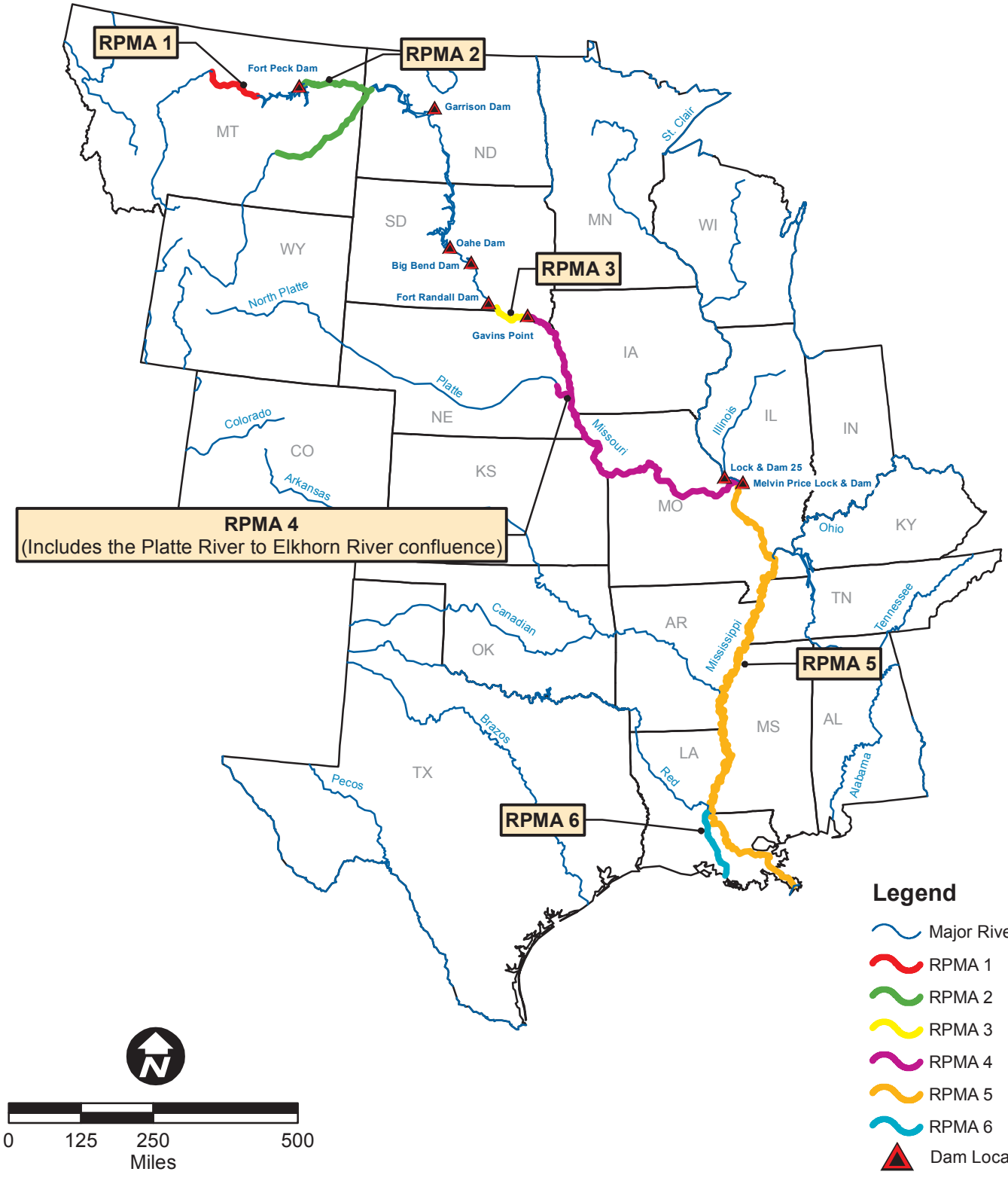
The pallid sturgeon is rare, but widely distributed throughout the Missouri River from its confluence with the Mississippi upstream to Fort Benton, Montana, the lower reaches of the Platte, Kansas, and Yellowstone rivers (tributaries of the Missouri River), the Mississippi River from Louisiana upstream to Keokuk, Iowa, including several major tributaries of the Mississippi such as the Atchafalaya River, Yazoo, and St. Francis rivers (USFWS, 1993). The total length of the species' range is approximately 5,656 km (3,515 mi) of river. The earliest record recognized by Bailey

and Cross (1954) was referred to by Cope (1879) as a shovelnose sturgeon. For most of the time since the pallid sturgeon was first described in 1905, fisherman and fisheries biologists did not readily distinguish between shovelnose and pallid sturgeon in their catches (Keenlyne 1989 as cited in Peters and Parham 2008). Today, historic references to very large individuals (greater than 5kg) of *Scaphirhynchus* spp. are now considered to be pallid sturgeon (Bailey and Cross 1954 as cited in Peters and Parham 2008).

Figure 8 displays a map of the pallid sturgeon range, including the six RPMA's. RPMA's 5 and 6 were designated downstream from the mouth of the Missouri River along the length of the Mississippi River. Pallid sturgeon have been regularly collected along the entire length of the Mississippi River (Hurley et al. 2004, Sheehan et al. 2000). Collections of pallid sturgeon have also been made in several small tributaries of the Mississippi River. RPMA 6 is the Atchafalaya River, separated from the Mississippi River by a river control structure. This control structure separates populations of pallid sturgeon in the Atchafalaya River from those in the Mississippi River (Peters and Parham 2008).

The Missouri River and its turbid tributaries was likely the core of the pallid sturgeon's historic range (Bailey and Allum 1962, Bailey and Cross 1954 as cited in Peters and Parham 2008). The entire Missouri River, from the mouth upstream to Great Falls, Montana, was available to pallid sturgeon prior to dam construction, which began in the 1930's, and channelization from Sioux City, Iowa downstream to the confluence with the Mississippi River. Today, much of the length from Fort Peck reservoir downstream to Gavins Point dam is now a lacustrine environment with short reaches of flowing water habitat. Pallid sturgeon were caught in the reservoirs for several decades after impoundment (Peters and Parham 2008), but today most of the specimens caught are senescing or are from stocked populations (USFWS 2007).

The longest RPMA on the Missouri River is RPMA 4. This reach begins at Gavins Point Dam and extends downstream to the confluence of the Missouri and Mississippi Rivers near St. Louis, Missouri. The lower Platte River, from the Elkhorn River confluence to the Missouri River confluence is included in RPMA 4. Recent studies have collected numerous pallid sturgeon in this segment and it has been the site of several releases of hatchery-reared pallid sturgeon (USFWS 2007). Sampling from 2005 to 2007 between Omaha, Nebraska and the Kansas River confluence, near Kansas City, Kansas, yielded 77 pallid sturgeon, 56 of which were known to be hatchery-reared individuals (Steffensen and Barada 2006, Steffensen and Hamel 2007, Steffensen and Hamel 2008).



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Loup Power District Hydro Project

Pallid Sturgeon Recovery Priority Management Areas

Loup River Hydroelectric Project
FERC Project No. 1256
Biological Asessment

DATE
November 2011

FIGURE
8

In April 2008, the NGPC participated in the first ever intensive broodstock collection effort for pallid sturgeon in RPMA 4. The purpose of this endeavor was to collect reproduction ready adult pallid sturgeon from the Missouri River to transport to fish hatcheries to help with breeding propagation efforts. A total of 168 pallid sturgeon were collected, 97 of which were known to be hatchery-reared and released into the Missouri River in 2004. Thirty-five of the pallid sturgeon caught were adults and were sent to fish hatcheries. The other 133 juvenile individuals were released back into the river. Three of the tagged juveniles that were collected had been released in the Missouri River above Gavins Point Dam and were collected downstream below the confluence of the Platte River.

The population of pallid sturgeon in RPMA 4 has been and continues to be intensively studied. There are several sites in RPMA 4 where stocking of hatchery-reared fish have taken place. Despite channel alterations and controlled reservoir releases altering habitat, pallid sturgeon are still able to migrate over the whole of this reach. By way of example, two pallid sturgeon captured in the Platte River had traveled 400 miles (greater than 660km) from their release location near Boonville, Missouri (Peters and Parham 2008).

Species of sturgeon across the globe are threatened by changes to riverine habitat and overfishing. Pallid sturgeon populations are extremely susceptible to threats because this species has never been as abundant as its more common counterpart, the shovelnose sturgeon. When the species was first described in 1905 (Forbes and Richardson as cited in USFWS 1993), it represented approximately one in five sturgeon in the lower Missouri River. Carlson et al. (1985) conducted a study on the Missouri and Mississippi rivers and found one pallid sturgeon in 647 sturgeon caught. In 1994, the ratio in the lower Missouri River was one pallid sturgeon to 341 shovelnose sturgeon (Doyle et al. 2005 as cited in Aron 2006). There has also been an apparent increase in hybridization between pallid and shovelnose sturgeon (Grady et al. February 2001).

Dam construction on the Missouri River has adversely impacted pallid sturgeon both by impeding their movement to spawning areas and by changing the flow and temperature regime, amounting to less suitable habitat along several parts of their historic range (Bailey and Cross 1954, Keenlyne 1989 as cited in Aron 2006). Little evidence has been found of spawning across the species' range, however some evidence to support spawning activity was found on several studies done on the lower Missouri River and Platte River (Peters and Parham 2008, Swigle 2003, USGS 2007). Larval fish released from Garrison Dam National Fish Hatchery in Montana during 2004 were recaptured in 2005, evidence that short term fry survival is occurring (Aron 2006). Juvenile recaptures of stocked populations have been increasing across the species' range, evidence that stocked juveniles are surviving and maturing.

5.4.3 Life History and Habitat Requirements

General Description

The pallid sturgeon was not described as a species until 1905 (Forbes and Richardson 1905, as cited in USFWS 1993). Prior to 1905, the pallid sturgeon was considered to be a different color morph of the shovelnose sturgeon. The relatively late recognition of the pallid sturgeon as a distinct species may have been because it was never very common. Pallid sturgeon have a flattened, shovel-shaped snout; long slender, and completely armored caudal peduncle (narrow part of body to which tail fin is attached); and lack a spiracle (small respiratory hole behind the eye of certain fishes). The mouth of the sturgeon is toothless, protusible, and ventrally positioned under the snout. Skeletal structure is primarily cartilaginous. Pallid sturgeon are similar in appearance to the more common shovelnose sturgeon. Principal features distinguishing pallid sturgeon from shovelnose sturgeon are the number of ribs (21 to 22 in pallid vs. 10 or 11 in shovelnose), the naked breast and belly in pallid sturgeon and the presence of sub-rhombic plates on the shovelnose sturgeon, and the length of the air bladder to standard length (8 times in pallid and 5 times in shovelnose) (Forbes and Richardson 1905).

Further analysis displayed other differentiating characteristics of pallid sturgeon. Morphological character indexes have been developed and proved useful for field identification of the sturgeon species. Recent studies have built upon the previous work and used several qualitative characters, such as shape of papillae on the barbells and lip lobes and the shape of gill rakers to distinguish pallid sturgeon from shovelnose sturgeon (Kuhajda et al. 2007).

After the eggs hatch, larval fish begin to drift downstream from the hatching site and settle in the lower portions of the water column. The distance of drift depends on water velocity, but can be more than 124 miles. Pallid sturgeon are considered juveniles when their gonads develop. Younger juveniles consume primarily macroinvertebrates while older juveniles are piscivorous (Gerrity et al., 2006).

Pallid sturgeon life history is not well known, especially in the early life stages (Wildhaber et al., 2007). Although the requirements for reproduction and spawning of the pallid sturgeon are not well understood, pallid sturgeon are thought to spawn in swift water over gravel, cobble, or other hard surfaces (USFWS, 1993). Pallid sturgeon are slow to reach maturity, with males reproducing at 5 to 7 years of age and females first spawning at 15 to 20 years of age (Keenlyne and Jenkins, 1993). Little is known about the lifespan of these fish in the wild; however, it is estimated that pallid sturgeon may attain ages greater than 40 years (Keenlyne and Jenkins, 1993). Spawning typically occurs between June and August (U.S. Environmental Protection Agency [EPA], 2007) with females typically not spawning on an annual basis, but rather on a 3- to 5-year interval. Difficulties have arisen in studying spawning habits of pallid sturgeon as a result of the turbid water conditions in large rivers inhabited by this species. Spawning is thought to occur in the Missouri River in mid-May to early

June when water temperatures and flows reach a certain level to allow for increased fish movement (USFWS, 1993). It is not fully understood what cues spawning movements in this species.

There have been no direct observations of natural reproduction of pallid sturgeon (Peters and Parham 2008). DeLonay et al. (USGS 2007) was able to track radio tagged shovelnose sturgeon as they moved upstream, spawned, and moved downstream. Simpkins and LaBay (USGS 2007) used egg mats in the Missouri River to collect sturgeon eggs from locations where reproductively mature shovelnose sturgeon were tracked using radio telemetry.

In the Platte River there have been no observations of pallid sturgeon reproduction, but *Scaphirhynchus* spp. larvae (could not identify species) have been collected (Peters and Parham 2008); however, shovelnose sturgeon (*Scaphirhynchus platorynchus*) frequently use the lower Platte River, as evidenced by Hamel et al. (2011). *Scaphirhynchus* spp. larve were collected in the Platte River from May 15 to June 24 and in water temperatures that ranged from 13.6 to 27.4°Celsius (C) (Peters and Parham 2008).

All known sturgeon spawning areas occur in freshwater rivers and streams over gravel and rock substrates. This information has been used to draw conclusions about where pallid sturgeon might spawn (Laustrup et al. 2007, USGS 2007, Wildhaber et al. 2007). Knowledge of where pallid sturgeon spawn is limited by this species low population density and the 3 to 4 year time interval between spawning events by an individual female (Peters and Parham 2008). In the Platte River, two pallid sturgeon implanted with radio transmitters moved downstream into the Missouri River at the same time that sturgeon larvae were collected. One of these pallid sturgeon had eggs when it was implanted and spent nearly a month in the Platte River before moving into the Missouri River at about the same time that the sturgeon larvae were collected. When recaptured in the Missouri, it was determined that the female no longer had eggs and it was assumed that she had spawned in the lower Platte River (Peters and Parham 2008, Swigle 2003).

