APPENDIX E-2

DRAFT BIOLOGICAL ASSESSMENT

Loup River Hydroelectric Project
FERC Project No. 1256

Draft Biological Assessment

Loup Power District
Hydro Project

April 13, 2012

Serving You Electrically
LOUP POWER DISTRICT

Loup Power District
Hydro Project

Loup River Hydroelectric Project
FERC Project No. 1256

Draft Biological Assessment

April 13, 2012

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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

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 continued operation of the Project and, therefore, by relicensing.

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 Final License Application, on Federally listed species. The District intends this BA to satisfy ESA Section 7 consultation requirements between FERC and USFWS.

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
Beaver Creek
Dry Cherry Creek
Shell Creek
Lost Creek Ditch
Loup River
Platte River
Lost Creek
Dry Cherry Creek Siphon
Monroe Powerhouse
Upper Power Canal
Lower Power Canal
Lake Babcock
Lake North
Intake Canal
916 Siphon
Oconee Siphon
Sawtooth Weir
Columbus Powerhouse
Monroe
Railroad Siphon
Looking Glass Creek Siphon
Beaver Creek Siphon
Genoa
Columbus
Tailrace Canal
Lost Creek Siphon
Settling Basin
Skimming Weir
Outlet Weir
Diversion Weir
Platte County
Nance County
Merrick County
Polk County
Butler County
Project Location
Nance & Platte Counties, Nebraska
2 1 0 2
Miles
Aerial Imagery: 2010 National Agricultural Inventory Project, Nance and Platte Counties Mosaic.
Corporate Limits, County Line: 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
Biological Assessment

DATE
April 2012

FIGURE
1

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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 16, 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
- Platte River bypass reach
- Lower Platte River

Boone
Platte
Burt
Dodge
Washington
Colfax
Nance
Merrick
Polk
Butler
Saunders
Douglas
Sarpy
Cass
Hamilton
York
Seward
Lancaster
Clay
Fillmore
Saline

Beaver Creek
Cedar River
Loup River
Platte River
Elkhorn River
Missouri River
Salt Creek

Lower Power Canal
Upper Power Canal
Monroe Powerhouse
Lake Babcock
Lake North
Columbus Powerhouse
Tailrace Canal
North and South Sand Management Area
Project Diversion
Loup River Bypass Reach
Platte River Bypass Reach
Lower Platte River

Monroe
Genoa
Columbus
Duncan
North Bend
Fremont
Omaha
Ashland
Louisville
Lincoln

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

29
680
80

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

DATE
April 2012

FIGURE
2

Path: Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Action_Area_Figure_2_V2.mxd

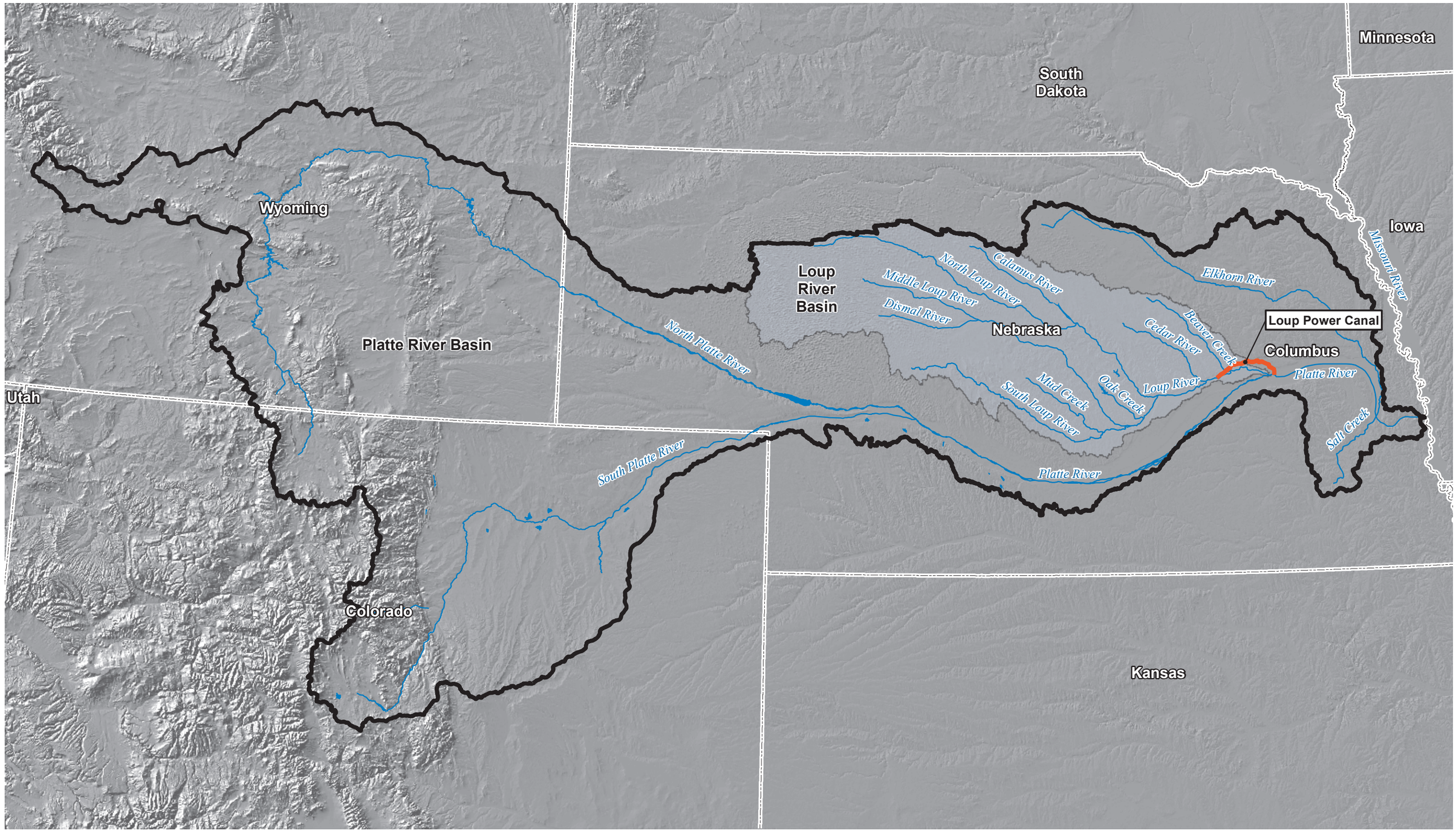
3. DESCRIPTION OF THE PROJECT

3.1 Project Location and Facilities

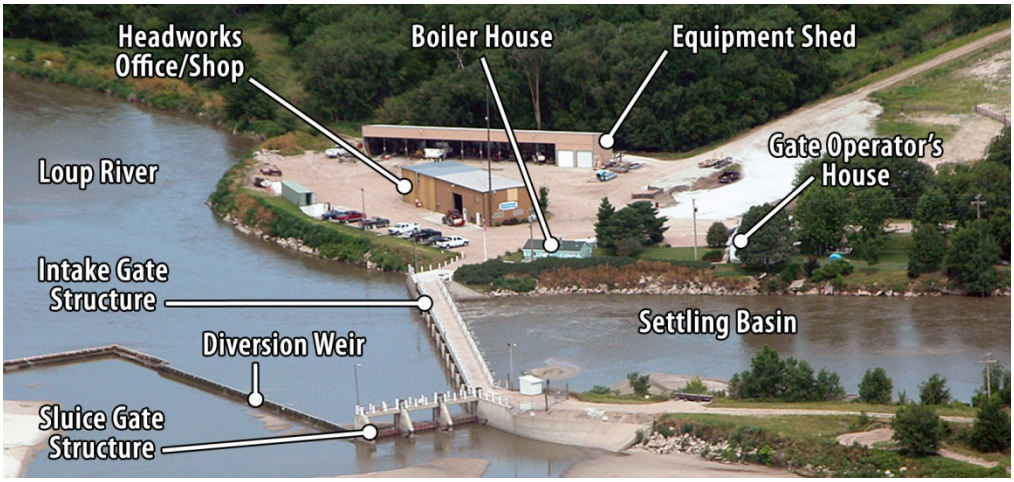
The Project was constructed in the mid-1930s and has been in continuous operation since it began operating in late 1937. During the period of operation, Project operations have remained essentially constant.

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 available water (up to 3,500 cubic feet per second [cfs] in accordance with the District's water appropriation limit and the hydraulic capacity of the Loup Power Canal) from the Loup River 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 is part of the larger Platte River Basin, shown in Figure 3.


Wyoming
Platte River Basin
Utah
Colorado
South Dakota
Minnesota
Iowa
Nebraska
Kansas
Loup River Basin
North Platte River
South Platte River
Platte River
Missouri River
Calamus River
North Loup River
Middle Loup River
Dismal River
Elkhorn River
Beaver Creek
Cedar River
Loup Power Canal
Columbus
Loup River
Oak Creek
Mud Creek
South Loup River
Salt Creek
45 22.5 0 45
Miles
Legend
Loup Power Canal
Platte River Basin
River
Source: Platte River Basin, River, National Hydrography Dataset: U.S. Geological Survey
Loup Power District Hydro Project
Platte and Loup River Basins
Loup River Hydroelectric Project
FERC Project No. 1256
Biological Assessment
© 2012 Loup River Public Power District
DATE
April 2012
FIGURE
3
Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Location_Map_BA_V2.mxd

The Project consists of the following features, shown in Figure 1; features at the Headworks are shown in the photo below:



Aerial view of the Headworks.

1. Diversion Weir – Located on the Loup River at 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 6 feet. 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.
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 – Spanning 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 radial 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

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

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 – The North SMA is approximately 320 acres in size and is located north of the Settling Basin, away from the Loup River. 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 Loup 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 kilovolt-amperes (kVA). At full load, each turbine generating unit can pass 1,000 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 through 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 limit potential backflow from Lake Babcock in the event of a canal breach.

11. Regulating Reservoirs – The Project includes two connected regulating reservoirs: Lake Babcock and Lake North.

    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 approximately 760 acres at its full pool elevation of 1,531 feet MSL, providing approximately 2,000 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, reservoir drawdown may be increased to 3 feet, and on occasion to as much as 5 or 6 feet. Only rarely, and primarily for maintenance purposes, is the reservoir drawdown as great as 7 feet (to elevation 1,524 feet MSL).

    Lake North is an off-channel regulating reservoir. Lake North covers approximately 200 acres at an elevation of 1,531 feet MSL and provides approximately 2,100 acre-feet of total storage. Lake North provides an estimated 1,175 acre-feet of effective (usable for generation) storage capacity between elevation 1,531 and 1,525 with approximately 925 acre-feet of ineffective storage below elevation 1,525.

12. 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[2] and rate of flow.

13. 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 2⅜ inch openings that are designed to exclude large items that could harm the turbines or mechanical equipment in the Columbus Powerhouse.

14. 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.

[2] The term ***stage*** refers to the height of a river (or any other body of water) above a locally defined elevation.

15. 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.
16. Tailrace Canal – The Tailrace Canal is approximately 5.5 miles long and contains no embankment sections because it was excavated along its entire length. It has a bottom width of 42 feet and a normal water depth of about 19 feet when generating at maximum turbine output. 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.
17. 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. The weir was modified to lower the tailwater at the Columbus Powerhouse and to increase the velocity of flow through the Tailrace Canal. The Tailrace Canal had experienced a sediment build-up as a result of canal bank sloughing. Lowering the weir increased velocities in the canal to assist with scouring the bed to its original design elevation.

3.2 Project Purpose and Objectives

The purpose of the Loup River Hydroelectric Project is clean, renewable 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).

In connection with the Project, the District provides a variety of public benefits to residents in Nance and Platte counties, visitors from Nebraska and elsewhere, and electric ratepayers across Nebraska, including the following:

- Low energy rates – Revenue from the Project reduces electric rates for District customers.
- Recreation – The District maintains and operates five developed recreation areas and three multi-use trails, which provide opportunities for activities such as camping, hiking, biking, and aquatic recreation.

- Agriculture – The Loup Power Canal facilitates irrigation of crops adjacent to the Project. There are 71 irrigation water withdrawal points along the length of the Loup Power Canal.
- Economic development – The District plays a key role in economic development in Nance and Platte counties by providing low-cost power, strategic land development, an increased tax base, recreation-based tourism, and direct employment.

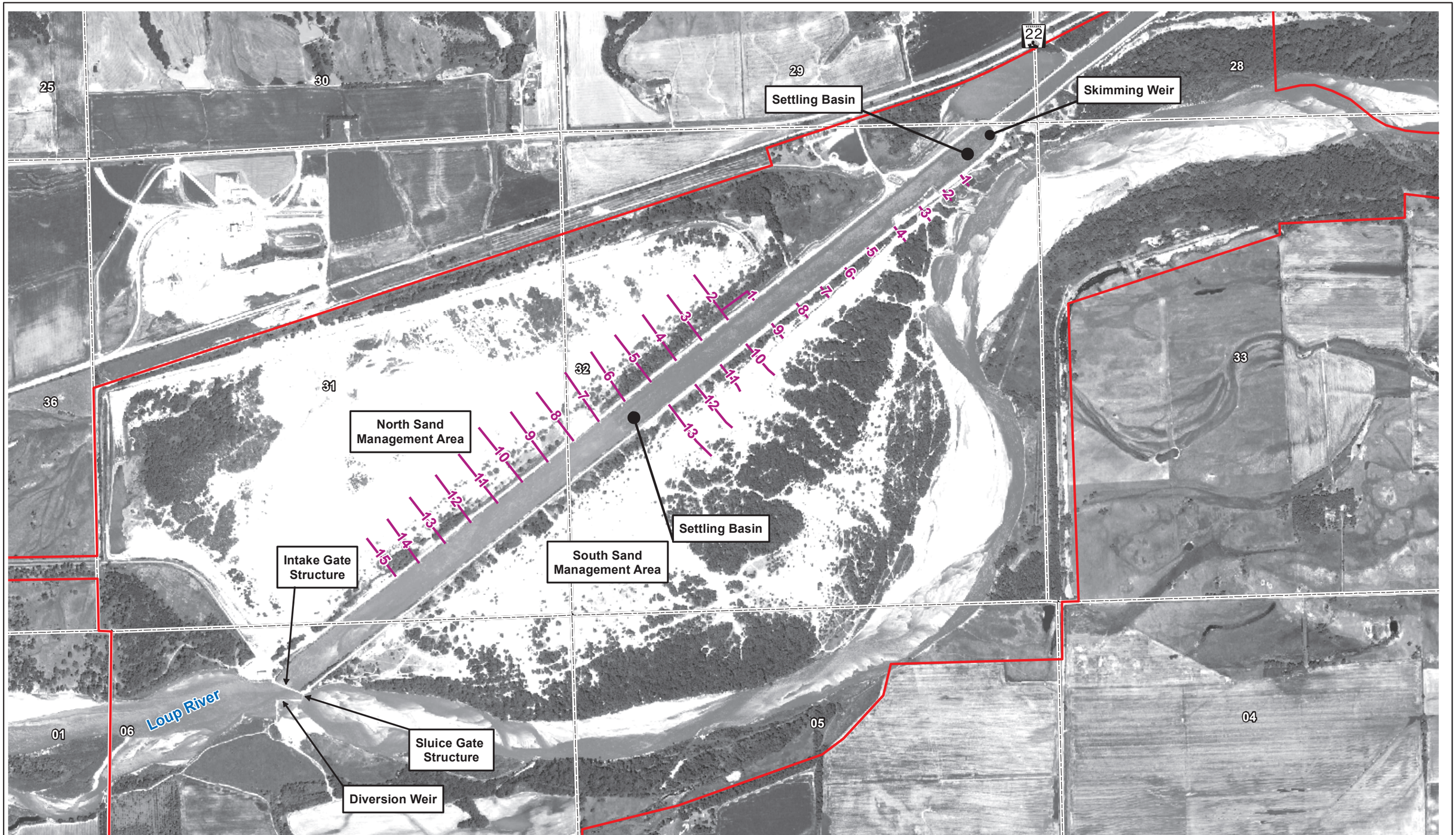
3.3 Current Project Operations

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
- Presence 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

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.

A floating Hydraulic Dredge is employed to remove accumulated sediment from the Settling Basin. Without frequent dredging, it is estimated that the Settling Basin would silt in within 1 year and cause the Project to shut down for lack of water. Since 1975, the Hydraulic Dredge has removed an average of approximately 1.25 million cubic yards (CY) (2.0 million tons) of sediment from the Settling Basin each year. 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.



Legend

- Project Boundary
- Section Line
- Dredge Discharge Pipe

1,000 500 0 1,000
Feet

Dredge discharge pipe lengths are approximate
Aerial Imagery: 2010 National Agricultural Inventory Project, Nance and Platte Counties Mosaic

Loup Power District Hydro Project

Settling Basin Dredge Discharge Locations

Loup River Hydroelectric Project
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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, 4/5/2012

The District has received ongoing authorization from USACE to discharge dredged material from the Settling Basin to the South SMA. Most recently, the District was provided CWA Section 404 Permit (Permit No. 2007-3190-KEA) on January 6, 2012. As documented in the referenced permit, USACE has determined that a CWA Section 404 permit is not necessary for Project discharges to the North SMA (USACE January 6, 2012).

The annual dredging operation is initiated in the spring after the winter ice cap melts in early March. Prior to 1988, the dredging operation would progress from downstream to upstream from March through November. However, since 1988, the dredging operation is suspended from early June to mid-August to accommodate the nesting season for interior least terns (*Sternula antillarum athalassos*), which are Federally listed as endangered, and piping plovers (*Charadrius melodus*), which are Federally listed as threatened.

When dredging begins, dredged material is pumped to the South SMA from pipe #1 to pipe #13, and to the North SMA from pipe #1 up to approximately pipe #8 between March and June 1 (see Figure 4). In mid-August, dredging begins again at the downstream end of the Settling Basin and progresses upstream toward the headgates. Typically, dredging is suspended in mid- to late November when ice begins to form on the Settling Basin. Prior to 1988, when the dredging schedule was modified to accommodate nesting, the entire Settling Basin was dredged at least once annually. However, since 1998, it is rare that the entire basin gets dredged annually.

After sediment is removed at the Settling Basin, diverted flows are routed to the Monroe and Columbus Powerhouses to generate electricity. Project generation is dispatched from the NPPD Control Center in Doniphan, Nebraska. NPPD is the exclusive purchaser of Project power. The NPPD dispatcher will request that Loup Power 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 upstream 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 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[3] 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 (10,000 cfs[4] and greater) 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 water management practices, including irrigation withdrawals. During these periods, the Project continues to operate normally, albeit with reduced flow available for diversion and generation. Also, during hot summer conditions, the District defers non-emergency maintenance procedures that require substantial curtailment of Loup Power Canal flows. This measure has been implemented to minimize the potential for low dissolved oxygen levels in the Loup Power Canal and potential fish kills that could result.

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.

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[3] Average determined from U.S. Geological Survey gage data for Water Years 1938 through 2009.

[4] The District has selected 10,000 cfs as a high flow based on institutional experience. A flow of 10,000 cfs in the Loup River upstream of the Project is equaled or exceeded 0.7 percent of the time. This means that on average, a 10,000 cfs or higher flow occurs approximately 3 days per year.

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, which are Federally listed as endangered, and piping plovers, which are Federally listed as threatened, within the Project Boundary. This has led to cessation 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. As discussed in Section 3.3, the hydraulic dredge removes an average of approximately 1.25 million CY (2.0 million tons) of sediment from the Settling Basin each year. 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 that lead to the North and South SMAs (see Figure 4).

In 2006, the District was approached by a materials processing company that wanted to remove and process sand from the North SMA. The District subsequently entered into an agreement with Preferred Sands[5] to remove sand from the North SMA and process it at Preferred Sands' facility located north of and outside of the Project Boundary.[6]

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

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[5] The District's original agreement in 2006 was with Harwest Industrial Minerals Corporation. 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.

[6] Prior to entering into an agreement with Harwest Industrial Minerals Corporation, the District discussed the sand removal operation with FERC staff and received guidance on necessary requirements of the agreement as they related to the Project license.

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 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 (Brown and Jorgensen, 2010). In 2010, severe weather in June impacted the nesting colonies and decreased the ratios. In 2011, fledge ratios were higher than 2010 but not as high as 2008 and 2009. 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. Implementation of the MOU is considered successful because it has enabled successful breeding of both species at

the North SMA while allowing sand removal operations to continue. 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, the District is proposing no new Project facilities. The Proposed Action to be considered in this BA is the issuance of a new license for the Project with the noted facility and operational modifications.

3.5.1 Proposed Project Operation

The Project has been in continuous operation since late 1937. During that time, Project operations, as described in Section 3.3, have essentially remained constant. The District proposes only one minor change to current operation of the Project described in Section 3.3. The District proposes to formalize a previous operating practice[7] for providing flow in the Loup River bypass reach in order to enhance aquatic habitat. In accordance with the previous practice, the District would allow approximately 75 cfs of flow down the Loup River bypass reach (measured at U.S. Geological Survey [USGS] Gage 06793000, Loup River near Genoa, NE) on days when the ambient temperature at Genoa or Columbus is forecast to reach or exceed 98 degrees Fahrenheit. This practice of providing flow in the Loup River bypass reach had previously been suspended due to concerns expressed by the Nebraska Department of Natural Resources (NDNR) related to potential violation of the District's water appropriation. The District met with NDNR to discuss its concerns and believes that this issue has been resolved to allow additional flow in the Loup River bypass reach without jeopardizing the District's water appropriation. The District has requested formal confirmation of this from NDNR but confirmation has not yet been received.

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 Project facilities.

[7] The practice of providing additional flow in the Loup River bypass reach was initiated in 1996 at 50 cfs at the request of NGPC. In 2004, the bypass flow amount was increased to 75 cfs at the request of NGPC. In 2008, the practice of providing flow in the Loup River bypass reach was discontinued due to concerns expressed by the NDNR related to potential violation of the District's water appropriation.

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. Additionally, at the request of USFWS, the District has prepared a draft MOU related to District dredging activities to formalize the measures previously implemented by the District to protect interior least tern and piping plover nesting activities at the North SMA.

The District is also proposing to formalize a previous operating practice for providing flow in the Loup River bypass reach in order to enhance aquatic habitat. In accordance with the previous practice, the District would allow approximately 75 cfs of flow down the Loup River bypass reach (measured at USGS Gage 06793000, Loup River near Genoa, NE) on days when the ambient temperature at Genoa or Columbus is forecast to reach or exceed 98 degrees Fahrenheit.

4. ESA CONSULTATION

On January 12, 2012, 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 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.

Consultation with USFWS has been ongoing since early 2008, when the District initiated discussions on Project relicensing prior to submitting its PAD to FERC. USFWS participated in development of the studies conducted during relicensing, attended study results meetings, and provided verbal and written comments on completed studies throughout the relicensing process.

In addition, the District (as FERC's designated Federal representative in conducting informal consultation with USFWS under Section 7) held several meetings specifically to coordinate on Section 7 and 10J issues. On July 22, 2008, the District met with USFWS to generally discuss the Section 7 and 10J process.