A recovery strategy outlined in the pallid sturgeon recovery plan (USFWS 1993) includes stocking of fish from hatcheries to supplement the wild populations. Artificial propagation and stocking require careful considerations of the source of the parental stock which are used to provide fish for a specific stocking locale (Peters and Parham 2008, USFWS 2007). As wild pallid sturgeon in certain areas of the Missouri reach senescence and die from old age, the propagation and stocking program concerns are becoming more critical (Schrey and Heist 2007). Between 1994, when the stocking program began, and 2004 nearly 62,000 pallid sturgeon have been stocked in RPMA 4 (Krentz et al. 2005). As part of this effort, 401 tagged pallid sturgeon were stocked in the Platte River in 1997 at the Nebraska Highway 50 Bridge. In 1998, a total of 84 age-6 pallid sturgeon, of which 10 were implanted with radio transmitters, were released in the Platte River at Two Rivers State Recreation Area

(RM 40). In 1999, 15 additional radio implanted pallid sturgeon were released at Two Rivers State Recreation Area (Peters and Parham 2008). Plans are currently being made for additional stockings in the lower Platte River, although nothing has been funded or finalized to date.

Movements and Migration

Pallid sturgeon have been documented making long distance movements during their life history (USGS 2007, Wildhaber et al. 2007, Peters and Parham 2008, NGPC December 2008). During the free-embryo and larval life stages, pallid sturgeon drift with the current. Juvenile individuals have been tracked moving downstream (Kynard et al. 2007). Peters and Parham (2008) stated that there have been no definitive relationships drawn between pallid sturgeon movements and spawning activities, however studies done by USGS (2007) and Wildhaber et al. (2007) noted that shovelnose sturgeon (often used as a pallid sturgeon surrogate) have exhibited spawning migrations when they are physiologically ready to spawn.

Pallid sturgeon have been observed moving in and out of the lower Platte River. Between 2001 and 2004, Peters and Parham (2008) and Swigle (2003) documented pallid sturgeon in sampling gear in the Platte River as early as April 2 and the latest date on which one was caught was September 25. From this group, individuals implanted with radio tags were documented exiting the Platte River by June 9 (Peters and Parham 2008, Swigle 2003). A female pallid sturgeon captured on May 3, 2001, in the Platte River contained visible eggs and moved out of the river at the same time as sturgeon larvae were collected. On May 23, 2002, a pallid sturgeon, which had apparently spawned, was captured and it also moved downstream at the same time as other sturgeon larvae were collected (Peters and Parham 2008). Of 25 hatchery-reared pallid sturgeon juveniles (ages 6 and 7) implanted with radio tags and released into the Platte River during April of 1998 and 1999, six individuals either remained in the Platte throughout the year or returned to the Platte from the Missouri River the spring following release (Snook 2002 as cited in Peters and Parham 2008).

In a three year Sturgeon Management Study conducted by Hamel et al. (August 2011), pallid sturgeon have been captured at various locations throughout the lower Platte River. During the most recent survey, in summer of 2011, twelve pallid sturgeon were captured in the lower Platte River (Hamel et al., August 2011).

Diet

Food habits of this species range from aquatic invertebrates to fish, depending on life stage (Gerrity et al. 2006, Peters and Parham 2008). Morphology studies of the mouth of pallid sturgeon reveal that they have the capability to protrude their mouth towards their prey and close it before retracting it, similar to sharks (Carroll and Wainwright 2003). Wanner et al. (2007) and Gerrity et al. (2006) (as cited in Peters and Parham 2008) used gastric lavage to sample the stomach contents of hatchery-reared pallid sturgeon and both studies found that juvenile pallid sturgeon were piscivorous.

Hoover et al (2007) used a colonic flushing technique and also found that fish, especially Macrhybopsis (chubs) spp., were a large portion of the pallid sturgeon diet. Comparing shovelnose and pallid sturgeon food habits have indicated that early in their life cycles they both feed on invertebrates, especially Ephemeroptera and Chironomids. However, results of a study done by Gerrity et al. (2006) on wild caught juvenile pallid and shovelnose sturgeon confirmed that juvenile pallid sturgeon and juvenile shovelnose sturgeon use different food resources. The study found that fish were an important diet component of juvenile pallid sturgeon, while juvenile shovelnose sturgeon fed primarily on aquatic insects. No pallid sturgeon specimens from the Platte River system have been analyzed for their stomach contents, so it is unknown what feeding habits occur in the lower Platte River; however, it is reasonable to assume they are similar to feeding habits in the Missouri River.

Several studies have reported that pallid sturgeon feed specifically on native minnow species and show preference toward species of the genus *Macrhybopsis* (Gerrity et al. 2006, Hoover et al. 2007, Wanner et al. 2007). Four species of chubs (*Macrhybopsis hyostoma*, *M. storeriana*, *M. gelida*, *Platygobio gracilis*) have been collected from the Platte River and are all potential prey items of juvenile and adult pallid sturgeon.

There have been no published studies on direct competition between pallid sturgeon and other species for available forage, but several publications have discussed this topic. Potential overlaps in diet with other species sympatric with pallid sturgeon are evident, especially during larval and juvenile life stages. Studies throughout the range of pallid sturgeon have found a diversity of species which share the habitat (Peters and Parham 2008, Peters and Parham 2008).

Habitat Requirements

Pallid sturgeon are considered to be well adapted for life on the bottom in swift waters of large, turbid, free-flowing rivers (USFWS 1993). Pallid sturgeon evolved in the diverse and ephemeral environments of the Missouri and Mississippi Rivers. The historic floodplain habitat of the Missouri and Mississippi Rivers provided important functions for native large-river fish, such as the pallid sturgeon. Floodplains were considered the major source of organic matter, sediments, and woody debris for the main stem rivers when flood flows crested the river banks. The transition zone between the vegetated floodplain and the main channel included habitats with variable depths described as chutes, sloughs, and side channels. The still waters in this transition zone allowed organic material, important to macroinvertebrate production, to accumulate. Both shovelnose and pallid sturgeon during their different life stages have a high incidence of feeding on aquatic macroinvertebrates, making these chutes and backwaters an inviting place for feeding. Flood flows connect these important habitats and allowed fish from the main channel to utilize these habitat areas for feeding (USFWS 1993). While most habitat descriptions are based on juvenile or adult life stage fish, the habitat used by different life stages of pallid sturgeon vary widely (Wildhaber et al. 2007).

Channel Shape and Structure

Historically, the range of the pallid sturgeon was comprised of large rivers with shallow braided channels and shifting sand bars (Peters and Parham 2008). The lower Platte River still retains this type of habitat. Pallid sturgeon in the lower Platte River use areas associated with the downstream ends of sand bars and in deeper channels along the edges of sand bars (Peters and Parham 2008, Swigle 2003). The lower Platte River includes the complex of shallow sandbar and swift deeper channel habitats which have been described as preferred conditions for adult and juvenile pallid sturgeon (Peters and Parham 2008). In the channelized sections of the lower Missouri River (RPMA 4) pallid sturgeon have been documented in areas near wing dikes (Jacobson et al. 2007, Laustrup et al. 2007). In the upper Missouri and Yellowstone Rivers, studies have found pallid sturgeon were commonly located in areas with sand bars and sandy substrates (Bramblett and White 2001).

Discharge and Flow

River discharge can influence the amount, quality, and/or accessibility of riverine habitats of pallid sturgeon. In the Platte River, the amount and accessibility of habitat for the pallid sturgeon is related to discharge (Peters and Parham 2008). High discharge events produce flow velocities that scour deeper channels and deposit sandbars which create and maintain the habitats favored by pallid sturgeon. Over the past century, water withdrawals have altered the volume and timing of flows in the lower Platte River (Ginting et al. 2008, NRC 2005, Parham 2007). An analysis of lower Platte River flows in relation to sturgeon habitat has indicated the need to protect at least a portion of the current flows below the Elkhorn and the annual discharge pattern to maintain the current habitat (Parham 2007, Peters and Parham 2008). The NGPC currently holds an in-stream flow right in the lower Platte River in an attempt to address this. There is considerable debate and uncertainty in the scientific community regarding the appropriate magnitude and frequency of flows necessary to maintain pallid sturgeon habitat. Presently, the habitat within the lower Platte River, specifically below the confluence with the Elkhorn River, has proven to be more than adequate pallid sturgeon habitat.

Depth

Recorded depths where pallid sturgeon are found is widely variable. Most studies have shown that pallid sturgeon prefer to use the deepest water available, which conforms to other habitat requirements. A study done on juvenile pallid sturgeon in a laboratory flume found the fish to be using deep water habitats (73-93cm) more than expected (Allen et al. 2007). A range of water depths where pallid sturgeon were found in the Missouri River in South Dakota were 4 to 5 m in depth (Erickson 1992). In Montana, pallid sturgeon were captured from depths that ranged from 1.2 to 3.7 m in the summer, but were captured in deeper waters during winter (USFWS 1993).

Juvenile pallid sturgeon in the Yellowstone and upper Missouri rivers (RPMA 1, 2) used depths which averaged 2.3 to 2.48m (Gerrity et al. 2008). Adults in these same areas were using depths between 0.9m and 14.5m (Bramblett and White 2001). In the lower Missouri River pallid sturgeon used depths greater than 2.0m (Spindler 2008). Larval pallid sturgeon in the upper Mississippi River were captured in trawls at depths from 2.1 to 3.6m (Hrabik et al. 2007).

In the lower Platte River, Snook (2001) studied radio-tagged, hatchery-reared pallid sturgeon and found them to be using depths which ranged from 0.33 to 1.21m. Peters and Parham (2008) found specimens caught in the Platte River using depths at an average of 1.27m. Depths at which fish were caught during the Peters and Parham (2008) study from 2001 to 2005 averaged 1.58m. All of these marked depths were deeper than those generally available in the lower Platte River, indicating that pallid sturgeon were selecting for the deepest water available and avoiding water less than 0.8m deep (Peters and Parham 2008).

Velocity

Several studies have been done on pallid sturgeon preference of velocity. Generally, pallid sturgeon have been found in the Missouri River in deep pools at the downstream ends of chutes and sand bars in the slower currents (USFWS 1993). Findings from a study on the Missouri River in South Dakota indicate that pallid sturgeon most frequently occupy river bottoms where velocity ranges from 0.10 to 0.30 m/s (Erickson 1992). Studies on microhabitat selection in Montana found pallid sturgeon are most frequently associated with water velocity ranging from 0.40 to 0.90 m/s (USFWS 1993).

In the lower Platte River, recent studies have shown pallid sturgeon appear to avoid waters with mean column velocities slower than 0.7m/s and prefer waters with a bottom velocity slower than 0.9m/s. Mean column velocity at the point of capture of pallid sturgeon averaged 0.79m/s (Peters and Parham 2008). Bottom velocity at the point of capture by trotlines, drifted gill nets, and drifted trammel nets ranged from 0.17 to 0.54m/s and averaged 0.33m/s. Snook (2001) located hatchery-reared pallid sturgeon at mean column velocities which ranged from 0.05 to 1.26m/s. Bottom velocities for this study ranged from 0.03 to 0.88m/s. Peters and Parham (2008) and Swigle (2003) using telemetry to study pallid sturgeon in the Platte River (both presumed wild and stocked fish) found the fish located at mean column velocities which ranged from 0.52 to 0.82m/s. Bottom velocities for these studies ranged from 0.21 to 0.55m/s.

Substrate

Pallid sturgeon are most frequently caught over a sand bottom, which is the predominant bottom substrate within the species range on the Missouri and Mississippi rivers. Bramblett and White (2001), Hurley et al. (2004), Peters and Parham (2008), Snook (2001), and Swigle (2003) all note the preponderance of use of sand substrate by pallid sturgeon. In a laboratory study (Allen et al. 2007), juvenile pallid sturgeon were found to used sand to a greater degree than expected and gravel to a lesser degree. In the Platte River, pallid sturgeon show a strong preference for sandy substrates. Pallid sturgeon were located using telemetry over 99.6% sand, 0.4% silt, and 0% gravel substrate areas (Peters and Parham 2008, Snook 2001, Swigle 2003).

Temperature

Pallid sturgeon inhabit areas where water temperatures range from 0°C to 30°C (32°F to 86°F), which is the range of water temperature on the Missouri and Mississippi Rivers. There have been very few studies to indicate temperature preference or the effects of temperature on the species. Curtis (1990 as cited in USFWS 1993) found no relation between surface water temperatures and depth used by shovelnose sturgeon on the Mississippi River and no indication that shovelnose sturgeon were moving into deeper, cooler water (if available) as water temperature increased. Because there is little information available on pallid sturgeon spawning, spawning requirements with regard to temperature are extrapolated from what is known regarding shovelnose sturgeon spawning. Shovelnose sturgeon spawn in the Missouri River near Vermillion, South Dakota, when water temperatures reach 18°C to 19°C (64°F to 66°F) in late May to June (Moos 1978 as cited in USFWS 1993). Shovelnose sturgeon spawning in the Tongue River, Montana, a tributary to the Yellowstone River, occurs from early June to mid-July at water temperatures between 16.9°C and 21.5°C (61°F to 70°F) (Elser et al. 1977 as cited in USFWS 1993).

In a laboratory setting, Adams et al. (2003) found that temperature was a major factor in the critical swimming speed that juvenile pallid sturgeon could maintain for a period of time in a flume setting. At 10°C they could maintain a slower speed (15.05cm/s) while at 20°C they could maintain a much faster speed (35.93cm/s). Hurley et al. (2004) found differences in the habitats used by pallid sturgeon above versus below 10°C. In the Platte River, temperature at the point of capture of pallid sturgeon by trotline or net ranged from 9.9 to 24.9°C and averaged around 15°C (Peters and Parham 2008). Snook (2001) found temperatures at radio telemetry locations of hatchery-reared pallid sturgeon in the lower Platte River ranged between 11.4 to 33.7°C. Telemetry studies conducted by Peters and Parham (2008) and Swigle (2003) found pallid sturgeon located at temperatures ranging from 3.5 to 24.9°C.

Turbidity/Suspended Solids

Pallid sturgeon historically occupied turbid river systems. Erickson (1992) studied pallid sturgeon habitat preference in South Dakota and found turbidity levels where pallid sturgeon were collected in the range from 31.3 Nephelometric turbidity units (NTU) to 137.6 NTU. In a laboratory study (Allen et al. 2007), juvenile pallid sturgeon used dark and very dark conditions to a greater extent than expected while avoiding cover. Studies of the retina of pallid sturgeon indicate adaptation to a turbid environment (Sillman 2005).

In the Platte River, suspended solids concentrations at the point of capture of pallid sturgeon ranged from 110.5 to 336mg/L and averaged 171.5mg/L (Peters and Parham 2008). Total suspended solids concentrations at telemetry locations of pallid sturgeon ranged from 86 to 1,228mg/L and averaged 385mg/L (Peters and Parham 2008, Swigle 2003).

5.4.4 Current Distribution in the Action Area

Historically, very few studies have been done on populations of pallid sturgeon in the Platte River. The earliest documented record of pallid sturgeon in the Platte River was a specimen collected near the mouth of the Elkhorn River in May 1979. Between 1979 and 2001, a total of 10 pallid sturgeon in the Platte and Elkhorn Rivers were captured by anglers in the Platte River and confirmed by NGPC (Peters and Parham 2008). Peters and Parham (2008) and Swigle (2003) captured 15 pallid sturgeon from the Platte River down stream from the mouth of the Elkhorn River from 2001 to 2004. This was the first concerted effort to capture pallid sturgeon in the Platte River. The presence of tags and markings on these fish indicated that at least 6 of the 15 were hatchery-reared.

Within the Action Area, the lower Platte River provides the best habitat for pallid sturgeon. The lower Platte River maintains its braided channel pattern and provides sandy substrates, slower currents for energy conservation and foraging, shallower feeding areas, and convergent flow areas around sandbars and islands that pallid sturgeon prefer. Habitat availability is greatest in the lower Platte River below the Elkhorn River confluence. This section appears to retain most of the appropriate habitat conditions and the connectivity that reliably allows use by pallid sturgeon (National Research Council, 2005). This is likely due to higher flows resulting from inflows of the Elkhorn River and Salt Creek. However, based on recent findings of the Sturgeon Management Study, the lower Platte River appears to afford pallid sturgeon usable habitat up to the vicinity of the Tailrace Return near Columbus.

Pallid sturgeon have been captured in the Elkhorn River, but there are no other known habitats for pallid sturgeon in tributaries of the lower Platte River system or in nearby Missouri River tributaries. Current habitat in the lower Platte River supports a diversity of populations of fish and other species, which form an interacting community that can support populations of adult and juvenile pallid sturgeon (Peters

and Parham, 2008). However, the low flow and higher temperatures likely prevent or inhibit the use of the lower Platte River during the warm summer months. Regular movement and migration of pallid sturgeon into and out of the lower Platte River are indicators that the population is healthy and that the current habitat is suitable for adult and juvenile pallid sturgeon (Peters and Parham, 2008). In the Platte River, the amount and accessibility of habitat for pallid sturgeon are related to discharge (Peters and Parham, 2008). High discharge events produce flow velocities that scour deeper channels and deposit sandbars, which create and maintain the habitats favored by pallid sturgeon.

Since 1997, pallid sturgeon have been stocked in the lower Platte and Missouri rivers to attempt to augment their recovery from endangered status (Krentz et al., May 12, 2005). In 1997, 401 pallid sturgeon were stocked in the Platte River at the Nebraska Highway 50 bridge. Prior to 2009, there were no known occurrences of pallid sturgeon located upstream of the Elkhorn River confluence. The most recent survey at that time was performed by Peters and Parham (2008) and documented the nearest pallid sturgeon occurrence in the lower Platte River at the confluence of the Elkhorn and Platte rivers, approximately 69 miles downstream of the Project.

The Sturgeon Management Study currently being conducted by the University of Nebraska, Lincoln (Hamel et al., 2011) has captured pallid sturgeon as far as RM 96, just downstream of the tailrace confluence, although the majority of the captures were located downstream of the confluence with the Elkhorn River at RM 32.3. Prior to 2009, pallid sturgeon have not been documented upstream of RM 32.3. In 2009, 69 pallid sturgeon were captured in the lower Platte River, three of which were located upstream of RM 32.3 (Hamel et al., January 2010). During year two (2010) of the same study, 39 pallid sturgeon were documented in the lower Platte River, with five located above RM 32.3 (Hamel et al., August 2011). During the 2011 study, 12 pallid sturgeon were captured in the lower Platte River, with two located upstream of RM 32.3 (Hamel et al., August 2011). The majority of pallid sturgeon captures have been documented in April and May, which is a typical migration time period for this species. The past three years (2009, 2010, and 2011) during which the Sturgeon Management Study in the lower Platte River has been conducted, have been considered to have mostly average to higher than average flows, which may explain why pallid are being captured further upstream than previously documented. There are no documented occurrences of pallid sturgeon in the Loup River or the Loup Power Canal. The pallid sturgeon is not currently known to occur within the Project Boundary.

5.4.5 Critical Habitat

Critical habitat, as described by the ESA, has not been designated for the pallid sturgeon.

5.5 Western Prairie Fringed Orchid

5.5.1 Background

The Western prairie fringed orchid (*Platanthera praeclara*) was Federally listed as a threatened species on September 28, 1989 (57 FR 39857-39864). The Western prairie fringed orchid is restricted to west of the Mississippi River and currently occurs in Iowa, Kansas, Minnesota, Nebraska, North Dakota and in Manitoba, Canada. This species has also been documented in South Dakota and Wyoming (USDA 2009). In 1996, the USFWS issued a recovery plan for the western prairie fringed orchid. The USFWS initiated a 5-year review of this species (71 FR 16176-16177) and the review was published on April 27, 2009. The review concluded that no change is warranted in the listing status of the western prairie fringed orchid and that the species should remain listed as threatened (USFWS, February 2009).

5.5.2 Current Status of the Species

The western prairie fringed orchid continues to decline across its historic range, with less than forty percent remaining (USFWS, May 3, 2011). Currently, known populations exist in six states (Iowa, Kansas, Minnesota, Missouri, Nebraska, and North Dakota) and Canada (USFWS, March 14, 2011). The largest population of concentrated orchids is located in North Dakota. Large populations also exist in Manitoba and northwest Minnesota. Smaller population complexes exist in Nebraska, Minnesota, and Iowa (USFWS, May 3, 2011). Surveys completed in 1996 by USFWS for the Western Prairie Fringed Orchid Recovery Plan documented known populations in six counties in Nebraska (Cherry, Hall, Lancaster, Otoe, Sarpy, and Seward) (USFWS, 1996). Currently, extant populations are known to occur in 18 counties and may occur at other sites in Nebraska. No extant populations are known to occur within Nance or Platte counties.

5.5.3 Life History and Habitat Requirements

The Western prairie fringed orchid is found in the eastern two-thirds of Nebraska, from Cherry and Keith counties in the west to the Missouri River in the east. This species is a perennial orchid found in wet-mesic to mesic tallgrass prairie, specifically in unplowed, calcareous prairies and sedge meadows. The soils in this region are usually Udolls or Udic Ustolls (humid to intermittently dry mollisols, or prairie soils) on gentle to moderate slopes. In tallgrass prairies, the Western prairie fringed orchid is typically associated with big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and little bluestem (*Schizachyrium scoparium*). This species is commonly associated with tufted hairgrass (*Deschampsia caespitosa*) and switchgrass

(*Panicum virgatum*) in wetter growth sites. In sedge meadows, this species is often dominated by sedges (*Carex* spp.) and spikerushes (*Eleocharis* spp.) (USFWS, 1996). There is evidence that orchid ecology is tied to mycorrhizal associations (symbiotic relationship between soil fungi and roots of plant) (USFWS, February 2009). In Nebraska, this orchid blooms almost exclusively from the last week of June to the first two weeks of July. Flowering may be suppressed by litter accumulation and stimulated by fire (USFWS, 1996). Flowers may be displayed for up to 21 days, with most individual flowers lasting 10 days (USFWS, March 14, 2011). Flowers must be pollinated for seed production and pollination is only accomplished by hawkmoths. Seeds are dispersed by wind and flooding.

5.5.4 Current Distribution in the Action Area

Currently, there are no known populations of Western prairie fringed orchids in Platte or Nance counties or in the Project Boundary. No areas within the Project Boundary contains suitable habitat for this species. Nebraska Natural Heritage Program searches did not find any known populations of western prairie fringed orchid within the vicinity of the Project Boundary. A recent revision of this species range (NNHP, May 2011) does not list Platte or Nance counties as being within this species range.

5.5.5 Critical Habitat

Critical habitat, as described by the ESA, has not been designated for the western prairie fringed orchid.

6. EFFECTS OF THE ACTION ON LISTED SPECIES

The District has conducted a series of studies within the Project Boundary and associated Action Area to examine potential Project effects on existing Federally listed Threatened or Endangered species. The summary of these Project effects is found below.

6.1 Interior Least Tern and Piping Plover

Interior least terns and piping plovers are known to occur within the Project Boundary and the Action Area. These species nest and forage on the North Sand Management Area (North SMA), along the Loup River bypass reach, and the lower Platte River.

6.1.1 North Sand Management Area

The District dredges out the settling basin adjacent to the North SMA every spring and fall in order to maintain flow in the power canal. The dredging operations provide an important source of water and food to the North SMA for a variety of species, including interior least terns and piping plovers. The potential exists that slurry water from the District's dredging operations at the North SMA could inundate nests, if these species nest near one of the outlet pipes; however, the District continues to work with the USFWS, NGPC, and the TPCP to suspend dredging operations when the

birds arrive in early May and resume dredging after the birds leave in August. If dredging were to cease year round, the North SMA would no longer be actively managed and would become vegetated and unsuitable for nesting without the addition of new dredged material. Because the District is working cooperatively with the agencies to avoid harm to these species by suspending dredging during the nesting season, the dredging operations at the North SMA would have beneficial effects on the habitat used by interior least terns and piping plovers by providing a source of water and food for these species, as well as replenishing nesting substrate. Effects of continued dredging operations would also be beneficial by continuing to provide a large expanse of open, unvegetated sand for these species.

In addition to the District's efforts to protect these species, Preferred Sands, the sand and gravel mining company that is leasing the North SMA from the District, has entered into an MOU with USFWS and NGPC, to which the District and the TPCP are cooperators. The MOU requires the development of an Adaptive Management Plan (AMP) for interior least terns and piping plovers, which was developed in 2008 and has been successful in enhancing habitat through the development of foraging ponds, clearing of vegetation, and protecting nesting birds while allowing Preferred Sands to continue their mining operations. The MOU and the associated AMP have had a beneficial effect on interior least terns and piping plovers on the North SMA, as demonstrated by above average fledging ratios in 2008 and 2009 (Bomberger-Brown, 2010).

6.1.2 Recreational Areas within the Project Boundary

The District provides public access for recreation to several sites within the Project Boundary, including Headworks Park which includes a 1,200-acre Off-Highway Vehicle (OHV) Park south of the power canal. The OHV Park operates from late September to early March and late May to early August. The area designated for the OHV Park, while adjacent to the Loup River and North SMA, has no record of nesting occurring. Although large expanses of sandy areas exist, the area may be undesirable nesting habitat due to it being surrounded by tall vegetation (mostly trees and shrubs), has limited sight distance for predators, is distant from water sources, and has considerable human activity during the nesting season. However, OHV use in this area could influence interior least tern and piping plover nest site selection and productivity.

6.1.3 Flow Depletion of the Loup River Bypass Reach

There are some differences in Loup River channel geometry (width, depth, etc) below the Diversion Weir as compared to above the Diversion Weir. However, there has been very little documented use of the Loup River for interior least tern and piping plover nesting, both above and below the Diversion Weir. Because of the lack of data, it is not possible to make a statistical comparison to determine if the differences in channel geometry are affecting use by interior least terns or piping plovers.

6.1.4 Sediment Removal

The results of relicensing Study 1.0 Sedimentation demonstrate that the available supply of sediment far exceeds both the Loup and lower Platte rivers' capacity to transport sediment (that is, the Loup River bypass reach and lower Platte River are not supply limited). Both the Loup River bypass reach and lower Platte River are in dynamic equilibrium and are well-seated in the braided morphology regime. No trend toward a different morphology is occurring or will occur under the District's proposed operating scenario.

In the Loup River bypass reach, the diversion of an average of 69% of Loup River flow to the canal, has reduced the average capacity of the bypass reach. However, since the diversion structure is not a dam, the remaining water flowing down the bypass reach is still carrying sediment at capacity and the Loup bypass reach is able to remain a braided river and in dynamic equilibrium. The Loup River bypass reach has adjusted to the diversion of both water and sediment. The analysis performed in relicensing Study 1.0 Sedimentation showed there was no aggradational or degradational trend occurring nor will one likely occur in the future. Therefore, current operations, which include flow diversion and sediment removal via dredging of the Settling Basin, do not effect sandbar formation in the Loup River bypass reach.

Downstream of the confluence with the Tailrace Canal, the lower Platte River has the full flow of both the Loup and Platte Rivers and is carrying sediment at full capacity. The analysis performed in relicensing Study 1.0 Sedimentation showed there was no aggradational or degradational trend occurring nor will one likely occur in the future. The lower Platte River has adjusted to the large sediment supply coming from upstream and the inflow of the Tailrace Canal. Therefore, current operations, which include the inflow from the Tailrace return, do not effect sandbar formation.

Because the Project's sediment removal operations have no effect on the braided channel morphology, which creates sandbars that may be used by interior least terns and piping plovers, the Project's sediment removal operations have no effect on any sandbars associated with the braided regime. Because no trend toward a different morphology is occurring or will occur in both the Loup bypass reach and in the lower Platte River under the District's proposed operating scenario, the proposed Project would not impact morphology, sandbars, or its suitability for interior least terns and piping plovers.

6.1.5 Sediment Transport

The Sedimentation Study conducted by the District included an analysis to determine if a statistically significant relationship between sediment transport parameters and interior least tern and piping plover nest counts existed. Sediment transport parameters included effective and dominant discharge, and total sediment transported, as well as flow related parameters. The initial results of this analysis indicated no significant relationship between interior least tern and piping plover nest counts and

sediment transport indicators. No evidence from this analysis was discovered that would suggest that a relationship exists between nest counts and sediment transport indicators or hydrologic parameters.

Supplemental statistical analysis of interior least tern data by river mile for RM 102 to RM 72 used binary logistic regression, multiple linear regression, nonparametric methods, and one-way ANOVA to evaluate if the hydrologic variables could explain nest count numbers and, as a result, could be an influencing factor in nesting of interior least terns on the lower Platte River. The results of these analyses are as follows:

- Nest counts were weakly associated with number of data collection visits per year, but strongly associated with interior least tern adult counts, which were also weakly associated with number of data collection visits.
- No association was detected between summed nest counts and river mile, which indicates that variability in nest counts is not associated with proximity to the Tailrace Return.
- A period of relatively high nest counts from 1987 to 1995 was followed by a period of lower but also static nest counts from 1995 to 2008 between RM 102 and RM 72; this dichotomy is not associated with Project operations.
- Binary logistic regression analysis failed to detect a measurable relationship between presence or absence of interior least tern nests and ranked calendar year, river mile, peak mean daily flow, percent diverted flow, or any combination of these variables.
- Nonparametric correlation studies suggested annual percent diverted flow as a weak but statistically significant predictor of nest counts summed by river mile. This relationship was demonstrated to be spurious following more thorough examination of results of multiple linear regression analyses.
- One-way ANOVA determined that changes in peak mean daily flow between years in relation to nest counts is statistically significant, providing evidence in support of the theory that high flows followed by low flows may be beneficial for interior least tern nesting. However, effect of flow on nest frequency is difficult to gauge from the current data because of extreme variability in the frequency and locations of annual nest counts.
- One-way ANOVA also determined that changes in flow between river miles is not statistically significant in relation to nest counts.