Table 1. Federally Listed Species in the Action Area

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

Sources: NatureServe, 2011, NatureServe Explorer: An Online Encyclopedia of Life [web application], Version 4.6, Arlington, VA: NatureServe, retrieved on April 10, 2012, http://www.natureserve.org/explorer/.

USFWS, July 2010, Endangered, Threatened, Proposed, and Candidate Species in Nebraska Counties, U.S. Fish and Wildlife Service, Nebraska Field Office, Grand Island, Nebraska, available online at http://www.fws.gov/mountain%2Dprairie/endspp/CountyLists/Nebraska.pdf.

Note:

[a] E = endangered; T = threatened.

On October 3, 2011, the District met with USFWS and NGPC to discuss the Section 7 and Section 10J process and specifically to discuss potential conservation measures to avoid or minimize impacts on threatened and endangered species. USFWS discussed the following potential conservation measures:

- Flow modification in the Loup River bypass reach (minimum flows and sculpting/maintenance flows) to improve interior least tern and piping plover habitat
- Revising District participation in the North SMA MOU from cooperating to a full signatory
- Consideration of a reregulating reservoir to minimize the effect of hydrocycling.

On November 2, 2011, a follow-up meeting was held to discuss potential avoidance, minimization, and mitigation measures discussed at the previous meeting. The following summarizes these discussions:

- USFWS and the District agreed with the concept of developing a separate MOU specific to the District's dredging practices.
- Prior to the meeting, USFWS had proposed a minimum flow of 300 to 400 cfs during July and August to maintain a lower water temperature and to keep fish from becoming stranded. The District indicated that minimum flows at these levels represent 21 to 31 percent of the District's total diversion during those months and that this level of minimum flow is not workable for Project operations.
- USFWS proposed a sculpting and maintenance flow between May 22 and June 29 with the goal of improving effective discharge to move more sediment and aid in bar formation and shaping processes.
- USFWS proposed that sandbar shaping be performed in three to five areas on the Loup River bypass reach where historical interior least tern and/or piping plover nesting activity has been observed. This would include mechanical sandbar shaping to lower existing point bars to mid-channel bars.
- The District investigated several scenarios and provided the following information relative to the potential for a reregulating reservoir:
    - Full attenuation of the hydrocycling peak would require approximately 300 to 400 acres of land and that construction of reregulating reservoir is cost prohibitive.
    - Potential use of Tailrace Park as a reregulation area could only support approximately 100 acre-feet of storage.
    - Potential storage within the Tailrace Canal would provide limited storage (up to 100 acre-feet) but is not feasible due to canal maintenance and infrastructure (such as bridges) issues associated with higher canal water levels.
- USFWS requested an analysis of what a 10, 20, and 50 percent attenuation of the hydrograph would look like.

On March 5, 2012, a follow-up meeting was held to continue discussions of potential avoidance, minimization, and mitigation measures discussed at previous meetings. The following summarizes these discussions:

- The District agreed that it would prepare an MOU to formalize agreement on the suspension of the District's dredging operations during the interior least tern and piping plover nesting season.

- For sandbar shaping, USFWS provided criteria to use in identifying potential locations. In addition, USFWS noted that there would be no reason to perform sandbar shaping in the absence of a new flow regime in the Loup River bypass reach.
- The District provided alternate hydrographs for 10 and 20 percent attenuation of hydrocycling flows and noted that 50 percent attenuation is essentially the run-of-river condition evaluated in the Flow Depletion and Flow Diversion study conducted for Project relicensing (see the Final License Application, Volume 3, Final Study Report). It was discussed that the District has limited potential to provide attenuation because a minimum of 1,000 cfs must run through the turbines. NGPC asked what it would it mean to maintain a constant 1,000 cfs to eliminate the "low" portion of the hydrocycling hydrograph.
- The District noted its intent to propose a 75 cfs minimum flow in the Loup River bypass reach when dictated by air temperature in accordance with the previous operating agreement with NGPC. The District reiterated that a 300 to 400 cfs minimum flow is not economically feasible.
- The District noted that relicensing Study 14.0, Alternative Project Operations and Sediment Management, requested by FERC, is assessing the affects of alternative flows in the Loup River bypass reach as it pertains to maintenance flows (see the Final License Application, Volume 3, Final Study Report).

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 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 (National Oceanic and Atmospheric Administration 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

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.

5.1.1 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 four river systems that accounted for the largest numbers of interior least terns are all considered meandering systems, while the Platte River system is considered a braided system. 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, September 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 5.1.3, 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.

5.1.2 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, March 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 commonly 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. However, the species have also been known to nest at colonies independent of each other.

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.

Additional research (Elliot et al., 2009; Elliot, 2011) was conducted that developed a geomorphic classification of the lower Platte River. This research identified discrete reaches of the Platte River with processes necessary for the maintenance of nesting habitat. The analysis included an evaluation (based on July 2006 National Aerial Imagery Program aerial photography) of river channel width, valley width, channel curvature (sinuosity), and in-channel habitat features. A multivariate classification was performed to determine the classification of reaches based on clustering of geomorphic features. The geomorphic variables are valley width, channel width, 1.25-mile sinuosity, and 5-mile sinuosity. Results from these analyses showed that the section from the Loup River to the Elkhorn River was dominated by intermediate valley width, low to medium sinuosity, and high channel widths. The widest reaches of the lower Platte River are located in the segment from the Loup River to the Elkhorn River.

In addition, total channel width and habitat measures were analyzed to develop relations between channel width and habitat features. The segment of the Platte River from the Loup River to the Elkhorn River has the widest valley width and highest degree of braiding, with many large, vegetated islands. However, while there is considerable variation in channel width between reaches, the mean active channel width is similar throughout the lower Platte River (1,500 feet).

General conclusions were that interior least tern and piping plover nest sites from 2006 to 2008 occurred in reaches that were narrower than reaches with large percentages of dark vegetation (indicating vegetatated mid-channel or point bars) or that were highly braded. These areas were predominantly downstream of the Elkhorn River confluence as there were more river nests per mile in the segement of the lower Platte River downstream from the Elkhorn River. This reach was also represented by narrow valley widths with low to medium sinuosity.

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 and Jorgensen, 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.

5.1.3 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 was recorded on the Loup River (Lott, November 2006). The NGPC Nongame Bird Program has been tracking interior least tern bird and nest counts since the mid-1980s. During that time, counts have been conducted along the Loup River and associated off-river sites (typically sand and gravel pits), including the District's North SMA,[8] in the majority of years. Table 2 summarizes the highest nest count data for the Loup River, including off-river sites, both upstream and downstream of the Project's point of diversion. The data indicates that in all but 2 years, more total nests were observed downstream of the point of diversion than upstream. Of the nests observed downstream, most were located at off-river sites. Most recorded nesting along the Loup River system occurs at off-river sites (NGPC, 2009).

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 off-river nest count data were available for the majority of years since 1985, the data inconsistently included counts at the North SMA; however, based on the District's observations, it is believed that interior least terns use the North SMA for nesting activities nearly every year, including those years when counts were not documented. Table 3 summarizes interior least tern nest counts and fledge ratios at the North SMA for years in which counts and fledging data were available. Although several years of nest count data at the North SMA were not available, the 112 nests documented at the North SMA in the 10 years of surveys make up approximately 23 percent of all interior least tern nests documented on the Loup River from 1985 through 2011.

[8] The NGPC data include bird and nest counts at the North SMA in some but not all years. However, based on the District's observations, it is believed that interior least terns use the North SMA for nesting activities nearly every year.

Table 2. Interior Least Tern Nest Counts[a] on the Loup River

Year	RM 0 to Point of Diversion		Point of Diversion to Middle Loup River		Loup River Total
	On-River	Off-River	On-River	Off-River[b]	
1985	0		0		0
1986	0		0		0
1987	8	35	5	0	48
1988	2	41	18	0	61
1989	0	5	2	0	7
1990	15	14	13	0	42
1991	0	0	28	0	28
1992	23	5	22	0	50
1993	6	8	13	0	27
1995	11	3	21	0	35
1997		6		0	6
1998	0		0		0
2000		0		0	0
2001		4		0	4
2003		5		0	5
2004		11		0	11
2005	0	30	0	0	30
2008		17			17
2009	2	14	4		20
2010	8	22	10		40
2011	15	13	22		50
Total	90	233	158	0	481

Sources: 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.

NPPD. November 19, 2009. "loup2009" Excel spreadsheet. Provided via email by Jim Jenniges on November 19, 2009.

TPCP. January 8, 2010. Letter report from Mary Bomberger Brown, TPCP, to Peter Melcher, Preferred Rocks of Genoa.

TPCP. December 28, 2010. Letter report from Mary Bomberger Brown, TPCP, to Kelly Agnew, Vice President, Operations, Preferred Sands, LLC.

TPCP. March 28, 2012. Interior Least Terns and Piping Plovers on the Loup Diversion Sand Pile (North Sand Management Zone) 2011. Provided via email by Mary Bomberger Brown, TPCP.

USFWS. 2011. Loup and Middle Loup River Interior Least Tern and Piping Plover Suvery Report 2010. Provided by Michael D. George, Nebraska Field Supervisor on June 7, 2011.

USFWS. 2012. Least Tern and Piping Plover Survey Report 2011. Prepared by Jeanine Lackey. Provided by Bob Harms via email on February 29, 2012.

Notes:

[a] For locations that were counted more than once in a year, the highest nest count was included in the total.

[b] Although no off-river counts were recorded upstream up the point of diversion, the survey data indicate that upstream off-river locations were surveyed, but no nests were observed.

Table 3. Interior Least Tern Nest Counts at the North SMA

Year	North SMA Nest Count	Fledge Ratio
1987	23	
1988	13	
1989	4	
1990	3	
1991	0	
1992	3	
2008	17	0.76
2009	14	1.36
2010	22	0.41
2011	13	0.54
Total	112	

Sources: 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.

TPCP. 2009. The Tern and Plover Conservation Partnership-Preferred Rocks of Genoa-2008. Provided via email by Mary Bomberger Brown, TPCP.

TPCP. January 8, 2010. Letter report from Mary Bomberger Brown, TPCP, to Peter Melcher, Preferred Rocks of Genoa.

TPCP. December 28, 2010. Letter report from Mary Bomberger Brown, TPCP, to Kelly Agnew, Vice President, Operations, Preferred Sands, LLC.

TPCP. March 28, 2012. Interior Least Terns and Piping Plovers on the Loup Diversion Sand Pile (North Sand Management Zone) 2011. Provided via email by Mary Bomberger Brown, TPCP.

Although only a few years of productivity data are available for the North SMA, the 3-year running average fledge ratio for this site (0.77) is above the fledging ratio of 0.70, recommended in the Recovery Plan for Interior Least Terns for population maintenance (TPCP, 2009 and January 8, 2010). Additionally, the fledge ratio at the North SMA in 2011 (0.54) was substantially higher than the mean fledge ratio of 0.22 chicks per nest for the entire Loup and Platte river systems (TPCP, March 28, 2012).

The Loup River was regularly surveyed for on- and off-river nesting from 1985 through 1995. Since then, surveys have been less consistent, with some years being surveyed for only on- or off-river nests. Routine surveys for on-river nests were reinitiated in 2009 and have continued through 2011. 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 4. 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 5 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 4. Comparative Analysis of Interior Least Tern Range-wide Survey Data

	2005	
	Adults	Colonies
Total[a]	17,591	489
Nebraska Total[b]	1,071	51
Loup River[c]	73	2
North Loup River[d]	14	2
Lower Platte River[e]	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:

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

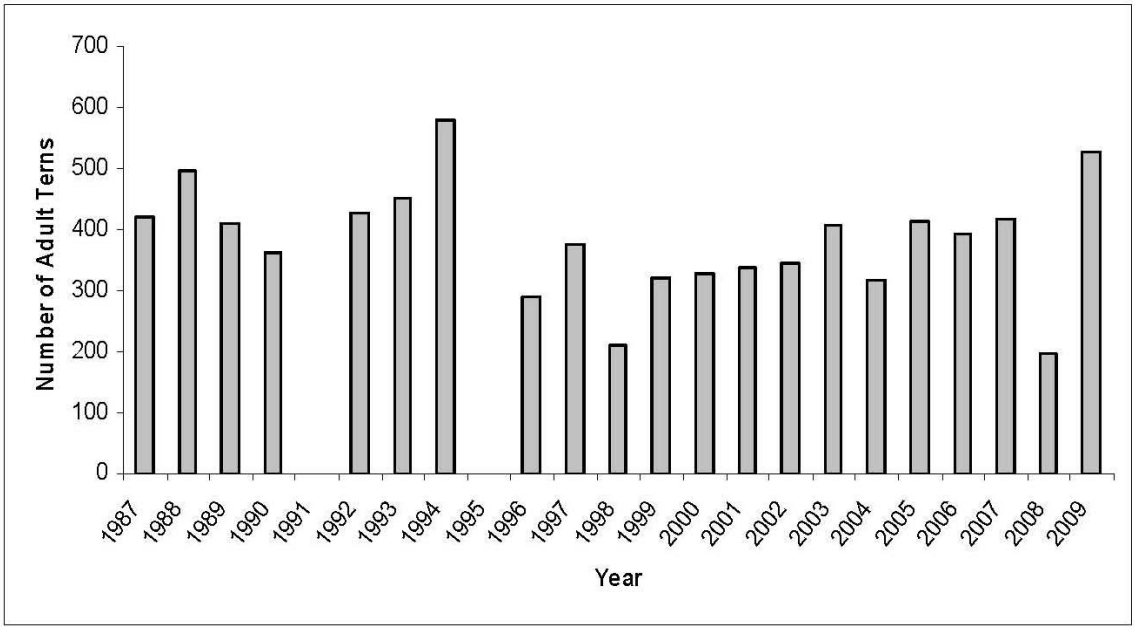
[b] Nebraska total includes birds counted at both on- and off-river habitat throughout Nebraska, but does not include birds counted on the Missouri River within the Nebraska boundaries.

[c] Loup River total includes birds counted at both on- and off-river habitat.

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

[e] 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.

5.1.4 Critical Habitat

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

5.2 Piping Plover

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).

5.2.1 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 (NGP&PC) 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 results of the 2011 census were not available at the time of the writing of this 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.

5.2.2 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 Gavins 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 removal operations and housing developments adjacent to the Loup, Platte, Niobrara, and Elkhorn rivers in Nebraska (Brown and Jorgensen, 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 and Jorgensen, 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, November 30, 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 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 (Armbruster, 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 above water level (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. Le Fer 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.

5.2.3 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).

The NGPC Nongame Bird Program has been tracking piping plover bird and nest counts since the mid-1980s. During that time, counts have been conducted along the Loup River and associated off-river sites (typically sand and gravel pits), including the District's North SMA,[9] in the majority of years. Table 5 summarizes the highest nest count data for the Loup River, including off-river sites, both upstream and downstream of the Project's point of diversion. The data indicate that in all but 4 years, more total nests were observed downstream of the point of diversion than upstream. Of the nests observed downstream, most were located at off-river sites (NGPC, 2009).

Although off-river nest count data were available for the majority of years since 1985, the data inconsistently included counts at the North SMA; however, based on the District's observations, it is believed that piping plovers use the North SMA for nesting activities in most years, including those years when counts were not documented. Table 6 summarizes piping plover nest counts and fledge ratios at the North SMA for years in which counts and fledging data were available. Although several years of nest count data at the North SMA were not available, the 40 nests documented at the North SMA in the 10 years of surveys make up nearly 29 percent of all piping plover nests documented on the Loup River from 1985 through 2011.

Piping plovers along the Loup River consistently use the North SMA within the Project Boundary for nesting, breeding, and foraging. The Loup River was regularly surveyed for on- and off-river nesting from 1985 through 1995. Since then, surveys have been less consistent, with some years being surveyed for only on- or off-river nests. Routine surveys for on-river nests were reinitiated in 2009 and have continued through 2011. 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 results were not yet available when this Draft BA was written.

[9] The NGPC data include bird and nest counts at the North SMA in some but not all years. However, based on the District's observations, it is believed that piping plovers use the North SMA for nesting activities nearly every year.

Table 5. Piping Plover Nest Counts[a] on the Loup River

Year	RM 0 to Point of Diversion		Point of Diversion to Middle Loup River		Loup River Total
	On-River	Off-River	On-River	Off-River[b]	
1985	0		0		0
1986	0		0		0
1987	1	10	2	0	13
1988	0	6	4	0	10
1989	0	6	0	0	6
1990	4	3	4	0	11
1991	0	0	9	0	9
1992	6	8	6	0	20
1993	0	3	5	0	8
1995	0	2	11	0	13
1997		5		0	5
1998	0		1		1
2000		0		0	0
2001		0		0	0
2003		0		0	0
2004		0		0	0
2005	0	9	0	0	9
2008		8			8
2009	1	5	2		8
2010	0	7	3		10
2011	1	3	4		8
Total	13	75	51	0	139

Sources: 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.

NPPD. November 19, 2009. "loup2009" Excel spreadsheet. Provided via email by Jim Jenniges on November 19, 2009.

TPCP. January 8, 2010. Letter report from Mary Bomberger Brown, TPCP, to Peter Melcher, Preferred Rocks of Genoa.

TPCP. December 28, 2010. Letter report from Mary Bomberger Brown, TPCP, to Kelly Agnew, Vice President, Operations, Preferred Sands, LLC.

TPCP. March 28, 2012. Interior Least Terns and Piping Plovers on the Loup Diversion Sand Pile (North Sand Management Zone) 2011. Provided via email by Mary Bomberger Brown, TPCP.

USFWS. 2011. Loup and Middle Loup River Interior Least Tern and Piping Plover Suvery Report 2010. Provided by Michael D. George, Nebraska Field Supervisor on June 7, 2011.

USFWS. 2012. Least Tern and Piping Plover Survey Report 2011. Prepared by Jeanine Lackey. Provided by Bob Harms via email on February 29, 2012.

Notes:

[a] For locations that were counted more than once in a year, the highest nest count was included in the total.

[b] Although no off-river counts were recorded upstream up the Project's point of diversion, the survey data indicate that upstream off-river locations were surveyed, but no nests were observed.

Table 6. Piping Plover Nest Counts at the North SMA

Year	North SMA Nest Count	Fledge Ratio
1987	9	
1988	1	
1989	3	
1990	1	
1991	0	
1992	2	
2008	8	3.38
2009	5	4.00
2010	7	1.57
2011	3	2.00
Total	40	

Sources: 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.

TPCP. 2009. The Tern and Plover Conservation Partnership-Preferred Rocks of Genoa-2008. Provided via email by Mary Bomberger Brown, TPCP.

TPCP. January 8, 2010. Letter report from Mary Bomberger Brown, TPCP, to Peter Melcher, Preferred Rocks of Genoa.

TPCP. December 28, 2010. Letter report from Mary Bomberger Brown, TPCP, to Kelly Agnew, Vice President, Operations, Preferred Sands, LLC.

TPCP. March 28, 2012. Interior Least Terns and Piping Plovers on the Loup Diversion Sand Pile (North Sand Management Zone) 2011. Provided via email by Mary Bomberger Brown, TPCP.

Although only a few years of productivity data are available for the North SMA, the 3-year running average fledge ratio for this site (2.52) is above the fledging rate of 1.13, which is currently recommended in the Recovery Plan for Piping Plovers for population maintenance (TPCP, 2009 and January 8, 2010). Additionally, the fledge ratio at the North SMA in 2011 (2.00) was higher than the mean fledge ratio of 1.40 chicks per nest for the entire Loup and Platte river system (TPCP, March 28, 2012).

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 NGP&PC population total, and the State of Nebraska group total in Table 7. As shown in this analysis, the significance of the Loup River system to the overall recovery of the species appears minimal.

Table 7. Comparative Analysis of International Piping Plover Census Data

	1991		1996		2001		2006	
	Adults	Pairs	Adults	Pairs	Adults	Pairs	Adults	Pairs
Total[a]	5,482	2,441	5,913	2,668	5,945	2,747	8,092	3,516
NGP&PC[b] Total	3,467	1,486	3,284	1,377	2,953	1,291	4,662	1,879
Nebraska Total[c]	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.

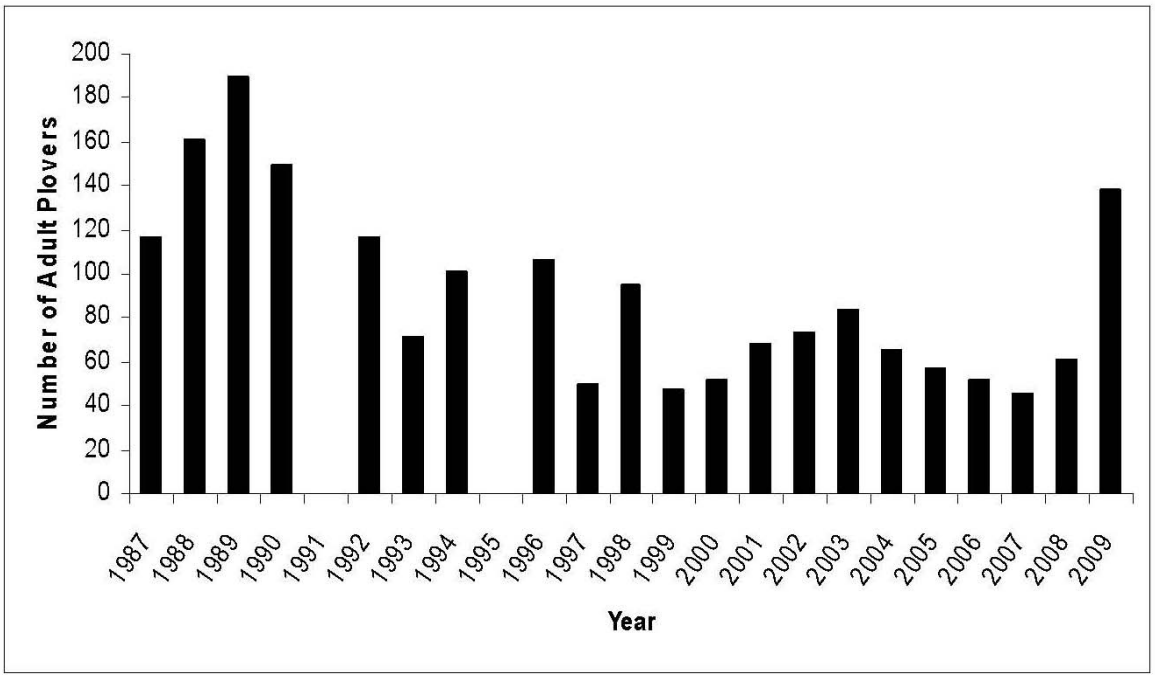
Notes:

[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.



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

5.2.4 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

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). On February 13, 2012, USFWS published its 5-Year Review: Summary and Evaluation (USFWS, February 13, 2012).