Based on this statistical analysis, Project operations are not statistically related to nest locations or numbers based on the best available nest count data.

6.1.6 Hydrocycling

Hydrocycling operations are known to increase the peak flow of a natural hydrograph. In the Hydrocycling Study (Study 2.0) conducted by the District, during dry conditions, the average difference in water surface elevation between the current operations seasonal hydrograph maximum and the run-of-river seasonal hydrograph maximum directly below the tailrace is approximately 0.82 feet. The difference decreases with distance downstream from the Tailrace Return. The difference is less pronounced during normal or wet conditions; however, a difference still exists. Project hydrocycling operations result in higher flows and stage on a daily basis than a run-of-river scenario; however, according to the hydrocycling study conducted by the District, a comparison of nesting season flows for run-of-river operations and current operations indicated that exceedances of the pre-nesting season benchmark flows are a result of natural high flow events. The pre-nesting season benchmark flows were used as a surrogate for sandbar elevation and potential maximum nesting elevation (with the understanding that nest locations may, in actuality, be above or below this surrogate elevation). All benchmark exceedances under current operations were due to high flow events that also caused benchmark exceedances under run-of-river operations and under no circumstance would an exceedance of a benchmark flow been avoided by run-of-river operational changes.

From a tern and plover nesting behavior perspective, terns and plovers select their nest location at some elevation above the daily hydrograph. This elevation is variable and not absolute. Assuming that the daily peak sets the elevation for which a bird will determine an elevation to nest at, the relative elevation above the wetted sand of a sand bar would be the same for current operations and a run-of-river scenario.

During a storm event, there is a net change in the peak elevation of a daily hydrograph (that is, pre-storm event maximum daily flow to post-storm event maximum daily flow). This is illustrated from June 15 through June 17, 2009, in Figure 9. This also shows that the magnitude of change from a pre- to post-storm event was typically very similar (within a reasonable range of the accuracy of measurement) for current operations and run-of-river operations, as demonstrated by the water surface elevation difference on June 16, 2009, in Figure 9.

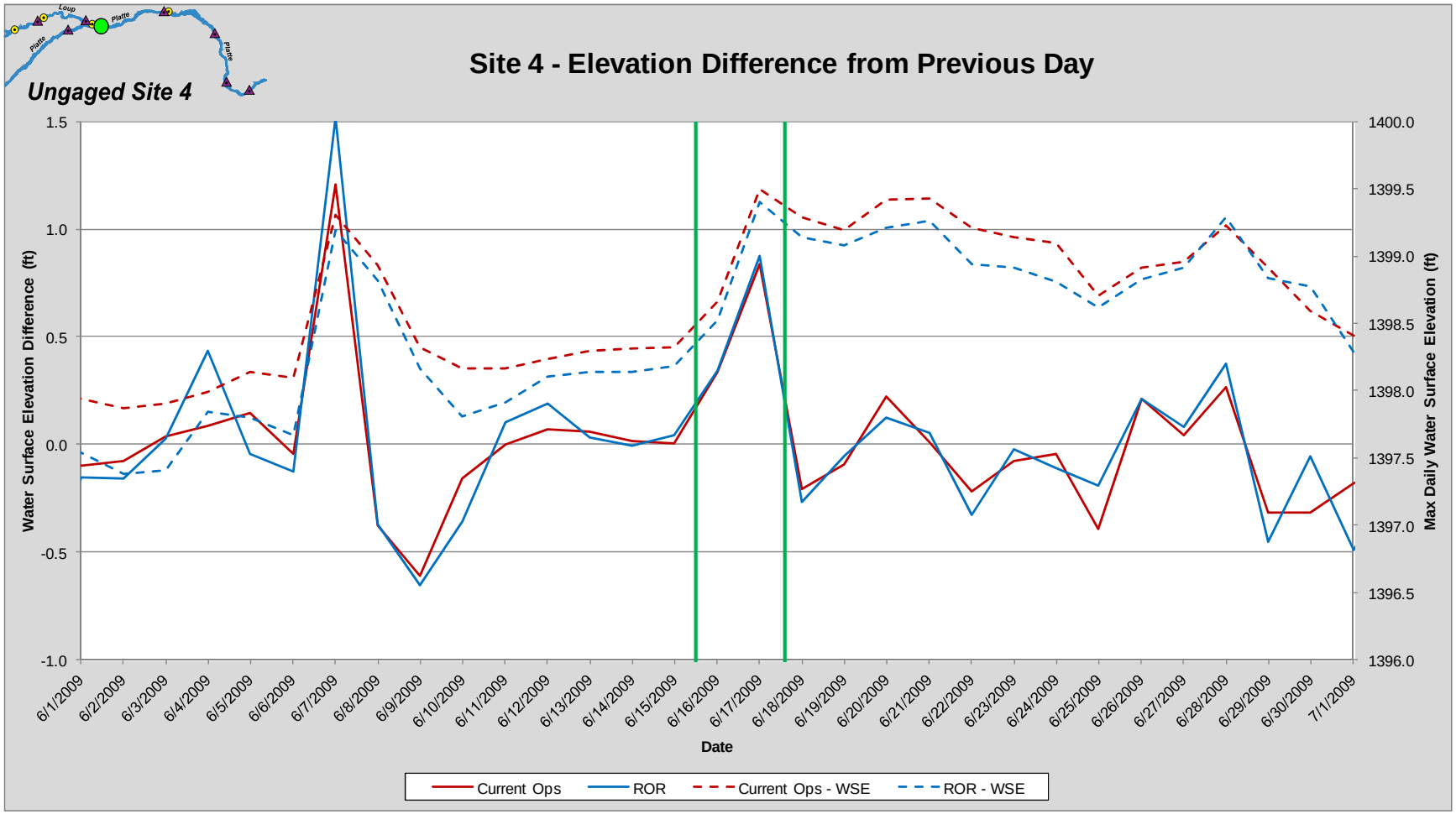

Figure 9. Stage Difference and Maximum Stage During June 16, 2009 Storm Event

Consequently, if a bird selects the same nesting location based on the elevation of wetted sand under either current operations or run-of-river scenario, based on the years reviewed, there is, under normal circumstances, at least an equal potential of nest inundation due to a storm event under current operations then under a run-of-river scenario.

This coincides with the generally accepted theory on both the Missouri River and the central Platte River that daily hydrocycling prompts these species to nest at slightly higher elevations on river sandbars than under run-of-river conditions (although the relative height above water level is assumed to be equal). By providing a daily cycle of peaks and troughs, the species locate their nests at a higher elevation that may prove beneficial when natural storm events occur due to a decrease in the magnitude of effect on the peak stage elevation.

In summary, based on the information available, the potential effects from hydrocycling on nest inundation is not greater than what would occur under a run-of-river scenario which would make the potential effects from operation of the Project "discountable."

Daily fluctuations in stage due to hydrocycling affect available nesting habitat in the form of increasing the wetted fringe of a sandbar. This effect is greatest when flows upstream of the Loup-Platte river confluence are the lowest. This may reduce the size of potential nesting habitat of some sandbars. However, nothing in the literature suggests that habitat is a limiting factor on the lower Platte River.

6.1.7 Platte River Flow Depletion

Based on the studies conducted by the District, flow diversion is not causing any water depletions through evaporative transport or any other means, to the lower Platte River. The studies conducted by the District show that flow diversion through the canal has less water depletions in the Platte River than if none of the Loup River flows were diverted.

6.1.8 PCB Dispersal

Because the interior least tern's diet consists primarily of fish, bioaccumulation of PCBs has the potential for negative effects on interior least tern populations; however, impacts from PCBs on interior least terns are not well understood or quantified (Thompson et al., 1997).

The District facilitated NDEQ PCB fish tissue sampling in Lake Babcock on August 11, 2009, in association with NDEQ's regularly scheduled 2009 PCB fish tissue sampling in the Tailrace Canal at the U.S. Highway 30 bridge, which occurred on August 12, 2009. Five common carp were collected at each location, in accordance with existing PCB sampling protocols developed by NDEQ under the EPA RAFTMP. The fillets from each collected sample were composited into a single

sample and were provided to the EPA Region VII laboratory in Kansas City, Kansas, for PCB analysis.

Analytical results for PCB (Aroclor 1248, 1254, and 1260) concentrations at each sample/site were below the reporting limit for each contaminant. For parameters where analytical results were above the reporting limit, NDEQ ran the data through its risk assessment calculation tables. Neither sample/site exceeded current state risk criteria; results are documented in the Nebraska Department of Environmental Quality's Findings of the 2009 Regional Ambient Fish Tissue Program in Nebraska (May 2011). As a result of the 2009 sample results, the fish consumption advisory that was previously in effect for the Loup Power Canal has been rescinded (NDEQ, May 25, 2011). Based on the analytical study results, it is determined that Project operations are not mobilizing PCBs that could affect fishery resources and; therefore, not affecting populations of fish consumed by interior least terns.

6.1.9 Ice Jams

Resource agencies expressed concerns regarding Project operation effects on ice jam formation and flooding and the associated effects on habitat in the Loup River bypass reach. The District commissioned the U.S. Army Corps of Engineers Omaha District to perform Relicensing Study 12.0 Ice Jam Flooding on the Loup River to determine whether or not Project operations promote ice-induced flooding downstream of the Project. The study concluded that the Project has not significantly changed the ice regime of the Loup River bypass reach, nor has it increased the risk of ice jam flooding. Therefore, the Project was not found to have an effect on the ice regime and does not affect the ability of ice to dynamically alter habitat used by interior least terns and piping plovers.

6.1.10 Conclusion

Suitable nesting habitat exists and is utilized by these species within the Action Area. There is a potential to influence nest site selection and productivity at the South SMA due to OHV use of the area. However, there is no record of nesting occurring in this area. The Project is shown to have no effect on the morphology of the Platte River due to sediment removal or that effects of Project operations are statistically related to interior and least tern nest site locations. Project hydrocycling, while increasing the daily peak, has, under normal circumstances, no greater potential to impact nest sites when compared to a run-of-river scenario. The Project does not contribute to flow depletions in the Platte River, PCB mobilization, or ice jam formation and flooding (that may benefit habitat creation). Additionally, the Project provides suitable, productive nesting habitat on the North SMA. Therefore, the relicensing of the Project may affect, but is not likely to adversely affect the interior least tern and the piping plover.

6.2 Whooping Crane

Whooping crane use of the Action Area would be primarily as a migratory corridor between breeding and wintering grounds. Whooping cranes are not directly dependent on resources associated with the Loup River or the Project. The possibility exists that the diversion of flows from the Loup River bypass reach could degrade potentially suitable roosting habitat downstream of the diversion weir. However, the likelihood of whooping cranes landing in the Action Area is low because it is located on the eastern edge of the central flyway corridor, which would make the potential effects from operation of the Project "discountable." Because the likelihood of a whooping crane occurring within the Action Area is extremely remote and any use of the area would be migratory, of short duration, and transient in nature, the relicensing of the Project may affect, but is not likely to adversely affect whooping cranes.

6.3 Pallid Sturgeon

The majority of pallid sturgeon captured within the Platte River has been below the confluence with the Elkhorn River and no occurrences have ever been documented in the Loup River or the Loup Power Canal. UNL researchers have completed nearly 3 years of a 5-year Sturgeon Management Study in the lower Platte River, and only a small percentage of pallid sturgeon were captured above the Elkhorn River confluence (Hamel et al., January 2010; Hamel and Pegg, 2011; UNL, June 30, 2011). Prior to the UNL Sturgeon Management Study, there had been no documentation of pallid sturgeon above the Elkhorn River confluence (Peters and Parham, 2008). This suggests that flows contributed by the Elkhorn River play a major role in habitat availability and flow requirements for the pallid sturgeon. Flows from the Elkhorn River and Salt Creek contribute approximately 22 to 28 percent of the total flow in the lower Platte River downstream of the Salt Creek. Based on this data and analysis indicating that the discharge is a contributing factor relative to the amount and accessibility of habitat for the pallid sturgeon, pallid sturgeon habitat above the Elkhorn River is limited, even with no hydrocycling present (that is, run-of-river operations). Table 5 indicates the pallid sturgeon capture results from the recent UNL Sturgeon Management Study.

Table 5. UNL Pallid Sturgeon Survey Summary

Year	Segment 1[1] (% of Total Pallid Captures)	Segment 2[1] (% of Total Pallid Captures)	Total
2009	66 (96%)	3 (4%)	69
2010	34 (87%)	5 (12%)	39
2011	10 (83%)	2 (17%)	12
Total	110 (92%)	10 (8%)	120

Notes:

[a] Segment 1 is the lower Platte River reach between the Missouri River and Elkhorn River confluence (Platte River RMs 0-32.3). Segment 2 is the lower Platte River reach between the Elkhorn River confluence and the Loup Power Canal Tailrace confluence (Platte River RMs 32.3-99.0).

The results from the sedimentation, hydrocycling, and flow depletion/diversion studies indicate that pallid sturgeon habitat suitability and connectivity are not substantially affected by Project. These studies established that Platte River water development activities upstream of the Loup-Platte river confluence likely contribute more to conditions in the lower Platte River than Project operations. In addition, the literature review revealed that pallid sturgeon prefer the Platte River over the Loup River and Diversion Canal for its sand substrates and abundant microhabitats such as convergent zones behind sandbars and islands. The sedimentation study established that dredging and sediment removal activities in the Loup Power Canal are not affecting the natural variability of the sandbars downstream of the tailrace confluence on the lower Platte River.

No observations of pallid sturgeon spawning in the Platte River have been recorded, though some juvenile pallid sturgeon have been captured within the Platte River (Peters and Parham, 2008). It is unclear as to what type of habitat the pallid sturgeon prefer for spawning, but coarse substrates and convergent flows seem to be important. These convergent areas vary little with changes in discharge (Jacobson et al., 2009) suggesting that hydrocycling should have little effect on pallid sturgeon use of these areas.

Temperature changes are often noted as factors affecting fish habitat suitability below hydropower facilities. However, the Project does not impound water for a prolonged period of time and does not include hypolimnetic releases; therefore, District hydrocycling and associated water releases have no effect on temperatures within the lower Platte River.

Because the Project does not affect water temperature downstream of the tailrace and no occurrences of fish being stranded by hydrocycling operations have been documented, the determination for the pallid sturgeon is may affect, not likely to adversely affect.

6.4 Western Prairie Fringed Orchid

The Project is anticipated to have no effect on western prairie fringed orchid. The Project Boundary does not contain the requisite habitat features for this species, nor have any western prairie fringed orchids been documented in the Project Boundary. The Project Boundary is also located outside of the current range of this species. Therefore, the continued operation of the Project is anticipated to have no effect on either individual plants or the continued existence of the western prairie fringed orchid.

7. CUMULATIVE EFFECTS

Cumulative effects are those effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur within the Action Area (50 CFR 402.02). Future Federal actions are not considered within the category of cumulative effects for ESA purposes because they require separate consultations under Section 7 of the ESA, after which they are considered part of the environmental baseline for future Section 7 consultations. Guidance for determining cumulative effects in the Endangered Species Consultation Handbook (USFWS, 1998) states the following:

"Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal, or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."

7.1 Reasonably Foreseeable Future Actions in the Action Area

There are no reasonably foreseeable state, tribal or local agency future actions in the Action Area that could have a cumulative effect on listed species.

7.2 Wildlife

No non-Federal activities are known within the Action Area that would have a cumulative impact on Federally listed wildlife.

7.3 Fish

No non-Federal activities are known within the Action Area that would have a cumulative impact on Federally listed fish.

7.4 Plants

No non-Federal activities are known within the Action Area that would have a cumulative impact on Federally listed plant species.

8. SUMMARY OF EFFECTS DETERMINATION

The determination of effects for Federally listed species is summarized in Table 6.

Table 6. Determination of Effects for Federally listed species

Common Name	Federal Status	Present in Project Boundary	Effect Determination
Interior least tern	Endangered	Yes	May Affect, Not Likely to Adversely Affect
Piping plover	Threatened	Yes	May Affect, Not Likely to Adversely Affect
Whooping crane	Endangered	No	May Affect, Not Likely to Adversely Affect
Pallid sturgeon	Endangered	No	May Affect, Not Likely to Adversely Affect
Western prairie fringed orchid	Threatened	No	No Effect

9. REFERENCES

50 CFR 402. Interagency Cooperation, Endangered Species Act of 1973, As Amended.

50 CFR 424.12. Criteria for Designating Critical Habitat.

32 FR 4001. March 11, 1967. Native Fish and Wildlife; Endangered Species.

50 FR 21784-21792. May 28, 1985. Endangered and Threatened Wildlife and Plants; Interior Population of the Least Tern Determined to be Endangered; Final Rule.

50 FR 50726-50734. December 11, 1985. Endangered and Threatened Wildlife and Plants; Determination of Endangered and Threatened Status for the Piping Plover; Final Rule.

55 FR 36641-36647. September 6, 1990. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Pallid Sturgeon; Final Rule.

67 FR 57638-57717. September 11, 2002. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northern Great Plains Breeding Population of the Piping Plover; Final Rule. Department of the Interior, Fish and Wildlife Service.

70 FR 39326-39327. July 7, 2005. Endangered and Threatened Wildlife and Plants; Initiation of a 5-Year Review of Black-Footed Ferret (*Mustela nigripes*) and Pallid Sturgeon (*Scaphirhynchus albus*); Notice.

71 FR 16176-16177. March 30, 2006. Endangered and Threatened Wildlife and Plants; 5-Year Review of Five Midwestern Species; Notice of Review.

72 FR 29544. May 29, 2007. Notice of Availability of the Revised Recovery Plan for the Whooping Crane (*Grus americana*).

73 FR 21643-21645. April 22, 2008. Endangered and Threatened Wildlife and Plants; 5-Year Reviews; Notice of Initiation of Review; Request for Information on Seven Listed Midwestern Species.

73 FR 56860-56862. September 30, 2008. Endangered and Threatened Wildlife and Plants; 5-Year Review; Notice of Initiation of Review; Request for Information on the Piping Plover (*Charadrius melodus*).

75 FR 15454-15456. March 29, 2010. Endangered and Threatened Wildlife and Plants; 5-Year Status Reviews of 14 Southwestern Species.

16 USC 661 et seq. Fish and Wildlife Coordination Act.

16 USC 1531-1544. Endangered Species Act of 1973, as amended.

Adams, S. R., G. L. Adams, and G. R. Parsons. 2003. Critical Swimming Speed and Behavior of Juvenile Shovelnose Sturgeon and Pallid Sturgeon. *Transactions of the American Fisheries Society* 132(2):392-397.

Allen, T. C., Q. E. Phelps, R. D. Davinroy, and D. M. Lamm. 2007. A Laboratory Examination of Substrate, Water Depth, and Light Use at Two Water Velocity Levels by Individual Juvenile Pallid (*Scaphirhynchus albus*) and Shovelnose (*Scaphirhynchus platorynchus*) Sturgeon. *Journal of Applied Ichthyology* 23:375-381.

Aron, C. 2005. South Dakota Interior Least Tern (*Sterna antillarum athalassos*) and Piping Plover (*Charadrius melodus*) Management Plan. Wildlife Division Report No. 2005-02. South Dakota Department of Game, Fish, and Parks, Pierre, SD.

Aron, C. 2006. South Dakota Pallid Sturgeon (*Scaphirhynchus albus*) Management Plan. South Dakota Department of Game, Fish and Parks, Pierre, Wildlife Division Report No. 2006-01, 96 pp.

Austin, Jane E, Amy L. Richert. 2001. A Comprehensive Review of Observational and Site Evaluation Data of Migrant Whooping Cranes in the United States, 1943-1999.

Bottitta, G. E., A. M. Cole, and B. Lapin. 1997. Piping Plovers Produce Two Broods. Wilson Bulletin 109: 337-339.

Bramblett, R.G., and R.G. White. 2001. "Habitat Use and Movement of Pallid and Shovelnose Sturgeon in the Yellowstone and Missouri Rivers in Montana and North Dakota." *Transaction of the American Fisheries Society* 130:1006-1025.

Brown, Mary Bomberger, and Joel G. Jorgensen. 2008. 2008 Interior Least Tern and Piping Plover Monitoring, Research, Management, and Outreach Report for the Lower Platte River, Nebraska. Joint report of the Tern and Plover Conservation Partnership and the Nebraska Game and Parks Commission.

Brown, Mary Bomberger, and Joel G. Jorgensen. 2009. 2009 Interior Least Tern and Piping Plover Monitoring, Research, Management, and Outreach Report for the Lower Platte River, Nebraska. Joint report of the Tern and Plover Conservation Partnership and the Nebraska Game and Parks Commission. Available online at http://ternandplover.unl.edu/2009%20LPR%20Least%20Tern%20and%20Piping%20Plover%20Report.pdf.

Brown, Mary Bomberger, and Joel G. Jorgensen. 2010. 2010 Interior Least Tern and Piping Plover Monitoring, Research, Management, and Outreach Report for the Lower Platte River, Nebraska. Joint report of the Tern and Plover Conservation Partnership and the Nebraska Game and Parks Commission.

Cairns, Winifred E. 1982. Biology and Behavior of Breeding Piping Plovers. *Wilson Bulletin* 94(4):531-545. Available online at http://elibrary.unm.edu/sora/Wilson/.

Canadian Wildlife Service and USFWS. March 2007. International Recovery Plan for the Whooping Crane. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 162 pp.

Carlson, D. M., W. L. Pfieger, L. Trial, and P. S. Haverland. 1985. Distribution, Biology and Hybridization of *Scaphirhynchus albus* and *S. platorynchus* in the Missouri and Mississippi Rivers. *Environmental Biology of Fishes* 14(1):51-59.

Carroll, A. M., and P. C. Wainwright. 2003. Functional Morphology of Prey Capture in the Sturgeon, *Scaphirhynchus albus*. *Journal of Morphology* 256:270-284.

Cohen, Jonathan B., Elizabeth H. Wunker, and James D. Fraser. 2008. Substrate and Vegetation Selection by Nesting Piping Plovers. *The Wilson Journal of Ornithology* 120(2):404–407, 2008.

Cuthbert, Francesca J., Brian Scholtens, Lauren C. Wemmer, and Robyn McLain. 1999. Gizzard Contents of Piping Plover Chicks in Northern Michigan. *Wilson Bulletin* 111(1):121-123. Available online at http://elibrary.unm.edu/sora/Wilson/.

Dirks, B., M. Schwalbach, K.F. Higgins, and C. Kruse. 1993. Soil Substrates, Objects, and Vegetation at Piping Plover and Interior Least Tern Nest Sites in South Dakota. In *Proceedings, The Missouri River and its Tributaries: Piping Plover and Least Tern Symposium*, eds. K.F. Higgins and M.R. Brashier. Brookings, SD: South Dakota State University, Department of Wildlife and Fisheries Sciences.

Ducey, J. 1985. The historic breeding distribution of the least tern in Nebraska. *Nebraska Bird Review*. 54(4): 72-73.

Ducey, J. 2000. *Birds of the untamed west: the history of birdlife in Nebraska, 1750 to 1875*. Making History, Omaha, Nebraska.

Elliott-Smith, E., S.M. Haig, and B.M. Powers. 2009. Data from the 2006 International Piping Plover Census. USGS Data Series 426.

EPA. 2007. Risks of Atrazine Use to Federally Listed Endangered Pallid Sturgeon (*Scaphirhynchus albus*) Appendix C. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, D.C.

Erickson, J. D. 1992. Habitat Selection and Movement of Pallid Sturgeon in Lake Sharpe, South Dakota. Master's Thesis. South Dakota State University, Brookings, South Dakota.

Faanes, C.A. 1983. Aspects of the Nesting Ecology of Least Terns and Piping Plovers in Central Nebraska. *Prairie Naturalist* 15:145-154.

Ferland, C.L., and S.M. Haig. 2002. 2001 International Piping Plover Census. USGS, Forest and Rangeland Ecosystem Science Center, Corvallis, Oregon.

Forbes, S. A., and R. E. Richardson. 1905. On a New Shovelnose Sturgeon From the Mississippi River. *Bulletin of the Illinois State Laboratory of Natural History* 7:37-44.

Gerrity, P. C., C. S. Guy, and W. M. Gardner. 2006. Juvenile Pallid Sturgeon are Piscivorous: A Call for Conserving Native Cyprinids. *Transactions of the American Fisheries Society* 135:604-609.

Gerrity, P. C., C. S. Guy, and W. M. Gardner. 2008. Habitat Use of Juvenile Pallid Sturgeon and Shovelnose Sturgeon with Implications for Water-level Management in a Downstream Reservoir. *North American Journal of Fisheries Management* 28:832-843.

Ginting, Daniel, Ronald B. Zelt, and Joshua I. Linard. 2008. "Temporal Differences in the Hydrologic Regime of the Lower Platte River, Nebraska, 1895-2006." USGS Scientific Investigations Report 2007-5267. Available online at http://pubs.usgs.gov/sir/2007/5267/.

Grady, J. et al. February 2001. Pallid and Shovelnose Sturgeon in the lower Missouri and Middle Mississippi Rivers.

Greer, S. 2003. Promise for the Piping Plover. *Wildbird*. November/December. 40-45.

Haig, Susan M. 1987. Population Biology and Life History Strategies of the Piping Plover. PhD Dissertation. Univ. North Dakota, Grand Forks. 121 pp.

Haig, Susan M. 1992. Piping Plover (*Charadrius melodus*). In *The Birds of North America*, ed. A. Poole, P. Stettenheim, and F. Gill, No. 2. Philadelphia: Academy of Natural Sciences; Washington, D.C.: American Ornithologists' Union.

Haig, Susan M. and E. Elliott-Smith. 2004. Piping Plover (*Charadrius melodus*) in The Birds of North America Online. (A. Poole, Ed.) Ithaca: Cornell Laboratory of Ornithology.

Haig, Susan M. and J.H. Plissner. 1993. Distribution and Abundance of Piping Plovers: Results and Implications of the 1991 International Census. Condor (95):145-156.

Haig, Susan M., and Lewis W. Oring. 1985. Distribution and Status of the Piping Plover Throughout the Annual Cycle. *Journal of Field Ornithology* 56(4):334-345.

Hamel, Martin J., and Mark A. Pegg. 2011. Sturgeon Management in the Platte River, Nebraska. 2010 Annual Performance Report. Project No. F-180-R. Submitted to USFWS.

Hamel, Martin J., Mark A. Pegg, Jeremy J. Hammen, and Tara L. Anderson. January 2010. Preliminary Draft Interim Report: Population Characteristics of Sturgeon in the Lower Platte River, Nebraska (Year 1).

Hoover, J. J., S. G. George, and K. J. Killgore. 2007. Diet of Shovelnose Sturgeon and Pallid Sturgeon in the free-flowing Mississippi River. *Journal of Applied Ichthyology* 23:494-499.

Hrabik, R. A., D. P. Herzog, D. E. Ostendorf, and M. D. Petersen. 2007. Larvae Provide First Evidence of Successful Reproduction by Pallid Sturgeon, *Scaphirhynchus albus*, in the Mississippi River. *Journal of Applied Ichthyology* 23:436-443.

Hurley, K. L., R. J. Sheehan, R. C. Heidinger, P. S. Wills, and B. Clevenstine. 2004. Habitat Use by Middle Mississippi River Pallid Sturgeon. *Transactions of the American Fisheries Society* 133(4):1033-1041.

Jacobson, R. B., H. E. Johnson, J. M. Reuter, and C. M. Elliott. 2007. The Roles of Physical Habitat in Reproduction and Survival of Pallid Sturgeon and Shovelnose Sturgeon in the lower Missouri River, progress 2005-06. Pages 143-217 in C. E. Korschgen, editor. Factors Affecting the Reproduction, Recruitment, Habitat, and Population Dynamics of Pallid Sturgeon and Shovelnose Sturgeon in the Missouri River. U.S. Geological Survey, Reston, Virginia.

Jacobson, Robert B., Harold E. Johnson, III, and Benjamin J. Dietsch. 2009. "Hydrodynamic Simulations of Physical Aquatic Habitat Availability for Pallid Sturgeon in the Lower Missouri River, at Yankton, South Dakota, Kenslers Bend, Nebraska, Little Sioux, Iowa, and Miami, Missouri, 2006-07." USGS Scientific Investigations Report 2009-5058. Available online at http://pubs.usgs.gov/sir/2009/5058/pdf/sir2009-5058.pdf.

Jenniges, J.J., and R.G. Plettner. 2008. Least tern nesting at human created habitats in central Nebraska. Waterbirds. 31(2):274-282.

Keenlyne, K.D., and L.G. Jenkins. 1993. Age at Sexual Maturity of the Pallid Sturgeon. *Transactions of the American Fisheries Society* 122:393-396.

Kirsch, E.M. 1996. Habitat selection and productivity of least terns on the lower Platte River, Nebraska. Wildlife Monograph no. 132.