5.3.1 Current Status of the Species

The historical range of the whooping crane extended from the Arctic coast south to central Mexico and from Utah east to New Jersey, South Carolina, Georgia, and Florida. Although whooping cranes once numbered greater than 10,000, it has been estimated that only 500 to 1,400 whooping cranes inhabited North America in 1870. In the late 1800s, the whooping crane disappeared from the heart of its breeding range in north-central United States. By 1937, only two small breeding populations

remained. The last surviving bird of the Louisiana population died in captivity in 1950. The other remaining population had only 18 recorded individuals in 1939.

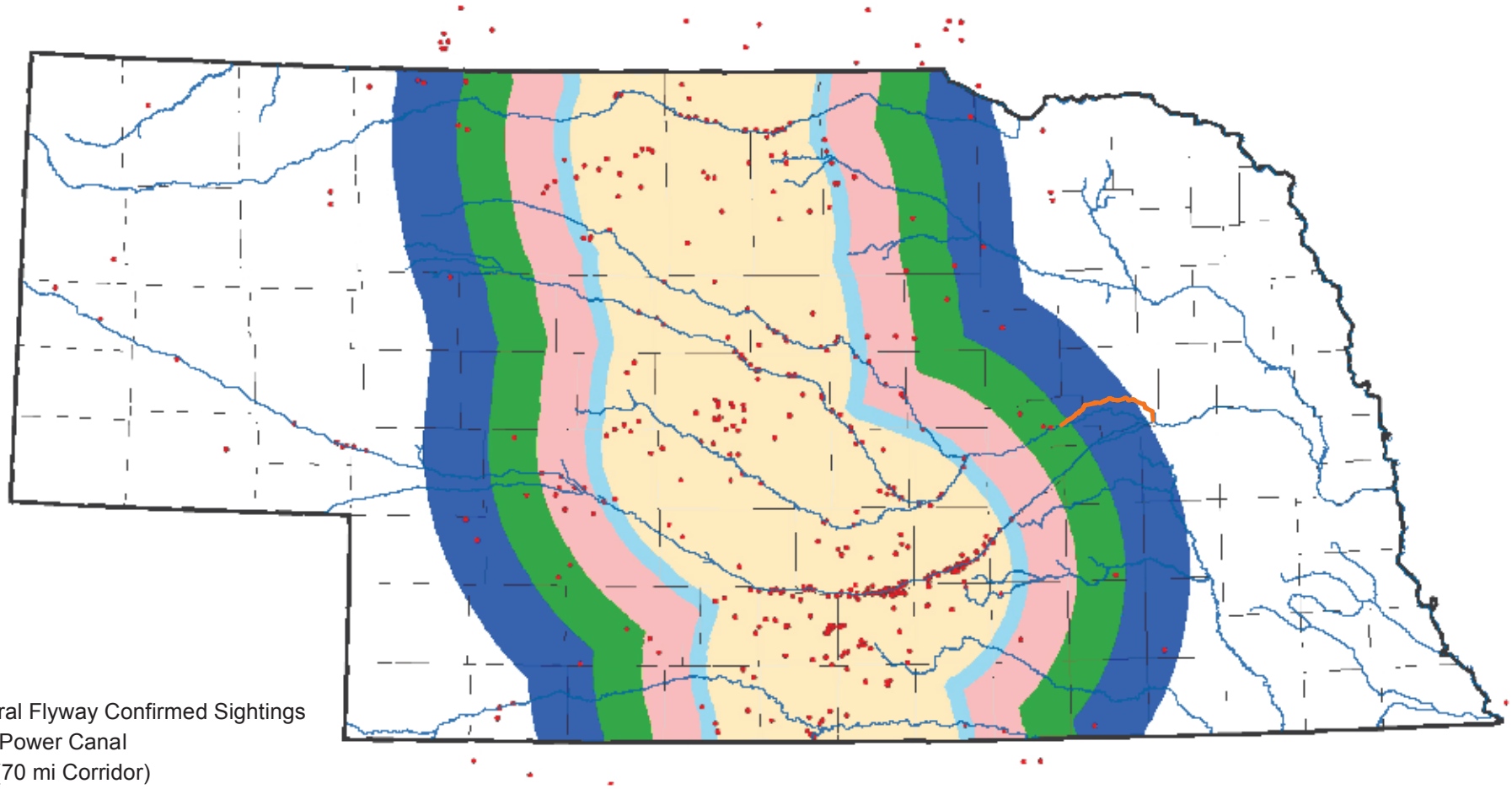
Today, most whooping cranes migrate from Wood Buffalo National Park in Canada to Aransas National Wildlife Refuge on the Texas coast. This route passes southeast through northeastern Alberta, south-central Saskatchewan, northeastern Montana, western North Dakota, western South Dakota, central Nebraska 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 migrate through Nebraska between early October and late November in the fall and mid-March to late May in the spring (Austin and Richert, May 2001). The Action Area is located within the easternmost band (approximating 2.5 percent of the total sightings) of the latest USFWS-defined Nebraska Whooping Crane Migration Corridor (see Figure 7). This most recent delineation of the whooping crane migration corridor is based on a portion of the total 2,384 sightings documented within the entire corridor from Texas to the Canadian border from 1975 through spring 2011 (USFWS, February 13, 2012).

Whooping cranes occur throughout North America, and the total wild population is estimated at 409 birds (USFWS, February 13, 2012). This estimate includes 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 279 birds. This flock has grown at an average of 4.6 percent per year over the past 70 years (USFWS, February 13, 2012). The review concluded that no change is warranted in the recovery priority or the listing status of the whooping crane (USFWS, February 13, 2012).

Possible threats to the whooping cranes include human settlement, over-utilization of water rights to estuary inflows in Texas, human-caused mortality, disturbance of breeding and wintering grounds, disease (for example, avian tuberculosis), predation, global warming and associated climate change, loss of genetic diversity, chemical spills in the wintering area, and collisions with power lines and fences (Canadian Wildlife Service and USFWS, March 2007; National Research Council, 2005).

"Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Biological_Assessment\Figure_BA_7_Whooping_Crane_Range_85x11_MARCH2012.mxd



Legend

- Central Flyway Confirmed Sightings
- Loup Power Canal
- 75% (70 mi Corridor)
- 80% (80 mi Corridor)
- 85% (110 mi Corridor)
- 90% (140 mi Corridor)
- 95% (180 mi Corridor)

0 25 50 100
Miles

Source: USFWS. Undated.
Nebraska Whooping Crane Migration Corridor.
Accessed on April 4, 2012.

Loup Power District Hydro Project

Nebraska Whooping Crane Migration Corridor

Loup River Hydroelectric Project
FERC Project No. 1256
Biological Assessment

DATE
April 2012

FIGURE
7

5.3.2 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 to 40 years (Canadian Wildlife Service and USFWS, March 2007).

The whooping crane is a bi-annual migrant across the Great Plains of the central U.S., in the spring and fall of each year, traveling between summer habitat in central Canada and wintering grounds in Texas. The migration corridor stretches approximately 2,400 miles long. In Nebraska, the migration corridor encompassing 75 percent of all documented sightings is approximately 75 miles wide, and the corridor encompassing 95 percent of sightings is approximately 185 miles wide, although occasionally this species may stop outside of the main corridor, primarily to the west 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 between 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, May 2001). 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 8 lists habitat measurements identified at whooping crane roosting sites on Nebraska rivers. It should be noted that virtually all of the habitat parameter data are based on observations on the central Platte River.

Table 8. Habitat Characteristics Noted at Nebraska Riverine Roosting Sites for Whooping Crane

Habitat Parameter	Observed Measurements of Habitat Parameters[a]	References
Wetted Channel Width	≥180 feet, usually >508 feet; average 764±276 feet	Johnson, 1982; Austin and Richert, May 2001
Percent Channel Inundated	>80%	Faanes et al., 1992
Unobstructed Channel Width	≥1,165 feet, <2,625 feet	Faanes, 1992; Austin and Richert, May 2001
Depth of water for roosting (shallow water habitat)	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

Shallow water habitat that exists within the Loup River could be used for roosting by whooping cranes. Use of this area would be migratory in nature. The District conducted an aerial imagery inventory and comparison of potential whooping crane roosting habitat in the Loup River both upstream and downstream of the point of diversion. Additionally, the District performed hydraulic modeling of two study sites on the Loup River (one upstream and one downstream). The results of these analyses were inconsistent.

The aerial imagery analysis found that all roosting habitat parameters (wetted channel width, percent channel inundated, and unobstructed channel width) in the Loup River bypass reach were generally outside the ranges of suitable roosting habitat for whooping cranes. Additionally, the only parameter within ranges of roosting habitat in the Loup River upstream of the point of diversion was wetted channel width, as shown in Table 9.

Table 9. Whooping Crane Habitat Parameters on the Loup River Identified via Aerial Interpretation

Habitat Parameter	Observed Measurements of Habitat Parameters[a]	Upstream of Point of Diversion	Downstream of Point of Diversion
Wetted Channel Width	≥180 feet, usually >508 feet; average 764±276 feet	399 to 569 feet Average[a] – 442 feet	131 to 402 feet Average[a] – 153 feet
Percent Channel Inundated	>80%	38 to 54% Average[a] – 42%	20 to 61% Average[a] – 23%
Unobstructed Channel Width (bank to bank)	≥1,165 feet, <2,625 feet	1,050 to 1,077 feet	652 to 669 feet

Note:

[a] Average is based on analysis of normal flow years.

The hydraulic modeling of sites on the Loup River (one upstream and one downstream of the point of diversion) found that roosting habitat parameters (wetted channel width, percent channel inundated, unobstructed channel width, and percent of channel with water depths less than 0.8 foot) downstream of the point of diversion provided some values within or just below suitable ranges. Additionally, roosting habitat parameters upstream of the point of diversion were generally within or just below suitable ranges with the exception of unobstructed channel width as shown in Table 10.

Table 10. Whooping Crane Habitat Parameters on the Loup River Identified via Hydraulic Modeling

Habitat Parameter	Observed Measurements of Habitat Parameters[a]	Upstream of Point of Diversion	Downstream of Point of Diversion
Wetted Channel Width	≥180 feet, usually >508 feet; average 764±276 feet	676 to 784[a]	160 to 499[a]
Percent Channel Inundated	>80%	82 to 95%[a]	25 to 78%[a]
Unobstructed Channel Width (bank to bank)	≥1,165 feet, <2,625 feet	825 feet	640 feet
Depth of water for roosting (shallow water habitat)	0 to 0.82 foot, approximately 40% of channel area <0.7 foot	33 to 42%[b]	24 to 40%[b]

Notes:

[a] Wetted width and inundation percentage ranges are based a range of flows for a normal flow year.

[b] Percentages are based on analysis of normal flow years.

These two analyses suggest that suitable habitat meeting all criteria for whooping crane roosting habitat does not exist either upstream or downstream of the point of diversion.

5.3.3 Current Distribution in the Action Area

The Project Boundary is located within the easternmost band (approximating 2.5 percent of the total sightings) of the USFWS-defined Nebraska Whooping Crane Migration Corridor (see Figure 7) (USFWS, February 13, 2012). Of the over 1,700 whooping crane sightings in Nebraska that have been recorded between 1942 and spring 2011 (USFWS, February 4, 2011, and April 8, 2011), no sightings have been documented within the Project Boundary, and only two sightings have been documented within the Action Area:

- An individual whooping crane was documented during the 2010 fall migration on the lower Platte River in Butler County, Nebraska.
- An individual whooping crane was documented during the 2011 fall migration on the lower Platte River near Columbus in Platte County, Nebraska (Pearse, March 27, 2012).

Three additional sightings have been documented on the Loup River greater than 3 miles upstream of the Project (USFWS, April 15, 2009). The overwhelming majority of whooping crane sightings in Nebraska occur along the central Platte River and points well west of the Action Area.

5.3.4 Critical Habitat

There is no critical habitat designated for the whooping crane within the Action Area. The nearest designated critical habitat for this species is 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

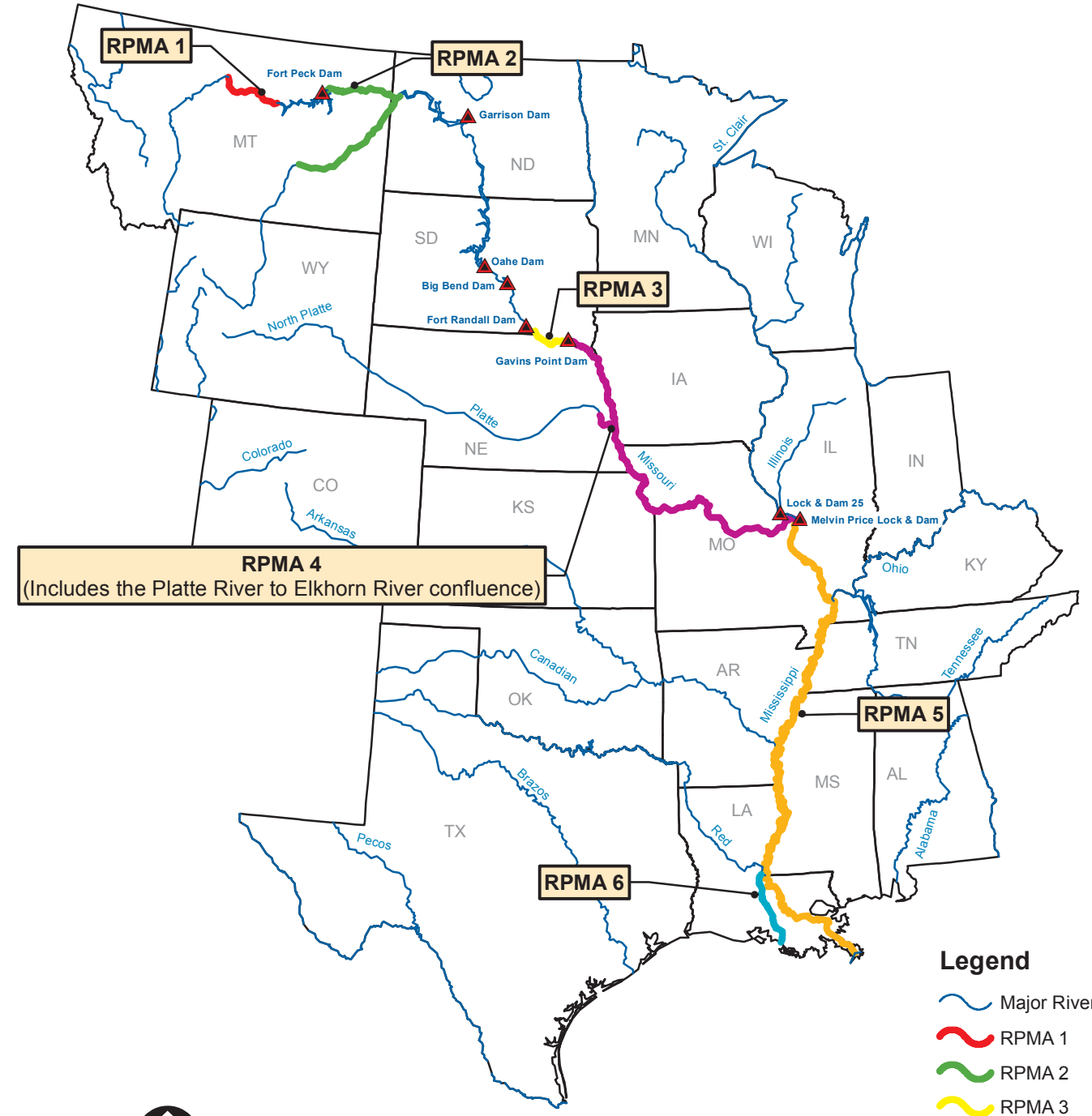
The pallid sturgeon (*Scaphirhynchus albus*) was Federally listed as an endangered species on September 6, 1990 (55 FR 36641-36647). The published range of this species includes the states of Arkansas, Illinois, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, North Dakota, 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 (RPMAs). 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 throughout the species' range.

5.4.1 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 kilometers (km) (3,515 miles) 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).

The Missouri River and its turbid tributaries were likely the core of the pallid sturgeon's historic range (Bailey and Allum, 1962, and 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 1930s, 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).

Figure 8 displays a map of the pallid sturgeon range, including the six RPMAs. 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 and includes the lower Platte River, from the confluence with the Missouri River upstream to the Elkhorn River confluence. 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
April 2012

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 along this stretch of the Missouri River, pallid sturgeon are still able to migrate over the whole of this reach. For 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, and 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, July 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.

5.4.2 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. (2007) was able to track radio tagged shovelnose sturgeon as they moved upstream, spawned, and moved downstream. Simpkins and LaBay (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 direct 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 and Pegg (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 degrees 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, July 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). In 2011, DeLonay described radio tagging results from a gravid female that indicated she likely spawned in the Platte River (DeLonay, January 18, 2012).

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., May 2005). As part of this effort, 401 tagged pallid sturgeon were stocked in the Platte River in 1997 at the Nebraska Highway 50

Bridge (RM 16.3). 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). The Middle Basin Pallid Sturgeon Workgroup is currently investigating additional stockings in the lower Platte River, although nothing has been funded or finalized to date (Middle Basin Pallid Sturgeon Workgroup, 2011).

Movements and Migration

Pallid sturgeon have been documented making long distance movements during their life history (USGS, July 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 and juvenile individuals has 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 1998 and April 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 the first 3 years of a 5 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) 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).

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; National Research Council, 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 to 93 centimeters [cm]) 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 meters (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 2.48 m (Gerrity et al., 2008). Adults in these same areas were using depths between 0.9 and 14.5 m (Bramblett and White, 2001). In the lower Missouri River pallid sturgeon used depths greater than 2.0 m (Spindler, 2008). Larval pallid sturgeon in the upper Mississippi River were captured in trawls at depths from 2.1 to 3.6 m (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 1.21 m. Peters and Parham (2008) found specimens caught in the Platte River using depths at an average of 1.27 m. Depths at which fish were caught during the Peters and Parham (2008) study from 2001 to 2005 averaged 1.58 m. 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 meter per second (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 0.7 m/s and prefer waters with a bottom velocity slower than 0.9 m/s. Mean column velocity at the point of capture of pallid sturgeon averaged 0.79 m/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 0.54 m/s and averaged 0.33 m/s. Snook (2001) located hatchery-reared pallid sturgeon at mean column velocities which ranged from 0.05 to 1.26 m/s. Bottom velocities for this study ranged from 0.03 to 0.88 m/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 0.82 m/s. Bottom velocities for these studies ranged from 0.21 to 0.55 m/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 percent sand, 0.4 percent silt, and 0 percent 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 degrees Fahrenheit [°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 (15.05 centimeters per second [cm/s]) while at 20°C they could maintain a much faster speed (35.93 cm/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 336 milligrams per liter (mg/L) and averaged 171.5 mg/L (Peters and Parham, 2008). Total suspended solids concentrations at telemetry locations of pallid sturgeon ranged from 86 to 1,228 mg/L and averaged 385 mg/L (Peters and Parham, 2008; Swigle, 2003).

5.4.3 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 and confirmed by NGPC (Peters and Parham, 2008). Peters and Parham (2008) and Swigle (2003) captured 15 pallid sturgeon in 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). Prior to the Sturgeon Management Study, it was thought that low flow and higher temperatures likely prevented or inhibited use of the lower Platte River during the warm summer months; however, the Sturgeon Management Study has captured pallid sturgeon in the Platte River during all three sampling seasons (spring, summer, and fall), indicating that the Platte River may provide suitable pallid sturgeon habitat year round. 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.

As discussed in Section 5.4.2, pallid sturgeon have been stocked in the lower Platte River in 1997, 1998, and 1999 to attempt to augment their recovery. In 2011, the Middle Basin Pallid Sturgeon Workgroup began investigating additional stockings in the lower Platte River, although nothing has been funded or finalized to date (Middle Basin Pallid Sturgeon Workgroup, 2011).

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 (RM 32.2), approximately 69 miles downstream of the Project.

The Sturgeon Management Study currently being conducted by the University of Nebraska, Lincoln (Hamel and Pegg, 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,[10] 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

[10] 2011 results are for spring sampling only; full year results were not available at this writing of the Draft Biological Assessment.

are no documented occurrences of pallid sturgeon in the Platte River bypass reach, the Loup River, or the Loup Power Canal. The pallid sturgeon is not currently known to occur within the Project Boundary.

5.4.4 Critical Habitat

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

5.5 Western Prairie Fringed Orchid

The Western prairie fringed orchid (*Platanthera praeclara*) was Federally listed as a threatened species on September 28, 1989 (54 FR 39857-39863). 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 (U.S. Department of Agriculture, 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).

5.5.1 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.

Western prairie fringed orchids may be threatened by habitat modification or destruction, over-utilization for commercial or scientific purposes, predation, inadequacy of existing regulatory mechanisms such as protection, and decrease of a singular pollinator species (hawk moths) due to pesticide use (USFWS, 1996).

5.5.2 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*). In wetter growth sites, this species is commonly associated with tufted hairgrass (*Deschampsia caespitosa*) and switchgrass (*Panicum virgatum*). 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, the Western prairie fringed 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.

5.5.3 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 (Nebraska Natural Heritage Program, May 2011) does not list Platte or Nance counties as being within this species' range.

5.5.4 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 SMA, along the Loup River bypass reach, and the lower Platte River.

6.1.1 North Sand Management Area

As discussed in Section 5.1.2, interior least terns and piping plovers nest extensively and successfully at the North SMA nearly every year. Documentation of nesting has been somewhat inconsistent, with documented counts in only 10 of 27 years. Since 1985, the 112 interior least tern and 40 piping plover nests counted at the North SMA have accounted for 23 and 29 percent, respectively, of the total nests counted along the Loup River (both on- and off-river sites). Fledge ratios for 2008 through 2011 indicate a high rate of productivity for both species with three running average ratios of 0.77 for interior least terns and 2.53 for piping plovers. Both of these ratios are above the rates considered necessary for population maintenance (0.70 and 1.13, respectively).

District dredging activities at the Settling Basin and North SMA maintain excellent habitat for interior least tern and piping plover nesting. The deposition of dredge material each spring and fall maintains the large expanses of open sand preferred by interior least terns and piping plovers and provide an important source of water and food to the North SMA for a variety of species, including interior least terns and piping plovers. If dredging were to cease year round and new dredged material not added annually, the North SMA would no longer be actively managed and would become vegetated and unsuitable for nesting.

Although the District suspends dredging activities in late May or early June to avoid impacting nesting activities, the potential exists that an interior least tern or piping plover nest would be initiated prior to complete cessation of dredging activities. In that event, it is possible that slurry water from the District's dredging operations could inundate the nest; however, inundation is unlikely because during the final stages of spring dredging, District personnel and TPCP personnel are continually monitoring for nesting activity and take precautions to protect any early nests.

Because the District is working cooperatively with the agencies to avoid harm to these species by suspending dredging during the nesting season, the continued dredging operations at the North SMA would have beneficial effects on the habitat used. The activity provides interior least terns and piping plovers with a source of water and food, 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, the District requires Preferred Sands, the sand processing company that is removing and processing sand from the North SMA, to manage their activities to prevent harm to these species. To this end, Preferred Sands has entered into an MOU in 2008 with USFWS and NGPC, to which the District and the TPCP are cooperators. The MOU required the development of an AMP for interior least terns and piping plovers, which has been successful at enhancing habitat through the development of foraging ponds, clearing of vegetation, and protecting nesting birds while allowing Preferred Sands to continue

their sand processing operations. The MOU and the associated AMP have had a beneficial effect on interior least terns and piping plovers at the North SMA, as demonstrated by high fledging ratios on the North SMA (Brown and Jorgensen, 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 as part of the recreational amenities provided by the Project. The OHV Park operates year-round, with the exception of closures during District dredging activities (generally March 15 to May 15 and August 15 to September 20). The area designated for the OHV Park, while adjacent to the Loup River and North SMA, has no record of nesting occurring. Due to the lack of interior least tern and piping plover use of recreational areas within the Project Boundary, these recreation activities would have no effect on the species.

6.1.3 Flow Depletion of the Loup River Bypass Reach

Although, there are some differences in Loup River channel geometry (such as width and depth) downstream of the point of diversion as compared to upstream of the point of diversion, interior least tern and piping plover use of the Loup River is minor in comparison to other rivers in Nebraska (see Tables 4 and 7). Of the 481 total interior least tern nests recorded along the Loup River between 1985 and 2011, 67 percent (323) were downstream of the point of diversion. Of the 139 total piping plover nests recorded, 63 percent (88) were recorded downstream of the point of diversion. Documented nesting at the North SMA accounts for approximately 23 percent (112) of all interior least tern nests and 29 percent (40) of all piping plover nests along the Loup River. Finally, recent data suggest that nesting productivity of both interior least terns and piping plovers is more successful at the North SMA than the average production for the Loup and Platte river systems.

Relicensing Study 14.0, Alternative Project Operations and Sediment Management (see the Final License Application, Volume 3, Final Study Report), evaluated various flow modification scenarios in the Loup River bypass reach. The intent of the analysis was not necessarily to identify an alternative operating condition, but rather to evaluate how a change in operation could affect sediment transport and subsequently interior least tern, piping plover, whooping crane, and pallid sturgeon habitat. One modification scenario was capping the diverted flow into the Loup Power Canal at 2,000 cfs. A second flow modification scenario consisted of capping flow diversion into the Loup Power Canal at 2,000 cfs and maintaining a minimum flow equal to the dominant discharge in the Loup River bypass reach between April 15 and August 1. The evaluation was performed for a wet, dry, and normal flow hydrologic classification. The results of this study indicated that while there is an increase in sediment transport when more flow is bypassed to the Loup River

bypass reach, the associated changes in channel widths and depths would be neglible. Channel widths would increase from 1 to 5 percent, and channel depths would increase by hundredths of a foot (collectively for the wet, dry, and normal years that were evaluated) under modified flow regimes when compared to current operations. With this limited amount of change, the effects on river morphology—specifically, sandbar size, distribution, and abundance—would likely be imperceptible.

6.1.4 Sediment Removal

The results of relicensing Study 1.0, Sedimentation (see the Final License Application, Volume 3, Final Study Report) 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 percent of Loup River flow to the canal has reduced the average capacity of the bypass reach. However, the Loup River bypass reach has adjusted to the diversion of both water and sediment. 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 River bypass reach is able to remain a braided river and in dynamic equilibrium. The analysis conducted in relicensing Study 1.0, Sedimentation (see the Final License Application, Volume 3, Final Study Report), 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 ongoing sandbar formation in the Loup River bypass reach. Habitat is available for interior least terns and piping plovers along the Loup River bypass reach as interior least terns and piping plovers have nested within this 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 capacity. The analysis performed in relicensing Study 1.0, Sedimentation (see the Final License Application, Volume 3, Final Study Report), showed there was no aggradational or degradational trend occurring nor would one likely occur in the future. The lower Platte River has adjusted to the sediment supply coming from upstream of the Tailrace Canal and the inflow of the Tailrace Canal. Relicensing Study 14.0, Alternative Project Operations and Sediment Management (see the Final License Application, Volume 3, Final Study Report), concluded that both the sediment transport modeling and regime method analyses revealed no particular enhancements in sediment transport under any of the augmentation loads studied below the Tailrace Canal. After a short period of aggradation below the Tailrace Canal, the model

exhibited slight changes in channel slope to compensate for the increased sediment supply. However, these changes were small and may be virtually undetectable relative to actual physical changes. The long-term trend identified through modeling The long-term trend does not indicate any substantial difference in sandbar formation or channel geometry that would affect interior least terns or piping plovers below the Tailrace Canal. Therefore, current operations, which include the inflow from the Tailrace Return, do not affect sandbar formation. Because the Project's sediment removal operations have no anticipated effect on the braided channel morphology, which creates sandbars that may be used by interior least terns and piping plovers, the District concludes that 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 would occur in both the Loup River bypass reach or in the lower Platte River under the District's proposed operating scenario (that is, continued operation of the Project), the proposed Project would not impact morphology, sandbars, or the existing nesting habitat of the Loup River bypass reach and the lower Platte River 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 discharge, 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 analysis of variance (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(r [752] = 0.198, $P < 0.01$), but strongly associated with interior least tern adult counts(r [752] = 0.625, $P < 0.01$), which were also weakly associated with number of data collection visits.
- No association was detected between summed nest counts and RM (r [136] = 0.013, $P > 0.05$), 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 as operations have remained the same during both periods.
- Binary logistic regression analysis failed to detect a measurable relationship between presence or absence of interior least tern nests and ranked calendar year, RM, peak mean daily flow, percent diverted flow, or any combination of these variables.
- Nonparametric correlation studies initially suggested annual percent diverted flow as a weak but statistically significant predictor of nest counts summed by RM (r [138] = 0.0.184, $P = 0.031$; T [138] = 0.133, $P = 0.039$). However, 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(F [21, 194] = 1,183.399, $P < 0.000$), 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 RMs is not statistically significant in relation to nest counts (F [30, 185] = 0.801, $P = 0.760$).

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 relicensing Study 2.0, Hydrocycling (see the Final License Application, Volume 3, Final Study Report), the average seasonal (May 1 to August 15) difference in daily maximum water surface elevations for current operations compared to run-of-river operations was calculated. The differences range from 0.29 feet immediately downstream of the Tailrace Return (Site 4) for flows in a normal year to 0.82 feet at in a dry year, as shown in Table 11.

Table 11. Average Seasonal Difference in Daily Maximum Water Surface Elevations Between Current Operations and Run-Of-River Operations

Site	Water Surface Elevation Difference (ft)[a]		
	Dry (2006)	Normal (2009)	Wet (2008)
Site 4 – Downstream of Tailrace Return	0.82	0.29	0.39
Platte River at North Bend	0.47	0.18	0.28
Platte River at Leshara	0.45	0.20	0.29
Platte River at Ashland	0.34	0.22	0.52
Platte River at Louisville	0.34	0.18	0.25

Note:

a Calculated by taking the average of the difference between the daily maximum current operations flow and the run-of river-operations flow.

The difference generally decreases with distance downstream from the Tailrace Return, and the difference is less pronounced during normal or wet conditions.

Nest Inundation

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 have been avoided by run-of-river operational changes.

Several factors exist that affect the potential for nest inundation. These factors include:

- Interior least tern and piping plover nesting behavior
- Timing of bird arrival and nest initiation relative to recent past river flows
- Variability and timing of natural storm events

Because of these factors, additional analysis is presented to illustrate that hydrocycling does not result in additional nest inundation relative to run-of-river operations.

The increase in water surface elevation associated with hydrocycling operations would not be expected to influence interior least tern and piping plover nesting site selection behavior. Interior least terns and piping plovers select their nest location at some elevation above the daily maximum water surface elevation. This nesting elevation is variable and not absolute. The relative distance for nesting above the maximum daily water surface and associated wet sand would be the same for current and run-of-river operations.

As noted in relicensing Study 2.0, Hydrocycling (see the Final License Application, Volume 3, Final Study Report), the elevation difference between current operations and run-of-river conditions is greatest during normal flows (non-runoff event flows). This difference diminishes during run-off events. Nesting elevation differences would also be consistent with this relationship.

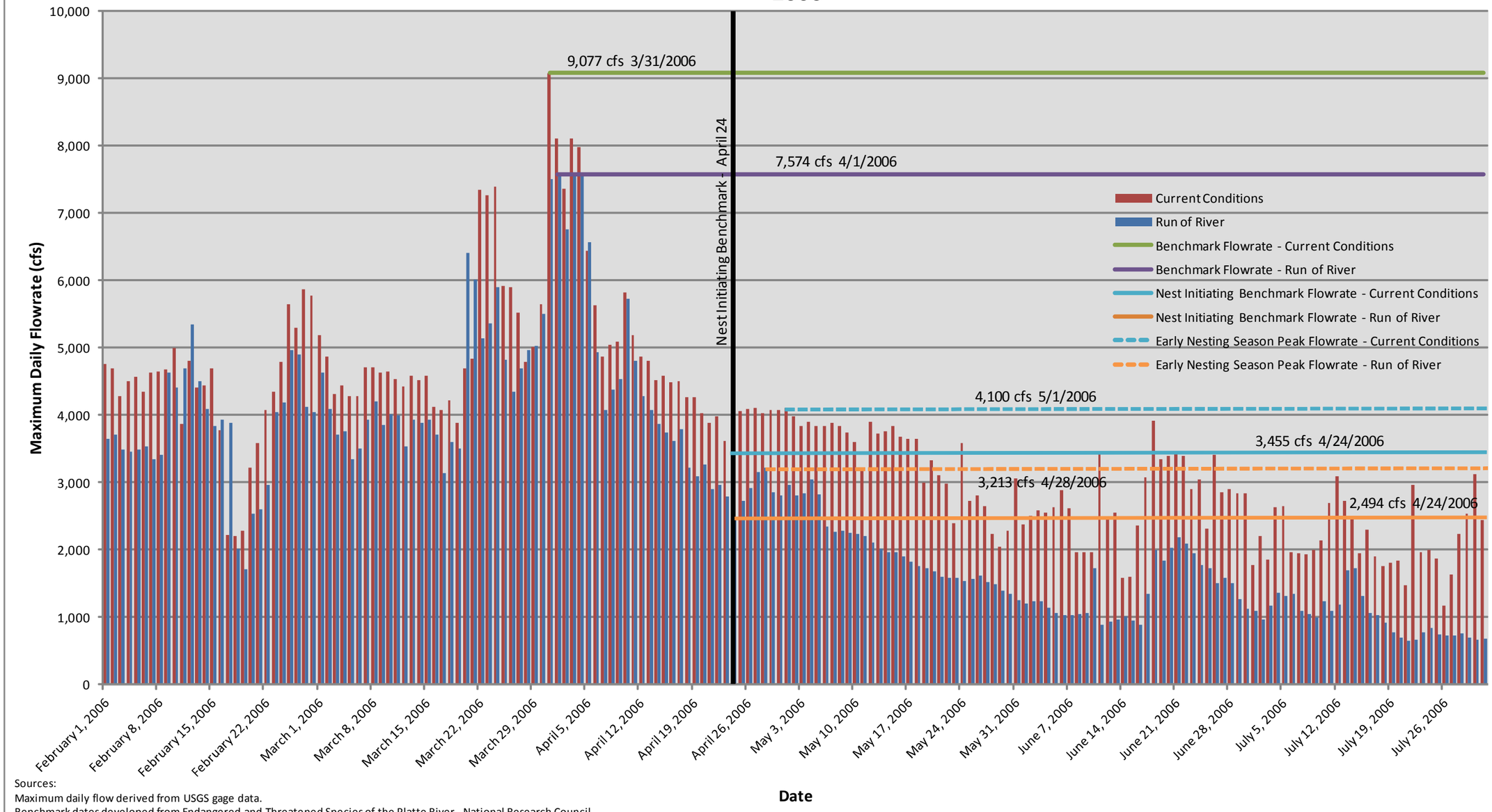
The daily maximum water surface elevations observed during current operations in essence cues the species to nest at higher elevations than under a run-of –river condition. The difference between current operations maximum water surface elevation and run of river maximum water surface elevation is smallest during a runoff event, and at times, equal. As a result, the potential risk of nest inundation at worst, equal, and at best, less under current operations when compared to run-of-river.

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.

The timing of bird arrival and nest initiation relative to the recent and current flow (and surface water elevation) is also a factor in potential nest inundation. For example, Figure 9 shows that if a benchmark flow were established on March 31, 2006, then sandbars may have established at elevations below this flow (9,077 cfs for current operations and 7,574 cfs for run-of-river operations).

Assuming that piping plover nest initiation began immediately upon arrival at the end of April (assuming April 24 for purposes of this analysis), the flow at this time for both current operations and run-of-river operations was on the decline (see Table 12 and Figure 9). An event occurred between April 24 and April 25 that resulted in increased flows that exceeded the flow that existed on April 24. The flows fluctuated at or near the April 25 peak daily flow for several days, peaking on May 1 at 4,100 cfs for current operations and on April 28 at 3,210 cfs for run-of-river operations. Theoretically, this could have disturbed nest initiation activities under both current operations and run-of-river operations (see Table 12). However, after this event, the remainder of this nesting season had no events that exceeded those in late April or early May for either current operations or run-of-river operations.

Comparison of Benchmark Flows
Site 4, Downstream of Tailrace (RM99)
Piping Plover
2006



Sources:
Maximum daily flow derived from USGS gage data.
Benchmark dates developed from Endangered and Threatened Species of the Platte River. National Research Council.

Loup Power District Hydro Project

Comparison of Benchmark Flows, Site 4, 2006

Loup River Hydroelectric Project
FERC Project No. 1256
Biological Assessment

DATE
April 2012

FIGURE
9

Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Draft_License_Application\Stream_Gage_Locations_E_11.mxd

Table 12. Maximum Daily Flowrates During Nest Initiation for Current Operations and Run-Of-River Operations – Site 4, 2006 (Piping Plovers)

Date	Maximum Daily Flowrate (cfs)	
	Current Operations	Run-of-River Operations
March 31 (benchmark)	9,077	7,574
April 23	3, 609	2,790
April 24 (nest initiation baseline)	3,455	2,494
April 25 (runoff event, increasing hydrograph)	4,061	2,721
April 26	4,092	2,910
April 27	4,099	3,148
April 28	4,035	3,213
April 29	4,081	2,854
April 30	4,076	2,805
May 1	4,100	2,961
M ay 2	3,985	2,811
May 3	3,839	2,835
May 4	3,907	3,045
May 5	3,843	2,815
May 6	3,832	2,343

In summary, based on the information available, there are many factors that can affect nest inundation. The potential effects from hydrocycling on nest inundation cannot be isolated and determined to be greater than what would occur under a run-of-river scenario, which would make the potential effects from operation of the Project "discountable."

Nesting Habitat

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 nesting habitat is a limiting factor on the lower Platte River. In Kirsch's discussion of results, she noted the following,

"Because least terns on the lower Platte River did not use much of either habitat that was apparently available and did not prefer 1 habitat over the other [on- or off-river], the amount of usable habitat does not seem to limit this population. Least terns may be limited by habitat in other regions." (Kirsch, 1996)

The increase in maximum surface elevation may reduce the suitability of some sandbars for nesting. As noted above, habitat availability has not been identified as a limiting factor on nesting. Furthermore, sandbar suitability is comprised of many factors, such as the height of sandbar formation (based on high flows), sandbar grain sizes, vegetation, and predation factors.

Forage

While forage habitat has not been identified as a limiting factor for interior least tern and piping plover habitat, a review of the potential effects of hydrocycling on a sandbed system, such as the lower Platte River, was analyzed.

No direct study has been done on the lower Platte River to assess diel flow effects on primary and secondary production as food sources for interior least terns and piping plovers. Limited research has been conducted on the Missouri River by Troelstrup and Hergenrader (1990) and by Le Fer (2006 and 2008). However, comparing river systems can be problematic as Gislason (1985) notes that the multitude of site-specific factors such as stream order, substrate type, channel morphology, thermal regime, water quality, and the existing biotic community would influence impact of diel flow fluctuation of a particular stream.

Troelstrup and Hergenrader (1990) conducted a study to examine the community structure of invertebrates colonizing artificial substrates in an impounded, fluctuating river. The Missouri River reach below Gavins Point Dam was studied as a site with daily fluctuations, and the reach below Fort Randall Dam was studied as a site without daily fluctuations. The study found the following:

- Samplers only 3 km below Gavins Point Dam were colonized by greater numbers of invertebrates than the samplers 21 km downstream of Fort Randall Dam.
- Chironomidae and Oligochaeta are tolerant of flow fluctuations. Gislason (1985) also found chironomidae to be tolerant of flow fluctuations.
- Fluctuations in current velocity at deeper depths (1 meter) were not severe enough to cause scouring of invertebrates or initiate a drift response from the samplers.
- Invertebrate communities on shallow samplers (30 cm) subjected to exposure from diel fluctuations in flow averaged 3 taxa per sampler and 91 organisms per square meter. In the absence of diel fluctuations, the sampler averaged 12 taxa and 743 organisms per square meter. This data is based on one year of sampling.

Le Fer (2006) studied piping plover foraging along three reaches of the Missouri River (downstream of Gavins Point Dam, downstream of Garrison Dam, and in Lake Sakakawea) and in alkali wetlands of North Dakota. Le Fer found no relationship between invertebrate availability and piping plover survivability. In a later publication based on the research from her 2006 thesis, Le Fer (2008) stated that there was no relationship between chick daily survival rates and invertebrate numbers or biomass, Coleoptera biomass, or biomass consumption index.

Regarding the availability of macroinvertebrate and fish foodsources in the Platte River, in 1997 through 2001, NDEQ conducted a statewide study to determine the biological integrity of Nebraska surface waters in compliance with EPA's Regional Environmental Monitoring and Assessment Program (R-EMAP) in EPA Region VII. This study included analysis of water, sediment, and fish tissue chemistries; habitat measurements; and fish and macroinvertebrate sampling and population analysis, and it developed the Index of Biological Integrity (IBI) for fish and an Invertebrate Community Index (ICI) for macroinvertebratess (NDEQ, December 2005). One location analyzed in this study was a side channel of the Platte River near the Tailrace Return (NDEQ ID MP1050). The R-EMAP results rated the Platte River in the vicinity of the Tailrace Return "excellent" for fisheries and "good" for macroinvertebrates on a rating scale of Excellent, Good, Fair, and Poor (NDEQ, December 2005). These results indicate that forage is not adversely affected by hydrocycling operations.

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 polychlorinated biphenyls (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 Nebraska Department of Environmental Quality (NDEQ) conducted PCB fish tissue sampling in Lake Babcock on August 11, 2009, and in the Tailrace Canal at the U.S. Highway 30 bridge 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 Region VII Ambient Fish Tissue Monitoring Program (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 NDEQ'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, there is no indication that Project operations are 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 USACE Omaha District to perform relicensing Study 12.0, Ice Jam Flooding on the Loup River (see the Final License Application, Volume 3, Final Study Report) 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. Due to the lack of interior least tern and piping plover use of recreational areas within the Project Boundary, these recreation activities would have no effect on the species. The Project is shown to have no effect on the current 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. Project hydrocycling may reduce the area of available habitat, but habitat is not considered to be limiting on the lower Platte River. Based on "excellent" and "good" ratings for macroinvertebrates and fisheries on a side channel near the Project Tailrace, forage is not adversely affected by hydrocycling operations. The Project does not contribute to flow depletions in the Platte River, PCB mobilization, or ice jam formation and flooding. 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.

6.1.11 Conservation Measures

The District proposes to formalize its annual dredging operations (as described in Section 3.3) in an MOU with USFWS and NGPC. Development of the MOU is in progress.

6.2 Whooping Crane

Whooping crane use of the Action Area would occur during the biannual migration between breeding and wintering grounds. Whooping cranes are not directly dependent on resources associated with the Loup River or the Project.

6.2.1 Species Presence in the Action Area

The Project is located within the easternmost band (approximating 2.5 percent of the total sightings) of the latest USFWS-defined Nebraska Whooping Crane Migration Corridor (see Figure 7). Beyond the 75 percent band, all other bands within the migration corridor appear to be established in an arbitrary manner. The 80 to 95 percent bands are concentric bands based on the 75 percent band, which is largely influenced by the concentration of documented sightings along the central Platte River. This concentration disproportionately influences the bands in an easterly direction in the vicinity of the Project, and thus overemphasizes the number of whooping crane sightings that might be expected within the Action Area.

This overemphasis, coupled with the fact that only two whooping crane sightings have been documented in the Action Area since 1942 out of over 1,700 documented sightings in Nebraska, indicates that the likelihood of whooping cranes landing in the Action Area is extremely low.

6.2.2 Habitat Availability

As discussed in Section 5.3.2, four habitat parameters for whooping crane were evaluated through aerial interpretation and HEC-RAS modeling for site both above and below the point of diversion. They were:

- Wetted Channel Width
- Percent Channel Inundated
- Unobstructed Channel Width (bank to bank)
- Depth of water for roosting (HEC-RAS modeling only)

Both methods of analysis identified that suitable habitat meeting all criteria for whooping crane roosting habitat does not exist either above or below the point of diversion. The HEC-RAS modeling showed that downstream of the point of diversion some values are within or just below suitable ranges and that upstream of the point of diversion parameters were generally within or just below suitable ranges with the exception of unobstructed channel width.

This comparison shows that habitat requirements for the whooping crane are lacking both above and below the point of diversion. The lack of habitat is a likely reason why an extremely low number (2) of whooping cranes have been observed in the Action Area.

6.2.3 Impacts of Flow Diversion

As shown discussing in Sections 5.3.2 and 6.2.2, whooping crane habitat below the point of diversion is, in general, outside the range of observed parameters. To determine the effects of flow diversion on the Loup River bypass reach, the District performed hydraulic modeling to compare whooping crane roosting habitat parameters in the Loup River bypass reach under current operating conditions and under a no diversion condition.

The results of this analysis identified changes in width and depth that would occur under a no diversion condition. The affect of these expected width and depth changes on roosting habitat parameters is summarized below:

- Wetted Channel Width – Under the no diversion condition, the wetted channel width would increase approximately 2 to 10 percent resulting in a maximum wetted width of approximately 550 feet.
- Percent Channel Inundated - The percent of channel inundated below the point of diversion under current operations ranges from 25 percent to 78 percent of the channel width. For the no diversion condition, the percentage of channel inundated would be similar to percentages above the point of diversion and would range from 78 percent to 97 percent of the channel width.
- Unobstructed Channel Width – The unobstructed channel width would remain unchanged under a no diversion condition.
- Depth of water for roosting - Below the point of diversion under current operations, percentages of the channel with water depths of 0.8 foot or less ranged from 24 percent to 40 percent. Under the no diversion condition, percentages of the channel with water depths of 0.8 foot or less would range from 15 percent to 34 percent.