Krentz, Steven, Rob Holm, Herb Bollig, Jan Dean, Mike Rhodes, Dave Hendrix, Gary Heidrich, and Bill Krise. May 12, 2005. Pallid Sturgeon Spawning and Stocking Summary Report: 1992-2004. U.S. Fish and Wildlife Service, Bismarck, North Dakota. Available online at

http://www.fws.gov/moriver/pallid%20spawning%20and%20stocking%20summary%200512.pdf.

Kuhajda, B. R., R. L. Mayden, and R. M. Wood. 2007. Morphologic Comparisons of Hatchery-Reared Specimens of *Scaphirhynchus albus*, *Scaphirhynchus platorynchus*, and *S. albus* x *S. platorynchus* hybrids (*Acipenseriformes: Acipenseridae*). *Journal of Applied Ichthyology* 23:324-347.

Kynard, B., E. Parker, D. Pugh, and T. Parker. 2007. Use of Laboratory Studies to Develop a Dispersal Model for Missouri River Pallid Sturgeon Early Life Intervals. *Journal of Applied Ichthyology* 23:365-374.

Larson, Michal A., Mark R. Ryan, and Brian G. Root. 2000. Piping Plover Survival in the Great Plains: An Updated Analysis. *Journal of Field Ornithology*. Vol. 71, No. 4, pp. 721-729.

Laustrup, M. S., R. B. Jacobson, and D. G. Simpkins. 2007. Distribution of Potential Spawning Habitat for Sturgeon in the lower Missouri River. U.S. Geological Survey, Open-File Report 2007-1192, Reston, Virginia.

LeFer, D. et al. 2008. Piping Plover Foraging-Site Selection on the Missouri River. *Waterbirds* 31:587-592.

Lott, C.A. November 2006. Distribution and Abundance of the Interior Population of the Least Tern (*Sternula antillarum*), 2005. U.S. Army Corps of Engineers. ERDC/EL TR-06-13.

Missouri River Recovery Program. October 2010. Integrated Science Program General Science Questions and Key Findings.

Mitchell, Wilma A. March 1998. "Species Profile: Least Tern (*Sterna antillarum*), Interior Population, on Military Installations in the Southeastern United States." U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS. Technical Report SERDP-98-1. Available online at http://www.dodreports.com/pdf/ada342312.pdf.

National Research Council. 2005. *Endangered and Threatened Species of the Platte River*. Washington, D.C.: The National Academies Press.

NDEQ. May 2011. Findings of the 2009 Regional Ambient Fish Tissue Program in Nebraska.

NDEQ. May 25, 2011. Fish Consumption Advisories. Retrieved on September 13, 2011. http://www.deq.state.ne.us/SurfaceW.nsf/Pages/FCA

NGPC. December 2008. Assessment of the Pallid Sturgeon, Least Tern, and Piping Plover in the Lower Platte River. Nebraska Game and Parks Commission Report, Lincoln, Nebraska.

NGPC. 2009. Data provided under the "Nebraska Game and Parks Commission Nongame Bird Program Data Use Agreement" between NGPC and HDR, signed on June 24, 2009.

NGPC. February 23, 2009. 2008 Loup River Sandpit Survey Report. Presentation given by Ben Wheeler, NGPC, at the 2009 Nebraska Least Tern and Piping Plover Meeting, Lincoln, NE.

Nebraska Natural Heritage Program. May 2011. Estimated Current Range of Western Prairie Fringed Orchid (*Platanthera praeclara*). Nebraska Game and Parks Commission.

Nicholls, Janice L., and Guy A. Baldassarre. 1990. Habitat Associations of Piping Plovers Wintering in the United States. *Wilson Bulletin* 102(4):581-590. Available online at http://elibrary.unm.edu/sora/Wilson/.

NOAA Fisheries. October 27, 2011. "Critical Habitat." *NOAA Fisheries, Office of Protected Resources*. Retrieved on November 2, 2011. http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm.

Parham, James E. 2007. "Hydrologic Analysis of the Lower Platte River from 1954-2004, with special emphasis on habitats of the Endangered Least Tern, Piping Plover, and Pallid Sturgeon." Nebraska Game and Parks Commission.

Pavelka, Greg. Personal communication between Greg Pavelka (USACE) and Melissa Marinovich (HDR).

Peters, Edward J., and James E. Parham. 2008. "Ecology and Management of Sturgeon in the Lower Platte River, Nebraska." Nebraska Technical Series No. 18. Nebraska Game and Parks Commission. Lincoln, Nebraska.

Plissner, Jonathan H. and Susan M. Haig. Status of a Broadly Distributed Endangered Species: Results and Implications of the Second International Piping Plover Census. *Canada Journal of Zoology*. Vol. 78, 2000.

Powell, A.N. and F.J. Cuthbert. 1992. Habitat and Reproductive Success of Piping Plovers Nesting on Great Lakes Islands. Wilson Bull. 104:151-161.

Prindiville Gaines, E. and M.R. Ryan. 1988. Piping Plover Habitat Use and Reproductive Success in North Dakota. *The Journal of Wildlife Management* 52(2):266-273.

Renken, R. B., and J. W. Smith. 1995. Annual Adult Survival of Interior Least Terns. *Journal of Field Ornithology* 66:112-116.

Roche, E.A., J.B. Cohen, D.H. Catlin, D.L. Amirault-Langlais, F.J. Cuthbert, C.L. Gratto-Trevor, J. Felio, and J.D. Fraser. 2010. Range-wide Piping Plover Survival: Correlated Patterns and Temporal Declines. Journal of Wildlife Management, November 2010: Vol. 74, Issue 8, pgs 1784-1791.

Root, Brian G., Mark R. Ryan, and Paul M. Mayer. 1992. Piping Plover Survival in the Great Plains. *Journal of Field Ornithology*, 63(1):10-15.

Schrey, A. W., and E. J. Heist. 2007. Stock Structure of Pallid Sturgeon Analyzed with microsatellite loci. Journal of Applied Ichthyology 23:297-303.

Sharpe, R.S., W.R. Silcock, and J.G. Jorgensen. 2001. *The Birds of Nebraska: Their Distribution and Temporal Occurrence*. Lincoln: University of Nebraska Press.

Sheehan, R. J., R. C. Heidinger, K. L. Hurley, P. S. Wills, and M. Nuevo. 2000. Middle Mississippi River pallid sturgeon habitat use project. Fisheries Research Laboratory, Southern Illinois University, Annual Progress Report - Year 4, Carbondale, Illinois.

Sidle, John G. 1993. Least Tern and Piping Plover Use of Sand and Gravel Pits along the Platte and Loup Rivers, Nebraska. In *Proceedings, The Missouri River and its Tributaries: Piping Plover and Least Tern Symposium*, eds. K.F. Higgins and M.R. Brashier. Brookings, SD: South Dakota State University, Department of Wildlife and Fisheries Sciences.

Sidle, John G., and Eileen M. Kirsch. 1993. Least Tern and Piping Plover Nesting at Sand Pits in Nebraska. *Colonial Waterbirds* 16(2):139-148.

Sillman, A. J., A. K. Beach, D. A. Dahlin, and E. R. Loew. 2005. Photoreceptors and Visual Pigments in the Retina of the Fully Anadromous Green Sturgeon (*Acipenser medirosturs*) and the Potamodromous Sturgeon (*Scaphirynchus albus*). *Journal of Comparative Physiology* A 191:799-811.

Smith, John W., and Rochelle B. Renken. 1993. Reproductive Success of Least Terns in the Mississippi River Valley. *Colonial Waterbirds* 16(1):39-44.

Snook, V. A. 2001. Movements and Habitat use by Hatchery-reared Pallid Sturgeon in the lower Platte River, Nebraska. Master's thesis. University of Nebraska-Lincoln, Lincoln, Nebraska.

Spindler, B. D. 2008. Modeling Spatial Distribution and Habitat Associations for Juvenile Pallid Sturgeon (*Scaphirhynchus albus*) in the Missouri River. Master's Thesis. South Dakota State University, Brookings, South Dakota.

Steffensen, K. D., and T. Barada. 2006. 2005 Annual Report, Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River: Segment 9. Nebraska Game and Parks Commission, Lincoln, Nebraska.

Steffensen, K. D., and M. J. Hamel. 2007. 2006 Annual Report, Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River: Segment 9. Nebraska Game and Parks Commission, Lincoln, Nebraska.

Steffensen, K. D., and M. J. Hamel. 2008. 2007 Annual Report, Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River: Segment 9. Nebraska Game and Parks Commission, Lincoln, Nebraska.

Stehn, Tom. August 30, 2011. Whooping Crane Total Population. Whooping Crane Recovery Team. Retrieved on November 16, 2011. http://www.learner.org/jnorth/tm/crane/PopulTotals.html

Swigle, B.D. 2003. Movements and Habitat Use by Shovelnose and Pallid Sturgeon in the Lower Platte River, Nebraska. M.S. Thesis, University of Nebraska, Lincoln.

Szell, Christopher C., and Mark S. Woodrey. 2003. Reproductive Ecology of the Least Tern along the Lower Mississippi River. *Waterbirds* 26(1):35-43.

Thompson, Bruce C., Jerome A. Jackson, Joannna Burger, Laura A. Hill, Eileen M. Kirsch, and Jonathan L. Atwood. 1997. Least Tern (*Sterna antillarum*). In *The Birds of North America*, ed. A. Poole and F. Gill, No. 290. Philadelphia: Academy of Natural Sciences; Washington, D.C.: American Ornithologists' Union.

TPCP. 2009. Tern and Plover Conservation Partnership Annual Monitoring Report to Preferred Rocks of Genoa – 2008.

TPCP. January 8, 2010. Tern and Plover Conservation Partnership Annual Monitoring Report to Preferred Rocks of Genoa – 2009.

USDA. 2009. Plants Profile, *Platanthera praeclara*, Great Plains white fringed orchid. http://plants.usda.gov/java/nameSearch

U.S. District Court for the District of Nebraska. October 13, 2005. Nebraska Habitat Conservation Coalition (P) v. U.S. Fish and Wildlife Service (D). Case: 4:03-cv-03059-LES-DLP. Document #: 53. Date Filed: 10/13/05.

USFWS. 1988. "Recovery Plan for Piping Plovers, *Charadrius melodus*, of the Great Lakes and Northern Great Plains." Great Lakes/Northern Great Plains Piping Plover Recovery Team. Twin Cities, MN: U.S. Fish and Wildlife Service.

USFWS. September 1990. "Recovery Plan for the Interior Population of the Least Tern (*Sterna antillarum*)." Twin Cites, MN: U.S. Fish and Wildlife Service.

USFWS. 1993. "Pallid Sturgeon (*Scaphirhynchus albus*) Recovery Plan." Bismarck, ND: U.S. Fish and Wildlife Service.

USFWS. June 28, 1994. Revised Recovery Plan for Piping Plovers (*Charadrius melodus*) Breeding on the Great Lakes and Northern Great Plains, Technical/Agency Review Draft.

USFWS. 1996. "*Platanthera praeclara* (Western Prairie Fringed Orchid) Recovery Plan." Ft. Snelling, MN: U.S. Fish and Wildlife Service. Available online at http://www.fws.gov/southdakotafieldoffice/WPFO%20recovery%20plan.pdf.

USFWS. November 30, 2000. Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project and Operation of the Kansas River Reservoir System. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota.

USFWS. December 16, 2003. "Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project and Operation of the Kansas River Reservoir System." U.S. Fish and Wildlife Service, Fort Snelling, Minnesota.

USFWS. September 2006. California least tern (*Sternula antillarum browni*) 5-Year Review Summary and Evaluation. Carlsbad Fish and Wildlife Office Carlsbad, California.

USFWS. February 2009. Western Prairie Fringed Orchid 5-Year Review: Summary and Evaluation. Twin Cities Field Office, Bloomington, Minnesota.

USFWS. April 15, 2009. Whooping Crane Observation, through Spring 2009. Provided to HDR Engineering, Inc. by Martha Tacha, Grand Island, Nebraska Field Office.

USFWS. September 2009. "Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation." U.S. Fish and Wildlife Service, Northeast Region, Hadley, Massachusetts, and Midwest Region's East Lansing Field Office, Michigan. Available online at http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B079.

USFWS. 2010. Loup and Middle Loup River, Interior Least Tern and Piping Plover Survey Report. Nebraska Ecological Services Field Office, Grand Island, Nebraska.

USFWS. March 14, 2011. Western Prairie Fringed Orchid Information. USFWS, North Dakota Field Office, Mountain-Prairie Region. Accessed September 26, 2011. Online at: http://www.fws.gov/northdakotafieldoffice/endspecies/species/western_prairie_fringed_orchid.htm

USFWS. May 3, 2011. Western Prairie Fringed Orchid. USFWS South Dakota Field Office, Mountain-Prairie Region. Accessed September 26, 2011. Online at: http://www.fws.gov/southdakotafieldoffice/ORCHID.HTM

USFWS. September 27, 2011. Whooping Crane – Species Profile. USFWS website, accessed on 9/27/11. Online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B003

USFWS and NMFS. March 1998. Endangered Species Consultation Handbook, Procedures for Conducting Activities Under Section 7 of the Endangered Species Act. Final.

USGS. July 2007. Sturgeon Research Update: Confirmed Pallid Sturgeon Spawning in the Missouri River in 2007. USGS Fact Sheet 2007–3053. Available online at http://pubs.usgs.gov/fs/2007/3053/.

Wanner, G. A., D. A. Shuman, and D. W. Willis. 2007. Food Habits of Juvenile Pallid Sturgeon and Adult Shovelnose Sturgeon in the Missouri River Downstream of Fort Randall Dam, South Dakota. *Journal of Freshwater Ecology* 22(1):81-92.

Weber, L. M., and B. H. Martin. 1991. Piping Plovers Nest on Dry and Nearly Dry Alkali Wetlands in the Northern Great Plains, 1986-1990. Prairie Naturalist 23: 209-212.

Wilcox, LeRoy. April 1959. A Twenty Year Banding Study of the Piping Plover. *Auk* 76(2):129-152.

Wildhaber, M.L., A.J. DeLonay, D.M. Papoulias, D.L. Galat, R.B. Jacobsen, D.G. Simpkins, P.J. Braaten, C.E. Korschgen, and M.J. Mac. 2007. "A Conceptual Life-History Model for Pallid and Shovelnose Sturgeon." USGS Circular 1315.

Wilson, E.C., W.A. Hubert, and S.H. Anderson. 1993. Nesting and Foraging of Least Terns on Sand Pits in Central Nebraska. *The Southwestern Naturalist* 38(1):9-14.

Ziewitz, J.W., J.G. Sidle, and J.J. Dinan. 1992. "Habitat Conservation for Nesting Least Terns and Piping Plovers on the Platte River, Nebraska." *Prairie Naturalist* 24(1):1-20.