The results indicate that the no diversion condition would not substantially change or improve the habitat parameters below the point of diversion for the whooping crane. Increased wetted channel width provide improved habitat, but would still be below the average of 764 feet. Percent channel inundated would improve to within the observed range. Unobstructed channel widths would not be affected, and depth of water for roosting would be reduced to less than the observed range.

6.2.4 Conclusion

Because the likelihood of a whooping crane occurring within the Action Area is extremely remote and any use of the area would be of short duration and transient in nature, and because suitable habitat is not currently present in the Action Area, nor would it occur under a no diversion scenario, the relicensing of the Project may affect, but is not likely to adversely, affect whooping cranes.

6.3 Pallid Sturgeon

6.3.1 Species Presence in the Action Area

Pallid sturgeon are known to use the lower Platte River, with 92 percent of pallid sturgeon captured below the confluence with the Elkhorn River between 2008 and 2011. Additionally, no occurrences have ever been documented in the Platte River bypass reach, the Loup River or the Loup Power Canal. 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; University of Nebraska-Lincoln, June 30, 2011). Prior to the 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. Table 13 indicates the pallid sturgeon capture results from the recent Sturgeon Management Study. In addition, all three years (2009, 2010, and 2011) of the UNL Sturgeon Management Study have found higher catch per unit effort (CPUE) values for both trammel net and trotline gears below the Elkhorn River confluence as compared to the lower Platte River above the Elkhorn confluence (Hamel and Pegg, 2011).

Table 13. Pallid Sturgeon Survey Summary

Year	Segment 1[a] (% of Total Pallid Captures)	Segment 2[a] (% of Total Pallid Captures)	Total
2009	66 (96%)	3 (4%)	69
2010	34 (87%)	5 (12%)	39
2011[b]	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).

[b] 2011 results are for spring sampling only; full year results were not available at this writing.

6.3.2 Habitat Availability

The presence of pallid sturgeon in the lower Platte River both upstream and downstream of the Elkhorn River confluence indicates that suitable habitat exists both upstream and downstream; however, as noted in Peters and Parham (2008), the amount of suitable habitat increases with increased discharge and reaches a maximum of approximately 30 percent at discharges of 10,000 cfs and higher.

Results from relicensing Study 2.0, Hydrocycling (see the Final License Application, Volume 3, Final Study Report) indicate that annual average percent of suitable habitat available in the lower Platte River increases consistently from a low of 1 percent above the Loup River confluence (near Duncan) to a maximum of 19 percent at Louisville. The increase in suitable habitat when moving downstream is consistent for minimum, maximum, and average daily flows. Just as discharge varies by month of the year, the percent of available habitat also varies by month, with the most suitable habitat available from February through June when flows are typically highest and suitable habitat can be as much as 29 percent at Ashland and Louisville.

6.3.3 Hydrocycling

The District used the results of Study 2.0, Hydrocycling to evaluate impacts of hydrocycling on the percent of suitable pallid sturgeon habitat available downstream of the Tailrace Canal. To determine a minimum percent of suitable habitat that could reasonably be expected to be used by pallid sturgeon, the District used the assumption that in order for suitable habitat to be used, it must also be connected. The connectivity data from Peters and Parham (2008), indicates that the lower Platte River is fully connected at a discharge of approximately 5,600 cfs. Connectivity drops off precipitously below 5,600 with approximately 30 percent connectivity at 4,000 cfs.

Based on this, the District assumed a minimum discharge of 5,000 cfs to provide approximately 50 percent connectivity. Using Peters and Parham's suitable habitat relationship, this discharge equates to approximately 19 percent suitable habitat.

Average minimum percent suitable habitat for current operations and run-of-river operations was then compared at the North Bend gage site for March through November for three years (2008 [wet], 2006 [dry], 2009 [normal]). The North Bend gage site was selected for evaluation of effects because the effect of hydrocycling on river stage diminishes with increased distance from the Tailrace Canal; therefore, North Bend would be considered a worst case. This analysis determined that out of 27 months evaluated, there was one instance where minimum suitable habitat was available under run-of-river conditions and there were no instances of minimum suitable habitat available under current operations. Based on this analysis, it is determined that continued hydrocycling operations would have a minimal effect on suitable habitat available to pallid sturgeon in the lower Platte River.

6.3.4 Sediment Removal

Relicensing Study 1.0, Sedimentation, and Study 14.0, Alternative Project Operations and Sediment Management (see the Final License Application, Volume 3, Final Study Report) determined that the removal of sediment at the point of diversion does not adversely affect the morphology of the lower Platte River. Specifically, the studies determined that the lower Platte River has adjusted to current operations, is in regime, and is seated well within regime zones considered as braided streams. Further, the analyses and other supporting literature clearly indicate that the lower Platte River at all locations studied is not supply limited, and is not aggrading or degrading, with no indications of channel geometry characteristic (width and depth) changes over time. Based on these results, continued Project sediment removal operations should have no effect on pallid sturgeon habitat.

6.3.5 Flow Depletion and Flow Diversion

Relicensing Study 5.0, Flow Depletion and Flow Diversion (see the Final License Application, Volume 3, Final Study Report), indicates that Project diversions reduce flow in the Platte River bypass reach such that suitable pallid sturgeon habitat is unlikely to exist except during very wet conditions.

6.3.6 Spawning

No documented 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), and there is no anecdotal evidence that pallid sturgeon have spawned in the lower Platte River. It is unclear as to what type of habitat 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 would have little effect on pallid sturgeon use of these areas.

6.3.7 Temperature

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.

6.3.8 Foodsource

In 1997 through 2001, NDEQ conducted a statewide study to determine the biological integrity of Nebraska surface waters in compliance with EPA's Regional Environmental Monitoring and Assessment Program (R-EMAP) in EPA Region VII. This study included analysis of water, sediment, and fish tissue chemistries; habitat measurements; and fish and macroinvertebrate sampling and population analysis, and it developed the Index of Biological Integrity (IBI) for fish and an Invertebrate Community Index (ICI) for macroinvertebratess (NDEQ, December 2005). One location analyzed in this study was a side channel of the Platte River near the Tailrace Return (NDEQ ID MP1050). The R-EMAP results rated the Platte River in the vicinity of the Tailrace Return "excellent" for fisheries and "good" for macroinvertebrates on a rating scale of Excellent, Good, Fair, and Poor (NDEQ, December 2005).

Additionally, according to *Fish and Wildlife Resources of Interest to the U.S. Fish and Wildlife Service on the Platte River*, the lower Platte River is considered to be one of the best warmwater river fisheries in the state (USFWS, May 15, 1987).

6.3.9 Conclusion

The results of the District's Sedimentation and Hydrocycling studies (see the Final License Application, Volume 3, Final Study Report) indicate that pallid sturgeon habitat suitability and connectivity downstream of the Tailrace Canal are not substantially affected by the 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.

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.

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.

Recent studies of the fish and macroinvertebrate communities in the lower Platte River in the vicinity of the Tailrace Return indicate that these foodsources are in good to excellent condition.

Although Project diversions reduce the suitable pallid sturgeon habitat in the Platte River bypass, the results of the Sturgeon Management Study indicate very limited pallid sturgeon use upstream of the Elkhorn River confluence. Therefore, the likelihood of pallid sturgeon attempting to use the Platte River bypass reach is extremely low.

For these reasons, 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 individual plants, critical habitat, 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 and National Marine Fisheries Service, 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 EFFECT DETERMINATIONS

The determinations of effect for Federally listed species are summarized in Table 14.

Table 14. Determinations of Effect for Federally Listed Species

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

9. REFERENCES

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ATTACHMENT A

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

Draft Meeting Notes

Project:	Loup River Hydroelectric Project FERC Project No. 1256
Subject:	Section 7 ESA and Section 10J FPA – Meeting #3
Meeting Date:	March 5, 2012 1:00 PM – 3:00 PM
Meeting Location:	Loup Public Power Headquarters – Columbus, NE
Notes by:	HDR

Attendees:

Robert Harms, USFWS	Richard Holland, NGPC	Neal Suess, LPD
Jeff Runge, USFWS	Joel Jorgensen, NGPC	Matt Pillard, HDR
Frank Albrecht, NGPC	Michelle Koch (NGPC)	Lisa Richardson, HDR

A meeting was held with the U.S. Fish and Wildlife Service and the Nebraska Game and Parks Commission to continue discussion of Section 7 of the Endangered Species Act, the consultation process, potential effects of the Project, Section 10J of the FPA, and possible protection, mitigation or enhancement (PM&E) measures.

Discussion at the meeting is documented according to the meeting agenda noted below.

Meeting Agenda:

1. Status of FERC Study Determination Alternatives Study
2. Review Process for North Sand Management Area MOU
3. Sandbar Shaping/Vegetation Removal
    a. Potential Locations
    b. Management and Access
    c. District Considerations/Feasibility
4. Hydrocycling
    a. Method of calculation of % reduction
    b. Results
    c. Discussion
5. Minimum Flows
6. Additional Discussion

1. Status of Evaluation of FERC Alternatives

HDR provided an update on the evaluation of the alternatives that FERC requested in their Study Plan Determination. The four FERC requested alternatives are being evaluated. HDR is in the process of stabilizing the sediment transport model for Alternative 1. Evaluations of the other alternatives will use sediment transport calculations. The results will be presented in what is being called Study 14 and will be included in the Final License Application.

2. North Sand Management Area MOU

- The District will prepare a draft MOU for circulation. HDR asked what the review process would be for the agencies. Bob Harms said he would be the point person on the MOU for USFWS and Frank Albrecht said he would be the point person for NGPC.
- USFWS asked if this MOU would tier off the existing MOU with Preferred. HDR stated that the intent of the MOU is to address the District's dredging practices and formalize the suspension of dredging activities for nesting season that is currently agreed to informally. It was determined that this MOU should be stand alone and not linked to the existing MOU.

- The NGPC asked what would happen if Preferred ceases operations? Or if a new lessee begins operations? NGPC noted that the concept of the MOU is to avoid "take." If activities were to change, how would those be addressed?
- The District noted that they cannot formalize in an agreement anything beyond what they currently do, that is, ceasing dredging activities for nesting season.
- NGPC asked what would happen if there were a new lessee other than Preferred? HDR noted that there is a transfer clause in the existing MOU and that the lease agreement between the District and Preferred requires any future operators to comply with necessary measures related to T&E species.

3. Sandbar Shaping

At the previous meeting USFWS suggested sandbar shaping as a potential mitigation or enhancement measure for interior least terns and piping plovers. USFWS stated that they reviewed the bypass reach aerials but did not identify any specific locations for shaping. However, they noted the following criteria to use to evaluate potential sites:

- What areas are the birds using now?
- What is the potential for disturbance?
- Presence of other disturbances, like bridge constrictions
- Distance from trees and the river banks (reducing risk of predation)

USFWS specifically noted the Central Sand and Gravel area – this is an area that the birds use repeatedly and it had a high number of nests in 2011, so there must be something right at that location. It was noted that protection of this area would be of great benefit to the birds. USFWS noted that there may be some ownership issues at this location that may make purchasing the property or an easement more difficult.

It was noted that early succession woody areas could be potential locations for clearing and potentially lowering to create a mid-channel bar.

HDR noted that areas of existing public ownership, such as WMAs, would be good areas for partnership and would reduce issues associated with land acquisition. NGPC stated that there are numerous other considerations for them in potentially using WMAs for T&E habitat. NGPC noted that the WMAs are mostly managed for upland and terrestrial wildlife; Tom Wellstead manages WMA's in this area. USFWS and NGPC noted that they would prefer that WMAs not be used for this purpose – WMAs are already managed/protected areas and part of the intent of this measure is to protect additional areas.

NGPC noted it would be beneficial to have the results from the FERC alternatives study, specifically, Alternative 4, to know how additional flows could work together and benefit sandbar clearing.

USFWS requested that the District identify two to four potential locations. They noted that identifying potential locations is the first of several steps. Once preliminary locations are identified, there are numerous steps that will take time to get to final locations. The site(s) will dictate the type of actions that would be needed to develop the area for use.

HDR asked for confirmation that the intent of this is not island building per se. USFWS confirmed that the intent of this action is bar shaping and clearing. USFWS noted that without a new flow regime, there is no reason to do the bar shaping because flows need to be altered to maintain the shaped conditions.
HDR asked if this would require continual maintenance/vegetation removal, etc. USFWS noted that the intent is not for continual treatment; they are thinking that a new flow regime would shape and maintain the shaped areas. Once areas are shaped, they would want to see how the river responds.

Does the initial shaping work speed up habitat improvements? Does the shaping combined with a change in effective discharge improve channel dimensions?

Although the shaping is be intended to be a one-time treatment, there would be many uncertainties with this type of work that would require monitoring by the applicant to relate corrections back to the impact. USFWS noted that if bar shaping and discharge don't work, there would need to be a reevaluation for other ways to offset impacts.

USFWS and NGPC reiterated that the results of the Alternative 4 analysis would be very useful in deciding how to proceed.

USFWS noted that there would be a lot of details to work out, but that in order to conclude consultation there would need to be agreement in principle and then the details would get worked out beyond that.

4. Hydrocycling

HDR presented hydrographs for May, June and July that were developed based on a 10% and 20% attenuation of hydrocycling as discussed at the last meeting. HDR noted that 50% attenuation is essentially run-of-river, which has already been evaluated in the studies. NGPC noted that the hydrographs provided good information but that the hydrographs needed to be tied to a proposed action.

The purpose of attenuation of hydrocycling is not just to reduce the peak, but to also fill the valley. NGPC noted that the more level the trough can be, the better productivity, biologically. They noted that trimming the peak by 10 or 20% isn't beneficial if there isn't more water in the trough. NGPC staff clarified that there are distinct concerns with both the peak and the trough. Specifically, the peak is a concern during nesting season (May, June, July, August).

NGPC asked what the minimum flow is through each of the turbines? The District noted that minimum is 1,000 cfs. NGPC asked what would it mean to maintain 1,000 cfs to eliminate the valley, or decrease the magnitude between the valley and the peak by focusing on raising the valley; the intent being to avoid zero flow to maintain the lower, wetter areas. NGPC asked what would the cost of this be? Would there be a way to offset the cost of filling the trough? Perhaps with higher peaks?

NGPC noted that the leveling of the trough for primary production, relative to time of the year the warmer months are more important. For secondary productivity, it would by year round. Additionally, NGPC noted that while August was not included in the original timeframes, the first two weeks in August are still important from a bird productivity perspective. USFWS and NGPC determined the following timeframes associated with peaks and valleys:

- Peaks are associated with birds - May to August 15
- Troughs are associated with aquatic life – May to October

So any additional analysis should analyze May to October. USFWS noted that the intent is to develop a plan that benefits the most years but they understand that in dry years there may not be much that can be done.

USFWS summarized three things to look at in any future analysis:

- Reducing the troughs
- Extending the peaks, but not increasing them
- Increasing the peaks

5. Minimum Flows

The District noted that they will propose a 75 cfs bypass flow when air temperature would dictate (based on the previous agreement). The District noted that a 300 to 400 cfs minimum flow is not feasible.

HDR noted that the USFWS letter to FERC on the DLA indicated different timeframes for minimum flows than July/August as was discussed at the last meeting of this group.

The USFWS offered that their letter was not necessarily recommendations, but they were reporting the effects – not the PM&E. The conditions they provided were based both on thermal indicators and the Montana Method. They indicated that they are not advocating for year round minimum flow. They are looking at July/August or July/August/September.

The USFWS asked if, while there is disagreement on minimum flow, are maintenance flows and the FERC alternatives open for negotiation? The District noted that they need to see what the results of the study are.

6. Additional Items

USFWS asked about the transmission lines comments from FERC on the DLA. USFWS asked if there are powerlines associated with the project.

The District clarified that FERC's definition of transmission lines is different – it is not necessarily an overhead line. The transmission lines that FERC is referring go from the generators to the substation. USFWS noted that the lines of concern to them are primarily transmission lines that cross rivers and may be prone to bird collisions.

USFWS asked what the next steps are?

- Final License Application will be submitted on April 16
- Anticipate FERC will ask questions
- FERC environmental analysis will begin this summer and take about a year.
- During FERC's environmental analysis, we can continue to work with agencies on a settlement agreement.

United States Department of the Interior

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

February 16, 2012

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

RE: Comments on Draft License Application; Loup River Hydroelectric Project; Federal Energy Regulatory Commission Project Number 1256; Nance and Platte Counties, Nebraska

Secretary Bose:

Please make reference to the Preliminary License Proposal (PLP) for the Loup River Hydroelectric Project (Project); Federal Energy Regulatory Commission Project Number 1256; Nance and Platte Counties, Nebraska that was submitted to the Federal Energy Regulatory Commission (FERC) on November 18, 2011. The PLP provided FERC with a draft Biological Assessment pursuant to section 7 consultation under the Endangered Species Act (ESA) and a draft environmental analysis to assist with preparing required documents under the National Environmental Policy Act (NEPA). Additional information provided included protection, mitigation, and enhancement measures (PM& E) that have applicability to ESA, NEPA, and section 10j of the Federal Power Act (FPA). The following U.S. Fish and Wildlife Service (Service) comments are provided in accordance with regulations implementing the FPA (18 CFR § 5.9) and our authorities pursuant to the ESA, Fish and Wildlife Coordination Act, NEPA, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and other executive orders and policies.

Background

Representatives of the Service, Nebraska Game and Parks Commission (Commission), Loup Power District (LPD), and its consultant met prior to submittal of the PLP on October 3 and November 2, 2011, to discuss, the section 7 process including the baseline for this consultation and the section 10j process. Further discussion included species affects and potential PM&Es, which if implemented as part of the relicensing process, could meet requirements of section 7 of the ESA and section 10j of the FPA. The PM&Es discussed, which should be viewed as an effort to achieve a settlement

agreement to meet ESA and FPA requirements, addressed impacts to federal and state fish and wildlife trust resources by category of project affect. The PM&Es were largely based on the results of studies conducted by LPD during the course of the Integrated Licensing Process (ILP) which identified affect to these species; and professional, peer-reviewed literature, survey information, knowledge of LPD operations, and extensive knowledge of the riverine habitats and life requisites of the affected species. Detailed discussion and justification for each of the PM&Es previously discussed with LPD and its consultant is included in this letter. We note that few of the PM&Es previously discussed at our October 3 and November 2, meetings were included in the PLP that was submitted to FERC by LPD. Please note that the Service and Commission remain willing to discuss the aforementioned PM&Es with LPD and FERC including other alternatives that may also have the potential to meet section 7 of ESA and section 10j of the FPA.

I. COMMENTS ON THE PLP EFFECT DETERMINATIONS TO FEDERALLY LISTED SPECIES

The following Service comments should be considered a summary of our review of the PLP for the Project as it relates to the federally endangered whooping crane, pallid sturgeon, and least tern and federally threatened piping plover and western prairie fringed orchid. In all instances we recommend revision of the Draft Biological Assessment (DBA) to take into consideration Project affects and potential PM&Es available to offset such affects and that studies completed by LPD during the ILP process be considered. The Service comments on DBA are based on the: a) current surveyed number and distribution of the aforementioned species in the Loup and Platte rivers; b) the potential Project impacts to habitat suitability in the bypass area of the Loup River and the lower Platte River for these species as applicable; and c) the importance of the Loup and Platte rivers in the conservation and recovery of these species when considering their range-wide distribution, which includes multiple river systems and watersheds in several states. Further, our comments were also based on the lack of PM&Es discussed at the October 3 and November 2 meetings in the DBA which could offset Project impacts. Further discussion and detail are provided in this letter, including the appendices.

Whooping Crane

The Service cannot concur with the conclusion that adverse effects resulting from Project operations to the whooping crane (*Grus americana*) are discountable because species usage estimates can be determined, the Project is located within the migratory corridor, and habitat affects are measureable.

Section 7 of ESA defines discountable effects as those extremely unlikely to occur and further states that based on best judgment a person would not: a) be able to meaningfully measure, detect, or evaluate insignificant effects; or b) expect discountable effects to occur. The Project is located within the whooping crane migratory corridor in Nebraska and it is during those migration times that the species is most at risk to mortality and injury if suitable roosting and foraging habitats are unavailable. Studies completed during the ILP process by LPD confirm that Project diversions reduce the suitability of

several habitat indices in the Loup River bypass area including: channel width, wetted width, and proportion of suitable depths for roosting, all important habitat indices for that which comprised suitable roosting habitat for whooping cranes.

Based on current population levels, approximately seven individual whooping cranes are likely to fly over the bypass area on an annual basis for both the spring and fall migrations. This represents roughly 2.5 percent of the total migratory population for the species that would be impacted by continued operation of the Project over the next 30 years. The Service has applied the discountable standard to other species in Nebraska. For instance, we consider a less than one percent chance of encountering (and impacting) the federally endangered American burying beetle as discountable. Admittedly, a far different species, but it is one whose population in the Nebraska sandhills is estimated to be in the thousands whereas the population of migratory whooping cranes is 279 individuals. As the Aransas Wood Buffalo population increases to meet recovery objectives, the number of individuals that could use the Loup River bypass area would also be expected to increase.

Least Tern and Piping Plover

The Service cannot concur with the determination that the Project may affect, but is not likely to adversely affect the piping plover (*Charadrius melodus*) and least tern (*Sternula antillarum*). Project water diversions reduce the suitability of several habitat indices in the Loup River bypass including: channel width, wetted width, and/or sandbar position. Project effects to stream temperature and instream habitat were identified in a study completed by LPD during the ILP process for the Loup River bypass. These impacts may affect food resources for the least tern and piping plover. Especially noteworthy and an outcome of the studies undertaken by LPD and its consultant during the ILP process is the Project's removal of 24 percent of the sediment supply at the diversion resulting in an impediment to sandbar habitat formation. Alterations to sandbar habitat through impediment to its formation affect the least tern and piping plover.

Hydrocycling is known through extensive scientific research to have an effect on primary production. Effects on primary production likewise have a negative effect on the availability of food resources for the least tern and piping plover. Discussions during the ILP process on the hydrocycling study completed by LPD showed that hydrocycling contributes toward the inundation of piping plover and least tern nests in the lower Platte River.

Pallid Sturgeon

The Service cannot concur with the determination that Project operations may affect, but are not likely to adversely affect the pallid sturgeon (*Scaphirhynchus albus*). The Service has determined that the Project is likely to impact the species by affecting the quantity and quality of habitat and riverine connectivity of multiple aquatic habitats starting from the tailrace on the Platte River to its confluence with the Missouri River. Project operations may also inhibit the spawning migration of the species. Recent research

further corroborates that the species spawns on the Platte River. Project hydrocycling operations as determined by studies conducted by LPD during the ILP process may also affect pallid sturgeon prey items as described in the subsequent aquatic community discussion.

Western Prairie Fringed Orchid

The Service concurs that Project operations are not likely to adversely affect the western prairie fringed orchid (*Platanthera praeclara*). The western prairie fringed orchid can be impacted by depletions to the Platte River system. A study conducted by LPD confirmed that depletions were less under current Project operations than under a no-Project operation scenario. The DBA should be revised to reflect this conclusion.

II. COMMENTS ON THE PLP EFFECT DETERMINATIONS TO RESOURCES OF CONCERN UNDER SECTION 10J OF THE FPA

There have been numerous studies on the effects of hydrocycling on other river systems that showed effects on the diversity and abundance of the aquatic community. The Service's February 9, 2009, comment letter to the Pre Application and Scoping Document identified concerns about hydrocycling affecting primary production, and stated that impacts to primary production may also affect the forage base for the pallid sturgeon, least tern, and piping plover. The Service's June 24, 2009, comments on the Proposed Study Plan identified concerns about Project hydrocycling on habitats of the fish community. The conclusion that Project hydrocycling for this relicensing action, however, has no effect on federal and state trust species seems to be unique and somewhat inconsistent with what other researchers have found on the Platte River and other river systems.

The Service has determined that the Project hydrocycling operations may impact the aquatic community in the lower Platte River. As reported in recent studies, the Project hydrocycling operations are likely to be a contributor in the reduction of benthic invertebrate production resulting the reduction in the growth rates of species that feed on benthic invertebrates including channel catfish, shovelnose sturgeon, and pallid sturgeon. Project impacts similarly affect the fish community by reducing the quantity of habitat available, quality of habitat available, and connectivity of these habitats. Given the conclusions that other researchers have found, and results from the studies conducted by the LPD during the ILP process, the Service's concerns regarding the Project's hydrocycling effects to the lower Platte River aquatic communities remain and in fact have been long standing.

The PLP proposes a minimum Loup River bypass discharge of 50 to 75 cubic feet per second (cfs) will maintain a "severe degradation" condition under the Montana Method. A study conducted by LPD under the ILP process showed that Project diversions severely impact fish habitat in the Loup River bypass area from April through October with the most severe degradation of such habitat from July through October. Furthermore, the

minimum bypass has a high probability of exceeding the temperature standard set by the Nebraska Department of Environmental Quality (approximately 90-percent daily exceedence according to the Second Initial Study Report (SISR) results). The Service expects similar impacts to the Platte River bypass area although impacts based on results from the SISR and the Updated Study report (USR) as completed by LPD are difficult to discern because of the influence of central Platte River streamflow.

III. PROPOSED PROTECTION, MITIGATION, AND ENHANCEMENT MEASURES TO AVOID AND MINIMIZE PROJECT EFFECTS FOR RESOURCES OF CONCERN UNDER ESA, NEPA, AND SECTION 10J OF FPA

The Service supports the investigations of the four alternatives described in FERC's June 10, 2011, request for study plan modifications (as amended December 21, 2011). Such a study could provide additional information that could result in the development of more focused PM&E measures to avoid and minimize impacts to federal and state trust species resulting from Project operations. The following are PM&E measures that were discussed by the Service and Commission at the October 3 and November 2, meetings with representatives of LPD and its consultant based on the most current information available. We look forward to the results of the FERC-requested evaluation of the operational alternatives and how the results of that study could be used to modify the current PM&E measures. The following PM&E measures are organized by Project affect.

Hydrocycling

The Service and Commission identified impacts from Project hydrocycling to the least tern, piping plover, pallid sturgeon, and the lower Platte River aquatic community and recommended several potential PM&E alternatives at our October 3 and November 2, meetings with representatives of LPD and its consultant as follows:

- **Timing:** PM&E measures should be put into place to avoid or minimize impacts to federal and state trust fish and wildlife resources within the March through October time frame. Hydrocycling affects are most pronounced from March through October.

- **Magnitude and Duration:** Consider implementation of some or all of these alternative PM&E measures including: a) no hydrocycling; b) limit the number of operational turbines; and/or c) develop re-regulation facilities. In regard to option b, the Columbus powerhouse has three turbines whose efficiency is optimized at 1,600 cfs, below that discharge, cavitation causes turbine instability and potential damage. Therefore, limits on the number of operational turbines to two or less during critical time periods would reduce the amplitude of the hydrocycle. A re-regulation reservoir stores hydrocycled peak flows within the Tailrace Return and allows for water to slowly return within the trough portion of the hydrocycle, which attenuates the hydrocycle and degree of Project affect. Capacity for

storage may be available through modifications within the Tailrace Return or through off-Project storage reservoirs. Barada (2009) suggested a reduction in the magnitude and duration of discharge peaks from the Project tailrace as a management strategy to benefit the downstream biotic community.

Flow Diversion

The Service and Commission identified impacts from flow diversion and sediment dredging to the least tern, piping plover, pallid sturgeon, whooping crane and the lower Platte River aquatic community and recommended several potential PM&E measures at our October 3 and November 2, meetings with representatives of LPD and its consultant as follows:

- **Minimum Flow:** The Service recommends the development of an instream flow bypass that is greater than the 50 to 75 cfs proposed in the PLP. The certification process for low impact hydropower facilities considers the maintenance of a "good" condition under the Montana Method as one criterion for certification (Low Impact Hydropower Institute 2011). A "good" condition for the Loup Bypass area represents a bypass within 297 to 364 cfs from April through September and 149 to 215 cfs from October through March. An increase in the minimum bypass from 50-75 cfs to 364 cfs would reduce the probability of exceeding the NDEQ temperature standard from 90-percent range to the mid-20 to 30 percent range (USR Figure 5-16). The Service requests that FERC consider magnitudes and durations of a minimum flow bypass that contributes toward improving whooping crane habitat suitability for both spring and fall migration periods. The Service also requests that FERC consider magnitudes and durations of a minimum flow bypass that contributes toward the improvement effective/dominant discharges in the Loup and Platte River bypass areas in addition offsetting Project-related reductions in sediment supply at the tailrace return.

- **Effective/Dominant Discharge:** Implement an effective/dominant discharge level flow from May-June on the Loup River bypass reach to enhance sediment transport. A May through June time frame approximates what might be expected under a natural hydrograph scenario. It also coincides with periods of high annual peak flows at Genoa (Figure C-6 of Appendix C).

- **Sandbar Shaping and Vegetation Removal:** We recognize that modifications to an effective/dominant flow regime may not necessarily translate to immediate changes in channel form because of the presence of riparian vegetation (Eaton et al. 2010; Tal et al. 2003). Therefore, the Service recommends mechanical modifications on two to four sandbar point bars within the Loup River bypass area. Mechanical modification would include removal of vegetation and shaping of sand on a point bar to an elevation that would be inundated by the expected effective/dominant discharge. Proposed mechanical modifications allow for the channel to quickly adjust to the modified flow regime. The proposed mechanical

modifications are similar to the mechanical actions in the Flow-Sediment-Mechanical approach adopted by the Platte River Recovery Implementation Program (USFWS 2006). Number of sites were based on a comparison of the number of nesting colonies upstream versus downstream of the Project diversion on the Loup River (see Appendix C).

- **Monitoring:** A multi-year monitoring program is recommended for the Loup River bypass and lower Platte River to: a) ascertain response of the least tern, piping plover, pallid sturgeon, whooping crane, and other riverine fish and wildlife species to the recommended PM&E measures; and b) ascertain habitat response of the above species to the recommended PM&E measures. Development of the monitoring program will be done in coordination and concurrence with the Service and Commission to ensure goals and objectives are met with regard to assessing species' response to PM&E measures.

IV. SERVICE RECOMMENDATIONS FOR NEPA PROCESS

The Loup River Hydroelectric Project represents a 53.4-megawatt (MW) project that has a total land area of approximately 5,200 acres of land of which approximately 1,100 acres is water. The geographic scope of the effects of the Project represents approximately 103-miles of Platte River and 30-miles of Loup River. Four federally listed threatened and endangered species are negatively affected by Project operations, not to mention the effects to other federal and state fish and wildlife trust resources.

The Project is similar in scope to other FERC relicensing projects where an Environmental Impact Statement (EIS) was prepared. For example, the Swan Falls Hydroelectric Project in Idaho (FERC Project No. 503-048) resulted in the preparation of an EIS, where a Final EIS (FEIS) was issued in August, 2010. The 25 MW hydroelectric project has a project boundary of 2,192 acres, of which 937 acres are water. The EIS stated only three resources considered in the Scope of Cumulative Effects: a) water quality (nutrients), b) white sturgeon (*Acipenser transmontanus*), and c) riparian vegetation. The geographic scope of effects to the white sturgeon represents the Snake River main stem between Brownlee dam and C.J. Strike dam (approximately 209 miles).

A FEIS was issued on November 2008, for the Holtwood Hydroelectric Project, (FERC Project No. 1881-050). The 107.2 MW project has a total land area within the project boundary of approximately 6,320 acres which includes 2,400 acres of lakebed under Lake Aldred. Water quality and fisheries were identified as the resources that have the potential to be cumulatively affected by the project. The geographic scope of effects to fish passage extends from the Susquehanna River Basin from the Chesapeake Bay to the basin to the York Haven Project (approximately 55 miles) and upstream.

In summary, the Loup River Hydroelectric Project represents a project that is similar in scope to the Swan Falls Hydroelectric Project and the Holtwood Hydroelectric Project. However, Loup River Hydroelectric Project has a much greater number of affected resources when compared to the aforementioned projects. The Service will defer to

FERC to determine the level of documentation needed to satisfy NEPA requirements for the Loup River Hydroelectric Project. However, the Service has serious concerns about the inadequacy of PM&E measures currently proposed in the PLP given the number of important resources involved. It may be difficult for FERC to support preparation of a Finding of No Significant Impact with only the current level of PM&E measures.

The Service appreciates the opportunity to provide comments on the PLP. Should you have any questions regarding these comments, please contact Mr. Jeff Runge within our office at (308) 382-6468, extension 22.

Sincerely,

Michael D. George
Nebraska Field Supervisor

Enclosures

cc: LPD; Columbus, NE (Attn: Neil Suess)
FERC; Washington DC (Attn: Lee Emery)
EPA; Kansas City, KS (Attn: Larry Shepard)
NGPC; Lincoln, NE (Attn: Frank Albrecht)
FWS; Denver, CO (Attn: Dave Carlson)
FWS; Denver, CO (Attn: Tom Econopouly)

Appendix A.

SERVICE COMMENTS ON PROJECT EFFECTS TO THE PHYSICAL ENVIRONMENT

I. Service Comments on Sedimentation

A recognized shortcoming of the Missouri River Basin study is that the sediment yield analysis only evaluates sediment sources, but does not assess sediment sinks. The assumed absence of sediment sinks leads to the incorrect assumption that the total quantity of source sediment is transported to the next downstream sub basin. This limitation was keenly noted by FERC in the April 8, 2011, SISR comments on the sediment budget. The Missouri River Basin study identified sources of sediment, but study methods did not identify areas of sediment deposition which includes hillslope deposition, valley deposition, and floodplain deposition (i.e., sediment sinks). This line of reasoning has also been applied in the Preliminary License Proposal (PLP) with the North and South Sand Management Areas (SMA) but nowhere else. Walling (2010) stressed the importance of understanding the entire sediment budget which includes sediment sources, sediment sinks, and sediment discharged to the downstream basin. Furthermore, Garg and Jothiprakash (2011) reported that physics-based and regression models, including the Universal Soil Loss equation and modified USLE, are primarily used for small watersheds, and these approaches have not shown significant results in estimating sediment yield from medium to large sized watersheds which is likely to represent the Loup and Platte River basins. A study often cited in the PLP elected to apply methods that are different from the Missouri River Basin study to estimate sediment yield (USACE 1990).

The Service is concerned about the Project's removal 24 percent of the sediment supply from the Platte River at North Bend and its effect on channel morphology leading to impacts to species habitats. The Service encourages FERC to consider the cumulative effects to lower Platte River sediment supply and how these effects may change into the future. For example, the US Army Corps of Engineers (Corps) had determined that bank erosion accounts for approximately five percent of the sediment supplied to the lower Platte River (USACE 1990). The Service has documented an increase in the stabilization of high banks from 25 percent in 1987 and 1988 to 38.8-percent from 2004 through 2006. A segment of the Platte River from the Loup River confluence to the Schuyler Bridge, which includes the tailrace return, has bank stabilization on 44.3 percent of the banks. Since 2006, the Service has received multiple requests for lower Platte River bank stabilization from the Corps and has reported multiple unpermitted bank stabilization projects (Jeff Runge and Robert Harms, USFWS, pers. comm. 2012). This increasing trend in bank stabilization projects reduces the availability of sediment that could be supplied through bank erosion and is cumulative to the removal of sediment supply to the Project tailrace.

The central Platte River is currently experiencing similar problems in the loss of sediment supply (Murphy et al. 2006). This erosion of sediment supply has migrated downstream as evidenced through the progressive coarsening of sediment in the central Platte River (Kinzel and Runge 2011). It is assumed that sediment transport impacts in the central Platte River will be realized in the lower Platte River. The Platte River Recovery Implementation Program intends to offset the sediment imbalance in the central Platte River through sediment augmentation, but the long-term feasibility of sediment augmentation remains under investigation. When considering the central and lower Platte River cumulative effects, the Corps (1990) conclusion that the sediment supply of the lower Platte River is virtually unlimited does not appear to be valid.

The Service suggests the following publications that would help to characterize Project impacts sandbar development and maintenance. Schmidt (2007) noted that higher concentrations of suspended sand would create larger eddy sandbars for the same hydrologic event. Low concentrations of suspended sand result in the formation of small sandbars (Schmidt 2007). The author showed that deposition rates during the 1996 controlled flood were larger downstream from the Little Colorado River, where suspended-sand concentrations were greater. It is similarly documented that dams along the Missouri River have greatly reduced sediment inflow into the system, reducing the amount of sand available for sandbar creation (USFWS 2009; National Research Council 2002).

Similarly, sediment-free water from the Tailrace Return is likely to facilitate sandbar erosion. In other river systems, Schmidt (2007) documented that low concentrations of suspended sand in the Little Colorado River may result in net sandbar erosion. Information from Elliot et al. (2009) identified a higher composition of the category "deep water" immediately downstream of the Project tailrace (Figure A-1). Deep water was characterized by the authors as water where the channel bottom was not visible. The presence of deep water was highest below the Project tailrace and diminishes further downstream. Downstream areas of deep water represent the Cedar Bluffs area and the Lower Platte River Gorge (Joeckel and Henebry (2008) that are formed through valley confinement, but the deep water at the Project tailrace return cannot be explained outside of the erosion of sediment supply. This deep water feature was also recognized by your staff as described in FERC's December 21, 2011, study plan determination.

When reviewing the body of current literature for the lower Platte River, there is not clear support that the lower Platte River is in stable geomorphic condition as stated in the PLP. Joeckel and Henebry (2008) concluded that channel surface for the study site encompassing the Project tailrace return (study site RG) decreased consistently during the period from 1938 to 1999. The consistent decrease in channel surface was detected despite an increasing trend in Mean Annual Flow and 7-day Low Flow for the North Bend streamgage (Graph E-12 of the PLP). A higher proportion of deeper water documented by Elliot et al. (2009) combined with a consistent decrease in channel area (Joeckel and Henebry 2008) indicates the possibility of channelization resulting from the Project's sediment deficit at the tailrace return. Joeckel and Henebry (2008) also noted

that "Sparse anecdotal data exist for some level of channel downcutting at some sites on the lower river". Furthermore, Horn et al. (2012) has identified that:

> The lower Platte River has not undergone channel narrowing as intensely as the central Platte River from the influence of tributaries, but it has still undergone a change in bar-forming processes related to a decrease in sediment and water discharge.

Unfortunately, the document referenced in the Horn et al. (2012) is currently "in review". When available, the Service will forward the document to FERC for consideration in the ILP process. In conclusion, information from published, scientific literature creates uncertainty around the PLP conclusion that the lower Platte River is in a state of dynamic equilibrium.

II. Service Comments on Hydrocycling

The Service believes that hydrocycling operations have resulted in the erosion of sandbars in the lower Platte River. Dexter and Cluer (1999) document the greatest number of rapid failures in sandbars is correlated to sudden or prolonged periods of discharge reduction. In studies of interior least tern nesting on the Arkansas River, the observed deterioration of sandbars by undercutting banks from diurnally fluctuated releases for hydropower (Lott and Wiley, In Press; Leslie et al. 2000). Budhu and Gobin (1995) explain the physics behind sandbar erosion by hydrocycling on the Colorado River. Also, the Biological Opinion on the Missouri River (USFWS 2000) reported that the bouncing of releases (2 days of low flow followed by 1 day of higher flows) at Gavins Point Dam resulted in the taking of "some" least tern and piping plover habitat. Hydrocycling has also been documented to facilitate vegetation encroachment on sand bars because of the daily downstream wetting of sand bars which would not be as prominent under a run-of-river regime (Lott and Wiley, In Press).

III. Service Comments on Temperature

The Serviced believes that Project operations have increased the probability of high water temperatures in the Loup River bypass. Water temperature is affected by atmospheric conditions, topography, streambed, and stream discharge (Olden and Naiman, 2010; Cassie, 2006). Surface water diversions have been documented to decrease the thermal capacity of the river and thus increase the likelihood of high temperature events and resulting in impacts to federal trust resources. Streamflow diversion would lead to small volumes of water that are more responsive to ambient conditions (Ward 1985), and low discharge leads to more pronounced diel temperature fluctuations. Meier (2003) through the use of heat balance models have linked water diversions to higher summer stream temperatures for low sloped, unshaded river systems. Recent synthesis papers discussing the thermal regime of rivers cite the Sinokrot and Gulliver (2000) paper as the most

current paper that documents the linkage between water diversions on stream temperature (Olden and Naiman, 2010; Cassie, 2006).

The comparison of the probability of temperature exceedence to streamflow is one product of the relicense studies whose methods were derived from Sinokrot and Gulliver (2000). LPD replication of methods developed by Sinokrot and Gulliver (2000) demonstrate that, at lower discharges, diel temperature fluctuations are more pronounced as evidenced in the probability of temperature exceedences graph in the USR (Figure 5-16). The current minimum flow bypass of 50 to 75 cfs has a high probability exceeding the Nebraska Department of Environmental Quality standard (approximately 90-percent daily exceedence).

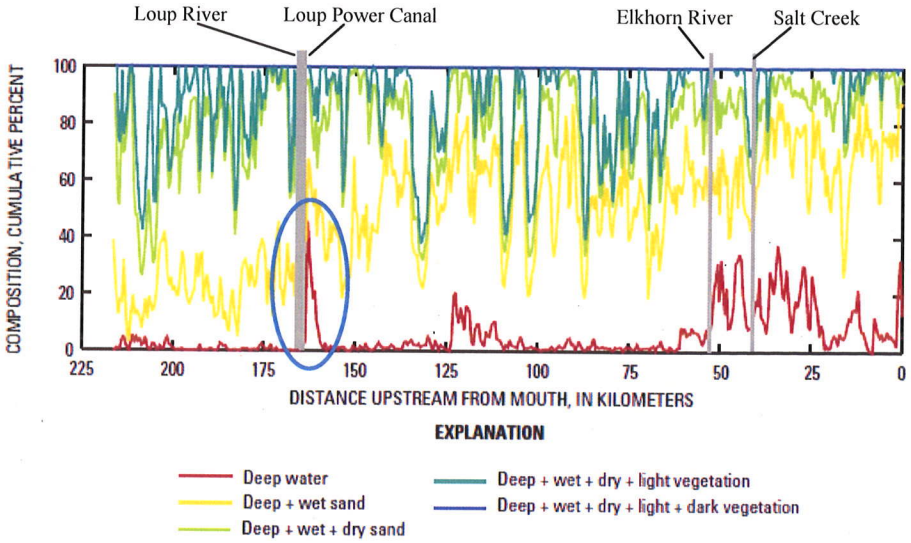

Figure A-1. Longitudinal comparison of percent channel composition from Elliot et al. (2009). The blue oval identifies the rapid increase in percent deep water downstream of the Project tailrace return. Deep water was classified as water where the channel bottom was not visible. Deep water areas downstream of the Project tailrace represent conditions of valley confinement (i.e., Cedar Bluffs and Lower Platte River Gorge).

Appendix B.

SERVICE COMMENTS ON EFFECTS TO SECTION 10J RESOURCES

I. Effects of Flow Bypass on the Loup River Fish Community

The Service has determined that Project operations impact the Loup River fish community by: a) increasing the probability of exceeding the water quality standard for warm water aquatic life, and b) reducing suitability of instream habitat.

In the previous section, the Service documented how Project effects stream temperature in the Loup bypass area. This relationship between stream temperature and flow has been documented in other river systems. Sinokrot and Gulliver (2000) and Meier et al. (2003) have documented that a reduction in stream discharge resulting from water diversions can directly affect water temperatures by decreasing thermal capacity and increasing the likelihood of high temperature events, and thus it is logical that lower flows in the Loup River bypass area have a higher probability of exceeding the water quality standard of 90° Fahrenheit.

Reducing the anthropogenic effect to a river's temperature regime is important for the ecological integrity of the biotic systems linked to river temperature. For example, the life cycles for freshwater insects and fish respond to the cumulative effects of thermal units (i.e. the accumulation of daily temperatures above some threshold) and absolute temperatures (Olden and Naiman, 2010). Fish species also have both chronic and acute temperature thresholds for survival, growth, and reproduction (Olden and Naiman, 2010). The Service has determined that the above ecological and physiological processes in the Loup River bypass area are affected by the frequent temperature exceedences of the water quality standard of 90° Fahrenheit associated with a minimum flow bypass of 50 to 75 cfs.

Service April 7, 2011, comments on the SISR also documents the impacts to the fish community in the bypass area of the Loup River and the bypass area of the Platte River as recognized using the Montana Method. The Service noted large differences in the proportion of Fair, Poor, or Degraded conditions for each of the respective months when comparing Site 1 upstream of the Project diversion to Genoa. The percentage of years categorized as Fair, Poor, or Degraded for the months from April through June ranged from 0 to 1.8 percent for Site 1 while percentages at Genoa ranged from 37.5 to 48.2 percent. From July through September, the percentage of years categorized as Fair, Poor, or Degraded ranged from 1.8 to 19.6 percent for Site 1 while percentages at Genoa ranged from 71.4 to 82.1 percent. In summary, approximately half of the years, over a year time frame, at Genoa were categorized as degraded for the months of July through September.

Service SISR comments also summarized the percent of total categorized as Fair, Poor, or Degraded from October through March for the 56-year period of record. There is an obvious difference in October when the Site 1 has zero years in a degraded condition while Genoa has 46.4 percent of the years categorized as degraded. The percentage of years categorized as Fair, Poor, or Degraded for the months from November through March ranged from 0 to 1.8 percent for Site 1 while percentages at Genoa ranged from 0 to 16.1 percent.