Zonick, C. A. 2000. The Winter Ecology of Piping Plovers (*Charadrius melodus*) Along the Texas Gulf Coast. Ph.D. Thesis, University of Missouri, Columbia.

ATTACHMENT A

ESA SECTION 7 CONSULTATION CORRESPONDENCE AND SPECIES LISTS FOR LOUP HYDROELECTRIC PROJECT RELICENSING

LOUP POWER DISTRICT
"SERVING YOU ELECTRICALLY"
GENERAL OFFICE
2404 15th Street
P.O. Box 988
Columbus, NE 68602-0988
Phone:
402/564-3171
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402/564-0970

Via Electronic Filing

October 16, 2008

Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Loup River Hydroelectric Project
FERC Project No. 1256
Notice of Intent to File and Pre-Application Document

Dear Secretary Bose:

Loup River Public Power District (Loup Power District or District) herein electronically files its Notice of Intent (NOI) to file an Application for New License for the Loup River Hydroelectric Project, FERC Project No. 1256 (Project). The District is the owner, operator, and original licensee of the Project. The existing license was effective on December 1, 1982, for a term ending April 15, 2014. Loup Power District is utilizing the Integrated Licensing Process (ILP) for this relicensing effort. Therefore, pursuant to 18 CFR § 5.6, the District is concurrently filing its Project Pre-Application Document (PAD) with its NOI.

The PAD is comprised of two public volumes (including appendices) and one privileged volume. The PAD contains all of the information required by 18 CFR § 5.6(c) and (d). It is being concurrently distributed (in hard copy or electronic format) to federal and state resource agencies, local governments, and Native American tribes in conformance with 18 CFR § 5.2(a) and § 5.6(a)(1) and (2). A distribution list of those parties is attached. Other parties known to be potentially interested in the relicensing proceeding are being notified by mail that the documents are available for viewing on the District's website or at the District's office in Columbus, Nebraska.

At this time, and pursuant to 36 CFR § 800.2(c)(4), the District requests that the Commission authorize Loup Power District to initiate consultation, as described in Section 106 of the National Historic Preservation Act, with the Nebraska State Historic Preservation Office (SHPO) and others regarding relicensing of the Project. Please note that 36 CFR § 800.2(c)(4) requires that the Commission notify the SHPO and other consulting parties in writing (or email) if this authorization is granted.

Also at this time, pursuant to 50 CFR § 402.08, the District requests that the Commission designate Loup Power District as its non-federal representative to conduct informal consultation with the U.S. Fish and Wildlife Service and to prepare a biological assessment(s) as necessary to comply with Section 7 of the Endangered Species Act.

All materials related to the current Project license as well as materials related to this NOI and PAD are available for inspection at the office of Loup Power District, 2404 15th Street, Columbus, NE 68602. A notice of this filing will be published in the *Columbus Telegram*, *Genoa Leader-Times*, *Nance County Journal*, and *Humphrey Democrat*. The NOI and PAD will also be available at the following public libraries and on the website established by the District for the relicensing of the Project, www.loup.com/relicense, and in accordance with the conditions of the Information Distribution Protocol contained within the PAD.

Columbus Public Library
2504 14th Street
Columbus, Nebraska

Genoa City Library
421 Willard Avenue
Genoa, Nebraska

The District looks forward to working with the Commission and all interested parties on relicensing the Loup River Hydroelectric Project. If you have any questions regarding this letter, the NOI, or the PAD, please contact me at (402) 564-3171 ext. 268.

Respectfully submitted,

Neal D. Suess
President/CEO
Loup Power District

Attachments: Notice of Intent to File for a New License
Pre-Application Document – Loup River Hydroelectric Project
Distribution List

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Loup River Public Power District (Loup Power District) P-1256-029

NOTICE OF INTENT TO FILE LICENSE APPLICATION, FILING OF PRE-APPLICATION DOCUMENT, COMMENCEMENT OF LICENSING PROCEEDING, AND IDENTIFICATION OF ISSUES AND ASSOCIATED STUDY REQUESTS

December 16, 2008

a. Type of Filing: Notice of Intent to File License Application for a New License and Commencing Licensing Proceeding.

b. Project No.: 1256-029

c. Dated Filed: October 16, 2008

d. Submitted By: Loup River Public Power District (Loup Power District)

e. Name of Project: Loup River Hydroelectric Project

f. Location: On the Loup River in Nance and Platte Counties, Nebraska.

g. Filed Pursuant to: 18 C.F.R. Part 5 of the Commission's Regulations

h. Applicant Contact: Neal Suess, President/CEO, Loup Power District, P.O. Box 988, 2404 15th Street, Columbus, Nebraska 68602 (866) 869-2087.

i. FERC Contact: Kim Nguyen (202) 502-6015 or via e-mail at kim.nguyen@ferc.gov.

j. We are asking federal, state, local, and tribal agencies with jurisdiction and/or special expertise with respect to environmental issues to cooperate with us in the preparation of the environmental document. Agencies who would like to request cooperating status should follow the instructions for filing comments described in paragraph o below. Cooperating agencies should note the Commission's policy that agencies that cooperate in the preparation of the environmental document cannot also intervene. See, 94 FERC ¶ 61,076 (2001).

k. With this notice, we are initiating informal consultation with: (a) the U.S. Fish and Wildlife Service and/or NOAA Fisheries under section 7 of the Endangered Species Act and the joint agency regulations thereunder at 50 CFR, Part 402 and (b) the State Historic Preservation Officer, as required by Section 106, National Historical Preservation Act, and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2.

l. With this notice, we are designating Loup Power District as the Commission's non-federal representative for carrying out informal consultation, pursuant to Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act.

m. Loup Power District filed a Pre-Application Document (PAD; including a proposed process plan and schedule) with the Commission, pursuant to 18 CFR 5.6 of the Commission's regulations.

n. A copy of the PAD is available for review at the Commission in the Public Reference Room or may be viewed on the Commission's website (http://www.ferc.gov), using the "eLibrary" link. Enter the docket number, excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCONlineSupport@ferc.gov or toll free at 1-866-208-3676, for TTY, (202) 502-8659. A copy is also available for inspection and reproduction at the address in paragraph h.

Register online at http://ferc.gov/esubscribenow.htm to be notified via e-mail of new filing and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

o. With this notice, we are soliciting study requests. All study requests should be sent to the address above in paragraph h. In addition, all study requests, requests for cooperating agency status, and all communications to and from Commission staff related to the merits of the potential application (original and eight copies) must be filed with the Commission at the following address: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426. All filings with the Commission must include on the first page, the project name (Loup River Hydroelectric Project) and number (P-1256-029), and bear the heading "Study Requests," "Request for Cooperating Agency Status," or "Communications to and from Commission Staff." Any individual or entity interested in submitting study requests and any agency requesting cooperating status must do so by February 10, 2009.

Study requests, requests for cooperating agency status, and other permissible forms of communications with the Commission may be filed electronically via the Internet in lieu of paper. The Commission strongly encourages electronic filings. See 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's website (http://www.ferc.gov) under the "e-filing" link.

Kimberly D. Bose,
Secretary.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Nebraska Field Office
203 West Second Street
Grand Island, Nebraska 68801

July 21, 2008

FWS-NE: 2008-494

Mr. Neal Suess
Loup Power District
2404 15th Street, PO Box 988
Columbus, NE 68602-0988

RE: Technical Assistance, Relicensing; Loup River Hydroelectric Project; Federal Energy Regulatory Commission Project Number 1256; Nance and Platte Counties, Nebraska

Dear Mr. Suess:

This is in regards to the proposed relicensing of the Loup River Hydroelectric Project (Project) by the Federal Energy Regulatory Commission (FERC), Project Number 1256. The Loup Power District manages operation of the Project, and is the non-federal project sponsor for the proposed relicensing action. The Project encompasses a diversion at Headwaters Park, near Genoa, Nebraska where flow at a maximum capacity of 3,500 cubic feet per second is diverted from the Loup River into a 35-mile-long canal. Flow from that canal is used to generate electricity at the Monroe and Columbus powerhouses. The Monroe Powerhouse is a run-of-the-river powerhouse. Lakes North and Babcock are located along the canal and are used to generate head pressure for the generation of electricity at the Columbus Powerhouse. Once exiting the Columbus Powerhouse, flows are discharged into the Platte River, approximately 1-mile downstream from the Loup and Platte rivers confluence. The 35-mile-long canal concurrently provides a water source to meet the irrigation needs of approximately 80 entities holding junior water rights to the Loup Power District's water right, dated 1935. Electricity generated by the Loup Power District is sold to the Nebraska Public Power District. The original 50-year federal license for the Loup River project was granted on April 17, 1934. The current license will expire in April 2014.

The U.S. Fish and Wildlife Service (Service), in coordination with the Nebraska Game and Parks Commission (Commission), has completed its preliminary review of the proposed relicensing project based on information and documentation provided at meetings on May 7, 2008, and June 25, 2008. The following comments are submitted to assist Loup Power District and its consultant HDR, in the preparation of a Pre-application document (PAD) for submittal to FERC in October 2008. A summarization of our preliminary concerns is included with this letter as an enclosure.

AUTHORITIES

The Service has responsibility under a number of authorities for the conservation and management of fish and wildlife resources. Chief among the federal statutes with which this office deals are the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), Fish and Wildlife Coordination Act (FWCA) (488 Stat. 401; 16 U.S.C. 661 *et seq.*), Bald and Golden

Eagle Protection Act (BGEPA) (16 U.S.C. 703-712, as amended), and Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712, as amended). Compliance with all of these statutes and regulations is required to be in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321-4347). In addition to these statues, the Service has authority under several other legislative, regulatory, and executive mandates to promote the conservation of fish and wildlife resources for the benefit of the American public.

In Nebraska, the Service has special concerns for endangered and threatened species, migratory birds, and other important fish and wildlife resources. We also are concerned about any impacts on Federal and State wildlife refuges and management areas and other public lands, as well as to other areas that support sensitive habitats. Habitats frequently used by important fish and wildlife resources are wetlands, streams, and riparian (streamside) woodlands. Special attention is given to proposals that include modification of wetlands, stream alteration, loss of riparian habitat, or contamination of important habitats. The Service recommends ways to avoid, minimize, rectify, reduce, or compensate for damaging impacts to important fish and wildlife resources and their habitats that may be attributed to land and water resource development proposals.

Please note that the Service's position on a project under the authorities of ESA, BGEPA, MBTA, FWCA, and NEPA cannot be assumed without our official written response. Pursuant to the "take" provisions under section 9 of ESA; 16 U.S.C. 688 (a and b) of BGEPA; and 16 U.S.C. 703 of MBTA, the project proponent is responsible for compliance with these federal laws regardless of whether the Service is able to respond within requested time frame.

ENDANGERED SPECIES ACT

Pursuant to section 7 of Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), every federal agency, in consultation or conference with the U.S. Fish and Wildlife Service (Service), is required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed or proposed species and/or result in the destruction or adverse modification of designated and/or proposed critical habitat. In accordance with section 7(a) (2) of ESA, the lead federal agency (FERC) should determine if any federally listed threatened or endangered species and/or designated/proposed critical habitat would be directly and/or indirectly affected by this proposed project. The assessment of potential impacts (direct and indirect) must include an "affect" or "no effect" determination and be presented to the Service in writing. If the Service agrees with the lead federal agency's determination, the Nebraska Ecological Field Office in Grand Island, Nebraska would provide a letter of concurrence. If federally listed species and/or designated/proposed critical habitat would be adversely affected by this action, the lead federal agency would need to continue section 7 consultation with the Service prior to making any irretrievable or irreversible commitments of resources in support of the proposed project or action.

Section 9 of ESA prohibits the taking of any federally listed endangered or threatened species. Section 3(18) of ESA defines take to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Our regulations (50 CFR 17.3) define harm to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. The ESA provides for civil and criminal penalties for the unlawful taking of listed species. Exemptions to the prohibitions against take may be obtained through coordination with the Service in two ways:

through interagency consultation for projects with federal involvement pursuant to section 7 or through the issuance of an incidental take permit under section 10(a)(1)(B) of ESA.

In accordance with section 7 of ESA, the Service has determined that the following federally listed species may occur in the Project area or be affected by proposed relicensing of the proposed Project:

Listed Species	Expected Occurrence
Pallid sturgeon (*Scaphirhynchus albus*)	Lower Platte River and Missouri River
Interior least tern (*Sterna antillarum*)	Migration, nesting
Piping plover (*Charadrius melodus*)	Migration, nesting
Western prairie fringed orchid (*Platanthera praeclara*)	Tallgrass prairie and wet meadows

Pallid Sturgeon

The pallid sturgeon was federally listed as an endangered species on September 6, 1990. In Nebraska, the pallid sturgeon is found in the Missouri and lower Platte rivers. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that provided macrohabitat requirements for the pallid sturgeon, a species that is associated with diverse aquatic habitats. These habitats historically were dynamic and in a constant state of change due to influences from the natural hydrograph, and sediment and runoff inputs from an enormous watershed spanning portions of ten states and Canada. Navigation, channelization and bank stabilization, loss of connectivity between a river and its floodplain, and hydropower generation projects have caused the widespread loss of this diverse array of dynamic habitats once provided to the pallid sturgeon in the Missouri and Platte Rivers, resulting in a precipitous decline in its population. Please refer to the enclosure for additional information regarding direct and indirect impacts to pallid sturgeon that are expected due to proposed relicensing of the Project.

Least Tern and Piping Plover

The least tern, federally listed as endangered, and piping plover, federally listed as threatened, nest on unvegetated or sparsely vegetated sandbars in river channels in the Missouri, Platte, Loup, and Niobrara rivers. The nesting season for the least tern and piping plover is from April 15 through September 1. Least terns feed on small fish in the river and piping plovers forage for invertebrates on exposed beach substrates. Navigation, channelization and bank stabilization, loss of connectivity between a river and its floodplain, and hydropower generation projects can adversely affect the least tern and piping plover. Please refer to the enclosure for additional information regarding direct and indirect impacts to the least tern and piping plover that are expected due to proposed relicensing of the Project.

Western Prairie Fringed Orchid

The western prairie fringed orchid, federally listed as threatened, inhabits tall-grass calcareous silt loam or sub-irrigated sand prairies. Declines in western prairie fringed orchid populations have been caused by the drainage and conversion of its habitats to agricultural production, channelization, siltation, road and bridge construction, grazing, haying, and the application of

herbicides. Populations are known to occur in Boone, Cherry, Dodge, Garfield, Grant, Greeley, Hall, Holt, Lancaster, Loup, Madison, Otoe, Pierce, Rock, Saline, Sarpy, Seward, and Wheeler counties, and may occur at other sites in Nebraska. Changes in the hydrology of adjacent riverine wetlands and wet meadow habitats may adversely affect populations of the western prairie fringed orchid as summarized in the attached enclosure.