II. Effects of Hydrocycling on the Lower Platte River Aquatic Community

The conclusion that Project hydrocycling for this relicensing action, however, has no effect on federal and state trust species seems to be unique and somewhat inconsistent with what other researchers have found on the Platte River and other river systems. Published scientific literature had identified the effects of hydrocycling on the aquatic community. Impacts from hydrocycling include reduced benthic invertebrate abundances (Gisalson 1985), stranding of burrowing invertebrates (Braaten and Guy 1995), and decreased feeding and growth of fish (Weisberg and Burton 1993). Hydrocycling effects to primary production and fish growth have been demonstrated in research specific to the lower Platte River. Barada (2009) noted slower growth rates for channel catfish collected in the Platte River compared to growth rates in published literature, and that channel catfish collected from sites directly below the Loup River Power Canal exhibited the slowest growth rates compared to sites further upstream and downstream. Holland and Peters (1992) observed similar slow growth of channel catfish in the lower Platte River suggesting stressful environmental conditions as a possible source. When comparing conclusions in published scientific literature to study results, Barada (2009) concluded that canal hydropeaking reduces availability of channel catfish prey which reduces consumption of prey items. The author also suggested that the reduced growth of channel catfish is influenced by individual adjustments to rapidly changing habitats due to hydrocycling.

In a separate study, Anderson (2010) stated that shovelnose sturgeon are aquatic benthivores, and it is likely that benthic invertebrates are being directly influenced by diel fluctuations from the Loup River Power Canal. Anderson (2010) concluded that Project hydrocycling effects on channel catfish, as documented by Barada (2009), would similarly affect shovelnose sturgeon because of similar diets and habitat uses. Anderson (2010) documented relatively high mortality rates for sturgeon on the lower Platte River compared to other shovelnose sturgeon populations. Anderson (2010) hypothesized that environmental stressors such as hydropeaking create an extreme environmental condition that results in direct mortality of individuals or forced emigration from the lower Platte River.

Recent publications have documented the potential effect of hydrocycling on fish diversity and abundance. Anderson (2010) reported lower fish diversity in the study site nearest the Project's tailrace return when compared to the downstream study site. A difference in fish abundance was also reported by Peters and Parham (2008a). The author

attributed hydropeaking as a possible cause for the reduced abundance due to its rapid alterations to flow regime.

The importance of the Platte River to the Missouri River basin fish communities has been well documented (Winders and Delonay 2011; Pierce et al. 2003; Newcomb 1989). Pierce et al (2003) stated that tributaries are critical to maintaining healthy fish populations in the Missouri River because they provide refugia for fish populations residing in the degraded main channel of the Missouri River. The authors also concluded that continued degradation of tributaries such as the Yellowstone, Platte, and Kansas rivers could further jeopardize fish populations in the Missouri River ecosystem.

Appendix C.

SERVICE COMMENTS ON DRAFT BIOLOGICAL ASSESSMENT

I. Whooping Crane

Importance of the Loup River

An understanding of whooping crane recovery is necessary prior to assessing how Project operations would affect the survival and recovery of the species. The whooping crane recovery plan lists two recovery objectives that would allow for a downlisting in status from federally Endangered to Threatened (CWS and USFWS 2005).

Objective 1 – Establish and maintain self-sustaining populations of whooping cranes in the wild that are genetically stable and resilient to stochastic environmental events.
Objective 2 – Maintain a genetically stable captive population to ensure against extinction of the species.

Within these objectives, there are measurable criteria specific to the Aransas Wood Buffalo Population (AWBP). Criteria for the AWBP are variable and based on the sustainability of other populations such as the Florida non-migratory population and the eastern migratory population. The following table lists the AWBP recovery criteria based on the number of sustainable non-AWBP populations.

Number of Sustainable Non-AWBP Populations	AWBP Criteria
2	40 productive pairs for at least 10 years
1	400 individuals (i.e. 100 productive pairs)
0	1,000 individuals (i.e. 250 productive pairs)

The Loup River bypass has a role in whooping recovery in the future if habitat could be improved compared to present conditions. Approximately 60 to 80-percent of the AWBP mortalities occur within the migration time periods totaling just nine weeks out of the year (CWS and USFWS 2005; Lewis et al. 1992). The Service recognizes the importance of improving the secure migration habitat range-wide which includes the Loup River bypass. Given the above downlisting criteria, none of the non-AWBP populations are currently considered sustainable, so the recovery criterion for the AWBP is 1,000 individuals of which there would need to be 250 productive breeding pairs. With the flock size estimated at 279 individuals, this would imply the need for secure habitat for a population that is approximately four times the current size. The Loup River bypass area has the potential to provide a greater contribution in stopover habitats for delisting to occur.

The Draft Biological Assessment (DBA) is correct in that the whooping crane was not included in the Service's July 21, 2008, letter. However, the Service justified the inclusion of the whooping crane in their February 9, 2009, comment letter to the Pre Application and Scoping Document. Improved mapping capabilities were developed that resulted in improved delineations of the whooping crane migration corridor for the

AWBP (Tacha et al. 2011). The improved mapping capabilities show that Loup River bypass is nearly contained within the eastern 95-percent boundary whooping crane migration corridor in Nebraska (Figure C-1). This would imply that 5-percent of the population migrates within the 95-pecent boundary, and the Service assumes the eastern corridor represents 2.5-percent or one half of the total 5-percent. The current AWBP population estimate is 279 individuals of which 2.5-percent represents approximately seven individual whooping cranes that are likely to fly over the bypass area for both the spring and fall migrations. Based on the downlisting criteria for the AWBP is 1,000 individuals, approximately 25 individual whooping cranes are expected to fly over bypass area, for both spring and fall migration seasons, on an annual basis with the expectation of roosting along the migration route.

Effects of Project Diversion

Assessments of habitat use in the DBA do not consider information from recently published documents. The DBA does not consider channel width, wetted width, and depth information published by Farmer et al. (2004) or Howlin et al. (2008) which represent important habitat criteria for the whooping crane. It is important to recognize that, although whooping crane may use a range of unobstructed and wetted widths, the species selects for the widest unobstructed and wetted widths available. The DBA description of habitat use in Table 4 does not capture the complexities of how the species selects habitats based on habitat availability using resource selection applications (Johnson et al. 2006, Rosenfeld 2003, Johnson 1980).

Farmer et al. (2004) concluded for the central Platte River that wide channel width was a necessary condition for a large number of whooping crane roosts to occur. Narrow channel widths precluded large numbers of use by cranes. Figure C-2 demonstrates that channel widths downstream of the Project diversion fall within the range of unobstructed channel widths that would preclude high number of whooping cranes. Unobstructed channel widths upstream of the diversion provide conditions that would allow for a much higher probability of use by the species. The Service has also applied channel width data to a suitability curve developed by Howlin et al. (2008) demonstrating that the channel width upstream of the diversion has a higher suitability compared to channel widths downstream of the diversion (Figure C-3).

Published literature also recognizes a suitability indice of "wetted width" (Farmer et al. 2005, Howlin et al. 2008). HEC-RAS modeling results from USR Table 5-10 compares wetted channel for Site 1 to Site 2-No Diversion (Table C-1). Narrower channel widths associated with Site 2 result in narrower wetted widths, and average wetted widths for the Site 1 dry, normal, and wet time period are greater than the average channel width for Site 2. Differences in channel width are consistent when comparing study sites upstream and downstream of the Project diversion. Figure 5-11 in the USR Flow Depletion/Flow Diversion also show that the No Diversion condition for study sites in the Loup Bypass area have the same streamflow as Study Site 1 but do not have the ability to achieve comparable wetted widths thus does not provide habitat for the species.

The distribution of depths across a channel represents another important habitat suitability indice for the whooping crane. Farmer et al. (2005) used the indice "wetted widths of channel >0.7 feet in depth" in their analysis, and Howlin et al. (2008) used the indice "depth of suitable sand less than 8 inches deep". Furthermore, Farmer et al. (2005) recognized a minimum depth to characterize roost habitat. The DBA indice "shallow water/wet sand" is not comparable to the above indices because the depth of water could not be determined through aerial interpretation (SISR, Page 42, footnote 6). To address the shortcoming of the aerial interpretation, the Service used data developed through HEC-RAS modeling to assess riverine habitat suitability because: a) the HEC-RAS models apply transect data collected with survey grade Global Positioning Units, and b) the indice "Percentage of Channel Width with Water Depths of 0.8 Foot or Less" used in HEC-RAS modeling better represents habitat suitability indices described by Farmer et al. (2005) and Howlin et al. (2008).

Table C-2 summarizes the indice "Percentage of Channel Width with Water Depths of 0.8 Foot or Less" from Table 5-19 of the USR and "Percentage of Exposed Channel Width" from Table 5-10 from the USR. The sum of both variables represents the indice "proportion of depth suitable or sand" described by Howlin et al. (2008). Figure C-4 compares the habitat suitability using the variables "proportion of depth suitable or sand" from Table C-2, and wetted width from Table C-1. When comparing suitability above and below the Project diversion, it is evident that Project operations have a considerable effect to whooping crane habitat suitability.

The DBA also does not discuss roost sites occur mid-channel away from visual obstructions such as tall vegetation and/or high banks (Farmer et al. 2004; Austin and Richert 2001; Faanes et al. 1992). While the DBA correctly states that the Loup River bypass has greater areas of shallow water/wet sand, the Service does not consider shallow water/wet sand as roost habitat unless it is located away from visual obstructions. Study sites upstream of the Project diversion have a larger percentage of mid-channel bars in comparison to downstream sites which have a higher proportion of point bars. The DBA does not describe the position of the shallow water/wet sand, but the Service would infer that the shallow water/wet sand is likely to be located adjacent to point bars next to the river bank where visual obstructions make the area unsuitable. Submerged mid-channel sand bars located upstream of the project diversion are likely to be higher in suitability because sandbars would be located away from visual obstructions.

II. Least Tern

The recovery team for the interior least tern has determined that the Platte and Loup rivers are essential for the recovery of the species. In 1990, the Service published the *Interior Population of the Least Tern Recovery Plan* (USFWS 1990). That plan includes recovery goals for the least tern along major river systems throughout the species range. Major recovery steps outlined in the plan include: a) determine population trend and habitat requirement; b) protect, enhance, and increase populations during breeding; c) manage reservoir and river water levels to the benefit of the species; d) develop public

awareness and implement educational programs about the least tern, and; e) implement law enforcement actions at nesting areas where there are conflicts with high public use.

The recovery plan further recommends the removal of the least tern from the list of threatened and endangered species if essential habitat throughout its range is properly protected and managed, and species distribution and population goals are reached and maintained for a period of ten years. Specifically, the recovery plan recommends that the following distribution and numbers of adult birds be maintained for ten years:

Missouri River system - 2,100
Lower Mississippi system - 2,200-2,500
Arkansas River system - 1,600
Red River system - 300
Rio Grande River system - 500

The recovery plan also specifies a geographic distribution of these totals within each river system. Within the Missouri River system, the plan calls for 1,120 of the 2,100 adult terns to be distributed in Nebraska, as follows:

Missouri River - 400 (shared with South Dakota on the Missouri River)
Niobrara River - 200
Loup River - 170
Platte River – 750

The Service does not support the DBA conclusion that interior least tern use of the Loup River in relation to use of other Nebraska rivers is minimal. The species recovery plan has identified the Loup River as important for species conservation and recovery, and species recovery cannot occur unless Loup River recovery objectives are achieved. Peripheral populations can be disproportionately important to the conservation of widely distributed species such as the least tern because individuals contribute to metapopulation longevity (Perkins et al. 2003; Howe and Davis 1991). The absence of spatially diverse habitats can result in crowded breeding habitat; thus, intra- or interspecific competition that can reduce local reproduction (Guo et al. 2005). Maintenance of peripheral populations also spreads risk so that variable habitat conditions in one or a few river systems do not threaten the entire species (Murphy et al. 1990). Species production in the Loup River in 2011 was especially important for the larger population because production on the Platte and Missouri Rivers were reduced due to flooding.

The DBA does not include important adult and nest survey information that was provided by the Commission. Table C-3 summarizes survey data from 1985 to 2008 (excluding 2005 International Census data reported in DBA). Total number of birds and nests were determined by using the highest number recorded on a single day for a segment of river. If two days were required to survey a segment, then data from those two days were combined as long as the survey dates were within two to three days of each other. Table C-4 also includes individual and nest information collected by the Tern and Plover Conservation Partnership for the North Sand Management Area.

Recent adult and nest surveys from 2009-2011 had the objective of counting peak bird and nest numbers on the Loup River, so data from these surveys provides an improved baseline for number of individuals and number of nests compared to the 2005 census that was based on different objectives. Tables C-5 and C-6 separates least tern data for the 2009-2011 surveys by location upstream and downstream of the diversion, respectively. The 2009 survey was conducted by the Nebraska Public Power District, the 2010 survey was conducted by the Service, and the 2011 survey was conducted by both agencies. The maximum number of individuals surveyed (i.e., Peak #) represents the peak number of individuals for one longitudinal survey. Multiple surveys were conducted for 2010 and 2011, and by using the maximum number of individuals for one survey eliminates the possibility of double-counting of individuals across multiple surveys. Total number of nests (i.e., Nests) represents the total number of unique nests documented for all surveys. Unique nests were determined by interpretation of Global Positioning Unit data or by comparison of observation dates. The Service has also modified the maximum number of individuals and total number of nests to reflect the number of birds and nests per river mile (i.e., per RM). The Loup River downstream of the Project diversion represents approximately 34.2 river miles. The Loup River from the Middle Loup/South Loup confluence to the project diversion represents approximately 21.8 river miles.

The Service has also summarized the total number of nesting colonies observed in the 2009 – 2011 surveys (Table C-7). A nesting colony is defined as a site having at least one active nest containing one or more eggs or chicks. Because least tern and piping plovers often nest together in a colony, Table C-7 does not separate colonies by species. As with the previous tables, data was modified to reflect the number of colonies per river mile. It is clear in Tables C-5, C-6, and C-7 that the Loup River upstream of the diversion has a higher number of: a) maximum number of individuals surveyed per mile, b) total number of least tern nests per river mile, and c) total number of nesting colonies per river mile for all three years of survey.

Species Use in the Loup River

The PLP stated that the calculation of channel width and depth using the no diversion effective and dominant discharges reveals that the values of both parameters would be larger under a no diversion condition than under current operations. Tables C-8, C-9, and C-10 provide a projection of: a) maximum number of individuals surveyed, b) total number of least tern nests, and c) total number of nesting colonies for the bypass area if habitat conditions in the bypass area were similar to conditions upstream of the bypass. The variable *Max # Bypass* represents the maximum number of individuals surveyed within the bypass area (i.e., Table C-8, Column 1). The number of river miles in the Loup River bypass (i.e., 34.2 river miles) is then multiplied by the maximum number of individuals surveyed per mile observed upstream of the Project diversion (i.e., Table C-8, Column 3) to develop the variable *Max # Potential*. The variable *Max # Potential* represents an indice of the maximum number of individuals that are expected to be observed in the Loup Bypass area if habitat conditions downstream of the Project diversion were similar to conditions upstream of the diversion and rates of use are similar. The difference between the variables *Max # Potential* and *Max # Bypass*

represents the number of individuals that could be present if the rate of use downstream of the Project diversion was similar to the rate of use upstream. Methods were similarly developed for: a) total number of least tern nests, and b) total number of nesting colonies for the bypass area as represented by Tables C-9 and C-10, respectively.

The LPD May 11, 2011, response to SISR comments stated that under the no diversion condition, the Loup River bypass reach would over time develop characteristics similar to the upstream location. If the Loup River downstream of the Project diversion was geomorphically similar to the river upstream of the diversion, then species use would be similar. If the rate of species use for the Loup River bypass area was similar to use documented for the Loup River upstream of the diversion, then we would expect the: a) maximum number of individuals to increase by 20 to 33 individuals; b) total number of nests to increase by 4 to 26 nests; and c) number of nesting colonies to increase by 2 to 4 colonies.

The upstream to downstream differences in species use is especially dramatic when considering that a single nesting colony as well as the majority of least tern nests occurred in a location in the Loup River bypass area where the channel migrated laterally into the Central Sand and Gravel sandpit. As noted in Figure C-5, channel widths of approximately 1,700 feet are much wider than widths documented in the flow depletion/flow diversion study. When removing nest totals from the Central Sand and Gravel sandpit, the total number of unique nests observed in the Loup Bypass area is reduced from 25 to 8. Additionally by removing the Central Sand and Gravel sandpit colony from the totals, 2011 represents the only year out of the 3-year survey that nesting colonies were observed in the Loup River bypass area. The Service would like to note that habitat suitability and species use at the site would likely diminish once the channel at the Central Sand and Gravel sandpit adjusts to the dimensions associated with the effective/dominant discharge and vegetation establishes in the area.

As discussed previously in the whooping crane section, channel width in the bypass segment of the Loup River is narrower than channels upstream of the diversion. For the central and lower Platte River, Ziewitz (et al. 1992) documented that least terns and piping plovers nested in river segments whose channel width was wider than what was typically available. Nest sites in the central Platte River averaged 969 feet (standard deviation 267 feet) while random sites averaged 659 feet (standard deviation 252 feet). Nest sites in the lower Platte River averaged 1,703 feet (standard deviation 316 feet) while random sites averaged 1,410 feet (standard deviation 335 feet). Results from the HEC-RAC analysis show channel widths upstream of the diversion averaging 825 feet while channels downstream of the diversion average 640 feet. As discussed previously, 17 of the 25 least tern nests in Loup Bypass area were located at the Central Sand and Gravel sandpit, a site considered by the Service to be an anomaly, but whose channel width is approximately 1,700 feet. The Service believes that the lower rates of use and nesting in the Loup River bypass are linked to lower channel width suitability.

Furthermore, the DBA did not consider the position of the sandbars in relation to habitat suitability. While the DBA correctly states that the Loup River bypass has greater areas

of bare sand, the Service does not consider bare sand as suitable habitat unless the sand represents a mid-channel sandbar isolated by streamflow. Study sites upstream of the Project diversion have a larger percentage of mid-channel bars in comparison to downstream sites which have a higher proportion of point bars. Mid-channel sandbars located upstream of the project diversion are likely to be higher in suitability because sandbars would be located away from visual obstructions.

As stated in Appendix B, Project operations may affect least tern forage because of Project diversions affecting water temperature in the Loup River bypass and instream habitat in the Loup and Platte River bypass areas. Least terns are opportunistic feeders. However, adults and chicks have different sizes requirements for food items, so a diverse and healthy fish community is necessary to support different least tern life stages.

The DBA also discusses Off-Highway Vehicle (OHV) use in the OHV park could influence interior least tern and piping plover nest site selection and productivity. While surveying for least tern and piping plovers, the Service has observed OVH use throughout the Loup River bypass area. The Service supports the DBA assessment that OHV could represent a disturbance-related effect to the species, and broad use of OHV in the bypass may be facilitated by low bypass flows.

Species Use in the Platte River

Figure 5 of the DBA identifies the number of adult least terns observed during June surveys although it does not separate river and sandpit observations. This separation of habitat types is important because the Project affect habitats differently. The DBA also discusses statistical studies conducted by the LPD which evaluated nest count data on the lower Platte River for all river miles downstream of the confluence with the Loup River. The DBA concluded that factors such as suitable habitat, mid-summer flooding, recreational disturbance, predation, nesting success in other locations, and threats in the wintering locations create variability in nesting numbers. The Service has determined that the DBA analyses cannot singularly assess Project effects to least tern nesting. The Project may/may not affect the species, but current methods can not verify this effect (of lack of) because methods cannot account for the aforementioned confounding factors that creates variability in the results.

According to the LPD USR response, approximately 1,794,800 tons of sediment are removed on an average annual basis through Project operations. Assuming a bulk density of sand at 1.9 tons per cubic yard (Kinzel 2009), approximately 944,632 cubic yards of sediment near the Project tailrace return would be needed to maintain sediment balance on an annual basis. The sediment removed from the available sediment supply would come from Platte River streambed, banks, and sandbars. Project removal of sediment at the Project diversion may affect Platte River sandbar formation and sediment free water from the Tailrace Return may facilitate sandbar erosion as observed in Figure A-1. As identified in Appendix A, this relationship between suspended sediments and sandbar development has been documented in other river basins.

The PLP referenced results from the aggradation/degradation analysis which used methods from Chen et al. (1999) stating that channel degradation was not detected at the North Bend streamgage and sites further downstream. However, the aggradation/degradation analysis is limited in that stream gage. The North Bend gage is approximately 30 miles downstream from the Project tailrace, and methods could not be used to detect change to the sub-aerial component of the channel (i.e., sandbars) (Alexander 2009).

As discussed in Appendix B, Project hydrocycling operations also affect primary productivity in the Platte River below the tailrace return which may affect least tern forage base. Project hydrocycling affect the least tern through sandbar erosion, and the continuous wetting of sandbars may also impact sandbar suitability by facilitating vegetation establishment (Appendix A).

Project hydrocycling also affects least tern nest inundation. The Service does not support the DBA conclusion that the relative elevation above the wetted sand of a sand bar would be the same for current operations and a run-of-river scenario. Brown and Jorgensen (2009) documented that sandbars do not form at the elevation of the peak flow. Rather, sandbars form at different elevations below the peak flow. Effects of hydrocycling on the descending slope of a peak flow thus, have the potential to inundate nests which is depicted in Figure C-7. Under run-of-river operations, a nest initiated in mid-April whose elevation is equivalent to 3,700 cfs would not be inundated by subsequent flows. Conversely, a nest could not initiate at comparable elevations under hydrocycling operations because peak of the hydrocycle would inundate any nesting attempt. Figure C-7 represents 2006 conditions and the magnitude hydrocycling effects vary across years and across different elevations. Service SISR comments, dated April 7, 2011, included commentary from the Commission which elaborates on the potential effects on nest inundation. It is reasonable to conclude under certain flow conditions that hydrocycling either: a) has the potential for nest inundation, or b) has the potential to inundate nesting habitat that would preclude nesting opportunities.

General Comments

1. The genus for the least tern has recently changed from *Sterna* to *Sternula*.

2. The DBA is correct in that the breeding range has not changed, but the number of breeding sites range-wide has diminished.

3. DBA statement that least terns are associated with piping plovers at nesting sites is incomplete. The species have been known to nest at colonies independent of the other species. Furthermore, species ranges are different further documenting why species are not always associated.

4. The Service would like to caution the use of 2005 census data as the sole source of data used to determine the significance of the Loup River to the species. The low number of bird counted in 2005 was a consequence of the time of survey.

The objective of the 2005 international least tern census was to implement a standardized method to survey the presence of the species across numerous river basins, and surveyors had a narrow time frame for to conduct surveys. Loup River surveys for the 2005 occurred immediately after a series of rainstorm events which inundated all available nesting habitats and may have moved individuals into other river systems (Jeff Runge, pers. comm. 2012).

5. The North SMA has 425.5 acres of sand, but only 100 to 150 acres is considered habitat for terns and plovers.

6. The Service does not view the MOU as a mitigation or enhancement offset for Loup or Platte River habitat impacts. The North SMA memorandum of understanding reduces the take of least tern and piping plover nests resulting from sand mining operations only and does not reduce effects of Project operations on Loup River nesting habitat.

III. Piping Plover

The Service finalized a recovery plan for the Great Lakes and Northern Great Plains Piping Plover in (USFWS 1988). The 1988 plan established a recovery goal for the northern Great Plains piping plover population of 1,300 pairs. The recovery plan identifies the geographic and temporal elements of the recovery goals that need to be met. The recovery plan states that the population must remain stable for a period of at least 15 years. The geographic goals in the recovery plan 1,300 pairs are to be distributed in the following locations.