Depletions to the Lower Platte River

Since 1978, the Service has concluded in all of its section 7 consultations on water projects in the Platte River basin that the Platte River ecosystem is in a state of jeopardy, and any federal action resulting in a water depletion to the Platte River system will further or continue the deterioration of the stressed habitat conditions. Due to the cumulative affect of many water depletion projects in the Platte River basin, the Service considers any depletion of flows (direct or indirect) from the Platte River system to be significant. Consequently, the Service has adopted a jeopardy standard for all section 7 consultations on federal actions which result in water depletions to the Platte River system. The Service considers the Platte River and its associated wetland habitats to be resources of national and international importance.

Affect/No Affect Determination

The Service recommends that the Loup Power District, in coordination with FERC, the lead Federal agency, consider the information provided above with regard to making its assessment of potential impacts of the proposed relicensing project on federally listed species and designated critical habitat and in making the "affect/no affect determination." Further, the Service recommends that the lead federal agency not limit its consideration of affect to that information located within the project footprint, but other potential affects as they become apparent during the course of other project studies and/or project development and modification. If it is determined that the proposed project may affect (beneficial of adversely) federally listed species or federally designated critical habitat, further consultation under section 7 of ESA with this office is required.

State Listed Species

In addition, all federally listed species are also State-listed under the Nebraska Nongame and Endangered Species Conservation Act. Further, there maybe State-listed species affected by the proposed project that are not federally listed. Specifically, lake sturgeon *(Acipensar fulvescens)*, an inhabitant of the Missouri and Platte rivers, utilizes the slip-faces of submerged sandbars as foraging and resting habitat, and is thought to spawn over gravel, cobble, or other similarly-sized substrate. The lake sturgeon is listed as threatened by the State of Nebraska. The sturgeon chub (*Macrhybopsis gelida*) is listed as endangered in Nebraska, and is found in main channel habitats associated with gravel and swift current. Reasons for the decline of both species are due to the loss of suitable habitat through modification of fluvial processes, loss of floodplain connectivity, and modification to natural hydrological cycles. Additionally, the least tern and pallid sturgeon are also listed as endangered by the State of Nebraska; and the piping plover and bald eagle are listed as threatened. To determine if the proposed project may affect State-listed species, the Service recommends that the project proponent contact Kristal Stoner, Nebraska Game and Parks Commission, 2200 N. 33rd Street, Lincoln, NE 68503-0370.

REVIEW, COMMENTS, AND RECOMMENDATIONS ON THE PROPOSED RELICENSING ACTION UNDER OTHER FISH AND WILDLIFE STATUTES

Bald and Golden Eagle Protection Act

The BGEPA provides for the protection of the bald eagle *(Haliaeetus leucocephalus)* and golden eagle (*Aquila chrysaetos*) by prohibition, except under certain specific conditions, the taking, possession, and commercial use of such birds. The golden eagle is found in arid, open country with grassland for foraging in western Nebraska and usually near buttes or canyons which serve as nesting sites. Golden eagles are often a permanent resident in the Pine Ridge area of Nebraska. Bald eagles utilize mature, forested riparian areas near rivers, streams, lakes, and wetlands and occur along all the major river systems in Nebraska. Bald eagles are also attracted to power plant facilities in the winter because they provide ice free conditions and feeding habitat. The bald eagle southward migration begins as early as October and the wintering period extends from December-March. Additionally, many eagles nest in Nebraska from mid-February through mid-July. Disturbances within 0.5-mile of an active nest or within line-of-sight of the nest could cause adult eagles to discontinue nest building or to abandon eggs. Both bald and golden eagles frequent river systems in Nebraska during the winter where open water and forested corridors provide feeding, perching, and roosting habitats, respectively. The frequency and duration of eagle use of these habitats in the winter depends upon ice and weather conditions. Human disturbances and loss of wintering habitat can cause undue stress leading to cessation of feeding and failure to meet winter thermoregulatory requirements. These affects can reduce the carrying capacity of preferred wintering habitat and reproductive success for the species. To comply with the BGEPA, it is recommended that the project proponent determine whether the proposed project would impact bald or golden eagles. If it is determined that either species could be affected by the proposed project, the Service recommends that the project proponent notify this office as well as the Nebraska Game and Parks Commission (Commission) for guidance regarding avoiding adverse impacts to bald and golden eagles.

Fish and Wildlife Coordination Act

The FWCA requires consultation with the Service and State fish and wildlife agency for the purpose of preventing loss of and damage to fish and wildlife resources in the planning, implementation, and operation of federal and federally funded, permitted, or licensed water resource development projects. This statute requires that federal agencies take into consideration the effect that the water related project would have on fish and wildlife resources, to take action to prevent loss or damage to these resources, and to provide for the development and improvement of these resources. The comments in this letter are provided as technical assistance only and is not the document required of the Secretary of the Interior pursuant to Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*) on any required federal environmental review or permit. This technical assistance letter is valid only for the described conditions and will have to be revised if significant environmental changes or changes in the proposed project take place. The Service anticipates FERC to include conditions to protect, mitigate damages to, and enhance the referenced fish and wildlife resources under Section 10(j) of the Federal Power Act of 1935.

To determine if the proposed project may affect fish and wildlife resources of the State of Nebraska under the FWCA, the Service recommends that the project proponent contact Carey Grell, Nebraska Game and Parks Commission, 2200 N. 33rd Street, Lincoln, NE 68503-0370.

Wetlands, Streams, Grassland, and Riparian Habitats

If wetlands or streams will be impacted by the proposed Project, a Department of the Army permit from the U.S. Corps of Engineers may be needed. The Service recommends that impacts to wetlands, streams, and riparian areas be avoided or minimized. In accordance with the Section

404(B)(1) Guidelines (Guidelines) of the Clean Water Act, the Guidelines emphasize that avoidance and minimization precede compensation, which is to be considered solely for unavoidable adverse impacts on fish and wildlife resources and supporting ecosystems. For projects that do not require access or proximity to, or location within aquatic environments (i.e., non-water dependant project) to fulfill its basic project purpose, it is assumed that practicable alternatives exist that would cause less damage to aquatic resources than projects that are located in aquatic ecosystems. In addition to determining the least environmentally damaging practicable alternative, 40 CFR Part 230.10(a) of the Guidelines also states, "... no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, **so long as the alternative does not have other significant adverse environmental consequences** (emphasis added).

If after an alternatives analysis has been completed in accordance with the Guideline, and unavoidable impacts are to occur to aquatic habitats, the Service recommends that compensation (i.e., restoration of a degraded wetland or creation) occur for like wetland type at a ratio of 2:1 (acres of wetlands restored/created to acres of wetlands impacted). For unavoidable impacts to streams, the Service recommends that stream pattern, profile, and dimension be mitigated at a ratio of no less that 1:1 (stream length and number, pattern, and length of meanders created/restored versus stream length and number, pattern, and length of meanders impacted; sequence and number of pools and riffles created/restored versus sequence and number of pools and riffles impacted). Additionally, compensation for impacts to riparian habitats should occur at a minimum ratio of 3:1 (i.e., acres of riparian habitat replaces for acres of riparian habitat impacted) The 3:1 ratio is based on the loss of the habitat and the amount of time that will be required for planted trees to reach maturity.

Migratory Bird Treaty Act

Under the MBTA, activities in grassland, wetland, stream, and woodland habitats that would otherwise result in the taking of migratory birds, eggs, young, and/or active nests should be avoided. Although the provisions of MBTA are applicable year-round, most migratory bird nesting activity in Nebraska occurs during the period of April 1 to July 15. However, some migratory birds are known to nest outside of the aforementioned primary nesting season period. For example, raptors can be expected to nest in woodland habitats during February 1 through July 15, whereas sedge wrens which occur in some wetland habitats normally nest from July 15 to September 10.

If various Project actions would occur during the primary nesting season or at any other time which may result in the take of nesting migratory birds, the Service recommends that FERC/Loup Power District arrange to have a qualified biologist conduct a field survey of the affected habitats and structures to determine the absence or presence of nesting migratory birds. For example, migratory birds can be electrocuted or collide with powerlines and be killed or injured. Bank swallows can nest on cut banks of canals and cliff swallows can nest on powerhouse and siphon structures. Routine maintenance of the canal, powerhouse, siphons and other facilities by FERC/Loup Power District could result in loss of these active nests. Surveys must be conducted during the nesting season. The Service further recommends that field surveys for nesting birds, along with information regarding the qualifications of the biologist(s) performing the surveys, be thoroughly documented and that such documentation be maintained on file by FERC/Loup Power District.

The Service requests that the following be provided to this office prior if the above conditions occur. The purpose of the request is to assist the project proponent to avoid the unnecessary take of migratory birds and the possible need for law enforcement action:

a) A copy of any survey(s) for migratory birds done in conjunction with FERC/Loup Power District activities, if any. The survey should provide detail in regards to survey methods, date and time of survey, species observed/heard, and location of species observed.

b) Written description of any avoidance measures implemented to avoid the take of migratory birds.

c) Written description of any circumstances where it has been determined by the project proponent that one or more active bird nests cannot be avoided by FERC/Loup Power District activities.

The Service appreciates the opportunity to provide comments on this proposed project. Should you have any questions regarding these comments, please contact Mr. Robert Harms within our office at (308) 382-6468, extension 17.

Sincerely,

John Cochnar

John Cochnar
Assistant Nebraska Field Supervisor

Enclosure

cc: FERC; (Attn: Kim Nguyen)
HDR; Minneapolis, MN (Attn: George Waldow)
NGPC; Lincoln, NE (Attn: Frank Albrecht)
NGPC; Lincoln, NE (Attn: Kristal Stoner)
NGPC; Lincoln, NE (Attn: Carey Grell)
USACE; Omaha, NE (Attn: John Moeschen)
NPS; St. Paul, MN (Attn: Randall Thorson)
FWS; Denver, CO (Attn: Don Anderson)

Enclosure

Preliminary Concerns,

Loup River Hydroelectric Project
Federal Energy Regulatory Commission
Loup Power District

U.S. Fish and Wildlife Service
Nebraska Game and Parks Commission

1) Flow depletion on the Loup River below the diversion at Genoa. Affected resources include:

a) diminished natural peak flows and sediment supply affecting sand bar development and suitability for nesting and foraging piping plover and least tern;

b) increased susceptibility of invasive and/or woody plant species becoming established on sandbar habitats;

c) water diversion for hydropower, irrigation, and any associated evaporation from the Loup River may increase susceptibility of land-based predation due to shallow water in channels affecting least tern and piping plover;

d) water diversion from the Loup River may increase human disturbance which may affect nest initiation and/or abandonment for the least tern and piping plover;

e) water diversion from the Loup River may lower production of invertebrates and fish affecting food availability for the least tern, piping plover, Tier 1 species, and other riverine fish and wildlife species;

f) low flows affecting fish movement/migration;

g) water diversion from the Loup River will increase probability of fish kills due to stranding of fish in pools and increased water temperatures;

h) loss and/or degradation of adjacent wetland habitats connected to the river via groundwater; and

i) narrow channels could result in vegetative encroachment.

2) Flow depletion on the Loup River above the diversion at Genoa to other water users due to preference system of water rights in exchange for just compensation. Affected resources include:

a) diminished peak flows affecting sand bar suitability for nesting and foraging piping plover and least tern;

b) increased susceptibility of invasive and/or woody plant species becoming established on sandbar habitats;

c) water withdrawals for other uses on the Loup River may increase susceptibility of land based predation due to shallow water in channels affecting least tern and piping plover;

d) water withdrawals from the Loup River may increase human disturbance which may affect nest initiation and/or abandonment for the least tern and piping plover;

e) water withdrawals from the Loup River may lower production of invertebrates and fish affecting food availability for the least tern, piping plover, Tier 1 species, and other riverine fish and wildlife species;

f) low flows affecting fish movement/migration;

g) water withdrawals from the Loup River will increase probability of fish kills due to stranding of fish in pools and increased water temperatures;

h) loss and/or degradation of adjacent wetland habitats connected to the river via groundwater; and

i) narrower channels could result in vegetative encroachment.

3) Flow depletion on the Platte River system from: a) evaporative losses within the power canal system, and b) withdrawal of water from canal for irrigation uses. Affected resources include:

a) diminished peak flows affecting sand bar suitability for nesting piping plover and least tern;

b) reduced production of invertebrates and fish potentially affecting food availability for the least tern, piping plover, pallid sturgeon, Tier 1 species, and other riverine fish and wildlife resources;

c) reduced flows affecting pallid sturgeon migration/movement;

d) increased susceptibility of invasive and/or woody plant species becoming established on sandbar habitats;

e) potential impact on spawning cues for pallid sturgeon, catfish, sauger, and other river fish;

f) loss and/or degradation of adjacent wetland habitats connected to the river via groundwater;

g) narrower channels could result in vegetative encroachment; and

h) thermal stress on fish.

4) Sediment-deprived flow that is discharged from the tailrace into the Platte River may have the following impacts:

a) reduced sandbar formation/maintenance for least tern, piping plover nesting and foraging habitats;

b) channel degradation resulting in disconnected side-channels, backwaters, a deeper, narrower main channel, and floodplain affecting least tern, piping plover and other riverine fish and wildlife resources;
c) changes in sand particle size may affect formation of sandbar habitats; and

d) changes in water temperature may affect abundance and distribution of forage.

5) Dredging and discharge activities at the settling basin. Impacts include:

a) overcovering of nests with discharge on nesting least terns and piping plovers;

b) entrapment of fish on spoil pile; and

c) entrainment and mortality of fish during dredging operations.

6) Hydrocycling. Affected resources include:

a) inundation of sandbars and loss of least tern and piping plover nests;

b) inundation of sandbars results in the loss of sandbar habitat that could have otherwise been used by least terns and piping plovers for nesting and foraging;

c) frequent daily erosion of sandbars affecting least tern and piping plover habitat needs;

d) impacts to benthic production affecting food resources for riverine fish and wildlife including listed threatened endangered species;

e) hydrocycling impacts to pallid sturgeon and other riverine fish species affecting fish passage, stranding fish in pools, heat stress, impacts to benthic invertebrates, and elevated levels of predation; and

f) water temperature changes and affects on forage abundance and distribution.

7) Recreation. Recreational benefits of the multiple use project may have degraded over the project period. Have the proposed benefit components been completed, maintained and operated, or enhanced during the project period? Affected resources include:

a) aquatic habitat for recreational fish species in storage reservoirs;

b) impediments in canal delivery system for distribution of recreational fish species;

c) access to project property for public fishing and hunting;

d) project operation activities resulting in fish kills within the canal and storage reservoirs;

e) degradation of the recreational fishery due to project-related activities;

f) a barrier to fish movement at the diversion dam; and

g) Canal maintenance activities may affect fish.