Montana - 60 pairs
North Dakota - 650 pairs
    Missouri River - 100 pairs
    Missouri Coteau - 550 pairs
South Dakota -350 pairs (including 250 pairs shared with Nebraska on the Missouri River)
    Missouri River below Gavin's Point - 250 pairs (shared with Nebraska)
    Other Missouri River sites - 75 pairs
    Other sites - 25 pairs
Nebraska - 465 pairs (including 250 pairs shared with South Dakota on the Missouri River)
    Platte River - 140 pairs
    Niobrara River - 50 pairs
    Missouri River - 250 pairs
    Loup River system - 25 pairs
Minnesota - 25 pairs at Lake of the Woods

The Service does not support the DBA conclusion that piping plover use of the Loup River in relation to use of other Nebraska rivers is minimal. The species recovery plan

has identified the Loup River as important for species conservation and recovery, and species recovery cannot occur unless Loup River recovery objectives are achieved. As discussed in the least tern section, peripheral populations can be disproportionately important to the conservation of the species by contributing to metapopulation longevity, the reduction intra- or interspecific aggressiveness within colonies and, to spread risk across multiple river systems (Perkins et al. 2003; Howe and Davis 1991). Species production in the Loup River in 2011 was especially important for the larger population because production on the Platte and Missouri Rivers were reduced due to flooding.

The DBA does not include important adult and nest survey information. Table C-11 summarizes survey data from 1985 to 2008 (excluding 2005 International Census data reported in DBA). Total number of birds and nests were determined by using the highest number recorded on a single day for a segment of river. If two days were required to survey a segment, then data from those two days were combined as long as the survey dates were within two to three days of each other. Table C-12 also includes individual and nest information collected by the Tern and Plover Conservation Partnership for the North Sand Management Area.

The Service has developed Tables C-13 and C-14 which separates the 2009-2011 piping plover survey data by location either upstream or downstream of the diversion. Tables C-13 and C-14 applied piping plover data using the same methods described in the least tern section.

Similar to findings in the least tern section, the Loup River upstream of the diversion has a higher number of: a) piping plover individuals per mile, b) piping plover nests per river mile, and c) nesting colonies per river mile for all three years of survey. This change is especially dramatic when considering that a single nesting colony as well as all of the documented piping nests in the Loup River bypass area occurred at the Central Sand and Gravel sandpit. As noted in Figure C-5, channel widths of approximately 1,700 feet are much wider than widths documented in the flow depletion/flow diversion study in the bypass area. When removing nest totals from the Central Sand and Gravel sandpit, there would be zero nests in the Loup Bypass area. The Service would like to note that once the channel at the Central Sand and Gravel sandpit adjusts to the dimensions associated with the effective/dominant discharge, it is likely the habitat suitability and species use at the site would diminish as well once vegetation establishes.

Species Use in the Loup River

The PLP stated that the calculation of channel width and depth using the no diversion effective and dominant discharges reveals that the values of both parameters would be larger under a no diversion condition than under current operations. Tables C-15, C-16, and C-10 provide a projection of: a) maximum number of individuals surveyed, b) total number of piping plover nests, and c) total number of nesting colonies for the bypass area if habitat conditions in the bypass area were similar to conditions upstream of the bypass. The Service developed Tables C-15 and C-16 by applying methods that were similar to those applied in Tables C-8 and C9.

If the rate of species use for the Loup River bypass area was similar to use documented for the Loup River upstream of the diversion, then we would expect the: a) maximum number of individuals would increase by 3 to 13 individuals; b) total number of nests would increase by 2 to 5 nests; and c) number of nesting colonies would increase by 2 to 4 colonies.

The upstream to downstream differences in species use is especially dramatic when considering that all documented piping plover nests occurred in the Loup River bypass area where the channel migrated laterally into the Central Sand and Gravel sandpit. As noted in Figure C-5, channel widths of approximately 1,700 feet are much wider than widths documented in the flow depletion/flow diversion study. When removing nest totals from the Central Sand and Gravel sandpit, the total number of nests observed in the Loup Bypass area is reduced from two to zero. Habitat suitability and species use at the site would likely diminish once the channel at the Central Sand and Gravel sandpit adjusts to the dimensions associated with the effective/dominant discharge and vegetation establishes in the area.

Channel width in the bypass segment of the Loup River is narrower than channels upstream of the diversion. Results from the HEC-RAC analysis show channel widths upstream of the diversion averaging 825 feet while channels downstream of the diversion average 640 feet. As discussed previously, all of the piping plover nests in Loup Bypass area were located at the Central Sand and Gravel sandpit whose channel width is approximately 1,700 feet. The Service believes that the lower rates of use and nesting in the Loup River bypass are linked to lower channel width suitability. While the DBA correctly states that the Loup River bypass has greater areas of bare sand, the Service does not consider bare sand as nesting habitat unless the sand represents a mid-channel sandbar isolated by streamflow. Study sites upstream of the Project diversion have a larger percentage of mid-channel bars in comparison to downstream sites which have a higher proportion of point bars. Mid-channel sandbars located upstream of the project diversion are likely to be higher in suitability because sandbars would be located away from visual obstructions.

The DBA also discusses Off-Highway Vehicle (OHV) use in the OHV park could influence interior least tern and piping plover nest site selection and productivity. While surveying for least tern and piping plovers, the Service has observed OVH use throughout the Loup River bypass area. The Service supports the DBA assessment that OHV could represent a disturbance-related effect to the species, and broad use of OHV in the bypass may be facilitated by low bypass flows.

Species Use in the Platte River

Figure 6 of the DBA identifies the number of adult least terns observed during June surveys although it does not separate river and sandpit observations. This separation of habitat types is important because the Project affect habitats differently. The DBA also discusses statistical studies conducted by the LPD which evaluated nest count data on the lower Platte River for all river miles downstream of the confluence with the Loup River. As discussed in the least tern section, the Project may/may not affect the species, but

current methods cannot verify this effect (of lack of) because methods cannot account for the confounding factors that creates variability in the results.

Project removal of sediment at the Project diversion may affect Platte River sandbar formation and sediment free water from the Tailrace Return may facilitate sandbar erosion. As identified in Appendix A, this relationship between suspended sediments and sandbar development has been documented in other river basins. The aggradation/degradation analysis Chen et al. (1999) is limited in that stream gage at North Bend is approximately 30 miles downstream from the Project tailrace, and methods could not be used to detect change to the sub-aerial component of the channel (i.e., sandbars) (Alexander 2009).

Project hydrocycling operations affects primary productivity in the Platte River below the tailrace return which may affect piping plover forage base. LeFer (2008) concluded that on the Missouri River, hydrocycling in combination with the decrease in physical habitat diversity has likely led to the decline in forage base for the piping plover. Similar effects would be anticipated for the lower Platte River. Project hydrocycling may affect the piping plover through sandbar erosion, and the continuous wetting of sandbars may also impact sandbar suitability by facilitating vegetation establishment (Appendix A). It is also reasonable to conclude under certain flow conditions that hydrocycling either: a) has the potential for nest inundation, or b) has the potential to inundate nesting habitat that would preclude nesting opportunities.

General Comments

1. The Service cautions the use of international piping plover census data as the sole source of data to determine the significance of the Loup River to the species. The goal of the international piping plover census is to describe long-term changes in population numbers and the species breeding distribution. To address this goal, the recovery team. To address this goal, the recovery team implemented a standardized method to survey the presence of the species across numerous river basins, and surveyors had a narrow time frame to conduct surveys. The time frame for surveys generally occurs in early to mid-June. This represents a time period when peak flows are frequent in the Loup River basin (Figure C-6) and species presence may be limited. Conversely, Service and NPPD nest surveys from 2009 through 2011 were generally conducted from mid-June through July with the objective of counting maximum number of individuals and nests.

2. The International Piping Plover Census is conducted every five years, not four as cited in the DBA.

3. Table 3 of the DBA should compare the Loup River metapopulation to the total number of piping plover adults when comparisons should be developed at the subspecies, population, or Distinct Population Segment level because of the biological significance of these units to species conservation (USFWS 2009).

4. Banded piping plover data accessible to the LPD demonstrates regular and routine dispersal between breeding sites and areas at various scales. This exchange of individuals demonstrates the Loup River contributes to the overall population and shows the interconnectedness of breeding areas and sites. Loss or increases of breeding sites and habitat on the Loup River, or elsewhere for that matter, has population-level consequences.

5. The Service does not view the MOU as a mitigation or enhancement offset for Loup or Platte River habitat impacts. The North SMA memorandum of understanding reduces the take of least tern and piping plover nests resulting from commercial sand mining operations only and does not reduce effects of Project operations on Loup River nesting habitat.

6. The DBA did not identify the pertinence of beach width, wetlands, and deep water habitats of the Great Lakes to Project effects.

IV. Pallid Sturgeon

As stated in the DBA, critical habitat has not been designated for the pallid sturgeon, but six Recovery Priority Management Areas (RPMAs) have been identified in the species recovery plan (USFWS 1993). These RPMAs were selected based upon recent pallid sturgeon records and the probability that these areas still provide suitable physical habitat for restoration and recovery of the species. These areas are in relatively good condition and in some reaches still exhibit a channel configuration of sandbars, side channels, and varied depths. The RPMAs also have one or more major tributaries affecting their hydrology, physical, and chemical characteristics.

The confluence areas of major tributaries to the lower Missouri and Mississippi rivers are highlighted in the recovery plan for the pallid sturgeon because of their importance as feeding and nursery areas for large river fish (USFWS 1993). RPMA number four, as described in the recovery plan, is the Missouri River below Gavins Point Dam to its confluence with the Mississippi River; most importantly, within 20 miles upstream and downstream of major tributary mouths, including, but not limited to the Platte, Kansas, and Osage rivers (USFWS 1993). It is important to note that natural recruitment of pallid sturgeon is sporadic or limited in RPMA 4 (USFWS 2007), and data indicate that the pallid sturgeon could face local extirpation.

Although no Platte River specific recovery objectives or criterion has been identified, the pallid sturgeon recovery plan states that species recovery is unlikely to be successful

without restoring the critical portions of morphology, hydrology, temperature regimes, and sediment/organic matter transport of the rivers that provide the life requisites for the species (USFWS 1993). Several documents have been published subsequent to the recovery plan that identifies the importance of the Platte River to the pallid sturgeon.

Several pallid sturgeon life stages have been documented in the Platte River. Peters and Parham (2008a) noted that adult and juvenile pallid sturgeon have been captured in the lower Platte River which is a significant indicator that the habitats found in the lower Platte River are suitable for pallid sturgeon. Larval sturgeon (species not confirmed) has been documented in the lower Platte River (Hofpar 1997, Reade 2000). DeLonay (2012) described the radio tagging of two gravid female pallid sturgeon in the Missouri River. Based on temperature data collected from an inserted data storage tag, it was determined that one of the pallid sturgeon likely migrated into the Platte River to spawn.

The pallid sturgeon 5-year review (USFWS 2007) identifies the lower Platte River as a major Missouri River tributary in RPMA 4 and documents why the lower Platte River is/was important habitat for pallid sturgeon:

> The lower Platte River is a major Missouri River tributary in RPMA 4 and likely is/was important habitat for pallid sturgeon. The lower Platte River is defined in Snook et al. (2002) as the Platte River from the confluence with the Missouri River upstream to the Loup River. Snook (2001) documented that hatchery-reared pallid sturgeon (1992 year class produced at Blind Pony State Fish Hatchery, Missouri) released (1994) in the lower Platte River tended to remain in this reach, and speculate that habitat features like sand bars were important features for the species. In 2003, Swingle (2003) collected two presumed wild pallid sturgeon in the lower Platte River and subsequently followed their movement via telemetry. One of these was a gravid female collected early May 2001 that subsequently moved into the Missouri River on June 9, 2001, suggesting the lower Platte River may be an important tributary for spawning.

Furthermore, the Middle Basin Pallid Sturgeon Workgroup is currently investigating the possibility of stocking the pallid sturgeon in the lower Platte River. Winders and Delonay (2011) stated the following:

> Sturgeon-specific monitoring efforts, telemetry studies on the Missouri and Platte rivers, along with intensive broodstock collection efforts below the mouth of the Platte have highlighted the potential importance of the Platte River to pallid sturgeon recovery efforts.

Potential Effects to Pallid Sturgeon

Potential impacts to the pallid sturgeon can be divided into the following categories: a) flow and sediment-related effects to sustainability of habitats, b) flow and sediment-related effects to habitat quantity and quality, c) flow-related effects to habitat

connectivity, d) flow-related effects to spawning behavior (spawning cues), and e) flow-related effects to prey items.

Flow and Sediment-Related Effects to Sustainability of Habitats – As discussed previously in Appendix A, Joeckel and Henebry (2008) concluded that channel surface for the study site encompassing the Project tailrace return (study site RG) decreased consistently during the period from 1938 to 1999. As identified in FERC's December 21, 2011, study plan determination, there was a higher proportion of deep water below the Project tailrace. The Project's removal of 24 percent of the sediment supply at the Project tailrace may result in future channel degradation which would affect species habitats. In summary, Project operations are likely to reduce habitat capacity for the pallid sturgeon.

Pallid sturgeon may also be affected by Project bypass operations. Study Site 3, located within the Platte River bypass area, has narrower channels compared to study sites downstream of the Project's tailrace return which is a result of Project diversions lowering effective discharge. This reduction in channel area would assume to have some proportionate reduction in pallid sturgeon habitat.

Project reductions in active channel area may affect pallid sturgeon habitats in two ways. Reduction in active channel area may affect the longitudinal distribution of habitats which in turn affect the presence or absence of species at large spatial scales (Rosenfeld 2003). Reductions in channel area may also reduce the lower Platte River's habitat capacity for a species which in turn affect species abundance (Rosenfeld 2003). These reductions in channel area may result in river segments that are unsuitable to pallid sturgeon, or suitability is so reduced that the river segment serves only as a migration corridor.

Flow and Sediment-Related Effects to Habitat Quantity and Quality - Several studies have characterized pallid sturgeon habitat in the lower Platte River as deeper channels along the downstream margins of sandbars and channel macroforms (Peters and Parham 2008b). Studies on the Yellowstone River, another braided river tributary to the Missouri River, identified similar use of deep water along the margins of sandbars and channel macroforms (Bramblett and White 2001). The Project's removal of 24 percent of the sediment supply at the Project tailrace return could affect the development of channel sandbars and macroforms. Furthermore, the Project's release of clear water at the tailrace return would increase water clarity in the lower Platte River. The clear water returns would affect the pallid sturgeon which select for dark to very dark conditions, avoid areas of low turbidity, and have specialized physiological adaptations to turbid environments (Peters and Parham 2008b). The increase in water clarity would decrease habitat suitability and may increase predation pressure on individuals near the tailrace return (Peters and Parham 2008b).

Project hydrocycling may also affect pallid sturgeon habitats. Depths of captured pallid sturgeon in the lower Platte River averaged 1.27 meters; depths at capture sites were deeper than those generally available (Peters and Parham 2008a). The authors also

concluded that pallid sturgeon were avoiding water less than 0.8 meters deep. Pallid sturgeon use of relatively deeper, swifter water has been documented in other systems (Jordan et al. 2006) and in the laboratory assessments (Allen et al. 2007). Elliot (2011) noted that deep water geomorphic classification (i.e., percent of deep water) was sensitive to discharge changes resulting from hydrocycling; therefore, it is reasonable to assume that hydrocycling similarly affects pallid sturgeon habitat.

Flow-Related Effects to Habitat Connectivity – Service April 7, 2011, comments on the SISR identified Project hydrocycling effects to the connectivity to pallid sturgeon habitats. Parham (2007) identified that the lower Platte River is generally unconnected at discharge rates below 4,400 cfs and rapidly becomes connected as discharges reaches 6,300 cfs. The river can be considered fully connected at a discharge of 8,100 cfs. Conclusions from the Lower Platte River Stage Change Study also validate conclusions from Parham (2007). The Lower Platte River Stage Change Study identified Run and Plunge habitats (i.e., pallid sturgeon microhabitat) are mostly connected across the width of the river at 6,000 cfs (HDR et al., 2009). Discharges less than 6,000 cfs may lower water elevations enough to limit access for pallid sturgeon since they will not or cannot move through Flat or Slackwater habitat.

The Service noted in the SISR comments that Project effects to pallid sturgeon habitat connectivity are infrequent during the winter months of December and January, and Project effects to pallid sturgeon habitat connectivity during the low flow months of July through October are primarily limited to the Ashland and Louisville study sites. The most prominent Project effects to connectivity occur from February through June and in November. For certain months, Project effects to connectivity occur upstream to Study Site 4. These losses of connectivity at Study Site 3 could imply Project diversions potentially affecting pallid sturgeon habitat in the Platte River Bypass area. Project effects to habitat connectivity may reduce the capacity of the Platte River to support pallid sturgeon individuals. Reductions in habitat connectivity may also affect the spawning migration of pallid sturgeon in the Platte River between April and July when reproductive shovelnose and pallid sturgeon generally move upstream to spawn DeLonay et al. (2009).

Flow-Related Effects to Spawning Behavior - It is likely that Project operations would not affect spawning behavior of the pallid sturgeon. DeLonay et al. (2009) identified potential long-term and short term cues for reproductive maturation and readiness to spawn. Day length is the likely long-term cue that is initiated months before a predictable spawning date. Of three potential short-term spawning cues (i.e., water temperature, discharge, day of year) water temperature is the most likely to affect the sensitivity of pallid sturgeon hormones, embryo development, and embryo survival. Since Project operations are not known to affect stream temperature in the Platte River, it is reasonable to conclude that Project operations would not affect spawning behavior. Although Project effects to spawning behavior may not be evident, Project impacts to spawning migration corridors were previously discussed.

Flow and Sediment-Related Effects to Prey Items – The Project may similarly affect pallid sturgeon prey items by: a) flow and sediment-related effects to sustainability of habitats, b) flow and sediment-related effects to habitat quantity and quality, c) flow-related effects to habitat connectivity, and d) flow-related effects on primary production. Although pallid sturgeon forage studies have not been conducted for the lower Platte River, Peters and Parham (2008b) has identified a range wide preference for benthic minnows especially those of the *Macrhybopsis* species which includes sturgeon chub (*Macrhybopsis gelida*), shoal chub (*Macrhybopsis hyostoma*), silver chub (*Macrhybopsis storeriana*), and flathead chub (*Platygobio gracilis*). Similar to discussions in previous sections, Project reductions in channel area, reductions in suspended sediment, removal of sediment supply near the tailrace return may affect habitat quality and quantity of pallid sturgeon prey items. Project hydrocycling operations may affect habitat quality and connectivity of habitat for pallid sturgeon prey items.

Most notable is the Project hydrocycling effects to primary production has been well documented as noted in Appendix B, Section II. This effect would be realized for benthic invertebrates commonly consumed by juvenile pallid sturgeon as well as affecting small fishes commonly consumed by adults. In addition, Peters and Parham (2008b) stated that increased water clarity would probably reduce the ability of pallid sturgeon to compete with other piscivorous species for the small fish in the lower Platte River.

General Comments

1. University of Nebraska at Lincoln researchers have captured both stocked and wild pallid sturgeon upstream of the Elkhorn River confluence for all three sampling years and all three sampling time periods (i.e., spring, summer, and fall). Thus, implying that the Platte River provides habitat for the pallid sturgeon year round as opposed to providing seasonal habitat described in the DBA.

2. The Service cautions the use of angler-reported pallid sturgeon to determine the range of the species. The initial range of the pallid sturgeon for the Platte River (i.e., downstream of the Elkhorn River confluence) was developed in absence of directed research upstream of the Elkhorn River confluence. The University of Nebraska at Lincoln studies provided the first effort in searching for the species upstream of the confluence.

Table C-1. Average channel width and wetted channel width in feet for channels upstream of Project diversion and downstream .

		Downstream	
	Upstream	Current Hydrology	No Diversion
Channel Width	825	640	640
Wetted Width (Dry)	660	237	550
Wetted Width (Normal)	726	346	576
Wetted Width (Wet)	743	378	576

Table C-2. Percent of exposed channel width (i.e., exposed channel) and percentage of channel width with water depths of 0.8 foot or less (i.e., width ≤0.8) for channels upstream and downstream of the Project diversion.

	Upstream of Diversion			Downstream of Diversion		
	Exposed Channel	Width ≤0.8	Sum	Exposed Channel	Width ≤0.8	Sum
Dry	20	38	58	63	24	87
Normal	12	38	50	46	30	76
Wet	10	34	44	41	30	71

Table C-3. Least tern adult and nesting information from annual surveys (Nebraska Game and Parks Commission Nongame Bird Database).

	Downstream of Diversion		Upstream of Diversion	
	Birds	Nests	Birds	Nests
1985	41	0	7	0
1986	10	0	0	0
1987	28	2	50	3
1988	14	2	58	18
1990	26	0	66	0
1992	83	23	70	23
1993	18	1	34	15
1995	46	13	82	27
1998	23	2	41	0

Table C-4. Least tern adult and nesting information for the North Sand Management Area. Cells classified as NA was used for years when data was insufficient in quantifying a use type.

Year	Adults	Fledglings	Chicks	Nests
1987	32	5	NA	30
1988	26	3	NA	16
1989	11	0	NA	4
1990	15	5	NA	12
1991	21	NA	NA	NA
1992	12	0	NA	NA
2008	19	3	2	17
2009	19	1	3	14
2010	22	3	4	22
2011	17	0	7	13

Table C-5. Peak number of least tern adults (Peak #), total number of least tern nests (Nests) observed on the Loup River upstream of the Project diversion for the 2009 through 2011 surveys. Peak number of least tern adults per river mile (Peak # per RM) and total number of least tern nests per river mile (Nests per RM) were calculated using the stream length of 21 miles.

Upstream of Diversion

	Peak #	Nests	Peak # per RM	Nests per RM
2011	33	27	1.51	1.24
2010	39	10	1.79	0.46
2009	37	4	1.70	0.18

Table C-6. Peak number of least tern adults (Peak #), total number of least tern nests (Nests) observed on the Loup River downstream of the Project diversion for the 2009 through 2011 surveys. Peak number of least tern adults per river mile (Peak # per RM) and total number of least tern nests per river mile (Nests per RM) were calculated using the stream length of 34.2 miles.

Downstream of Diversion

	Peak #	Nests	Peak # per RM	Nests per RM
2011	25	16	0.73	0.47
2010	28	7	0.82	0.20
2009	38	2	1.11	0.06

Table C-7. Number of nesting colonies observed on the Loup River upstream and downstream of the project diversion for the 2009 through 2011 surveys (Upstream and Downstream, respectively). Number of nesting colonies per river mile were calculated using the stream length of 21 miles and 34.2 miles for river segments upstream and downstream of the Project diversion, respectively.

	Number of Colonies		Colonies per RM	
	Upstream	Downstream	Upstream	Downstream
2011	4	4	0.19	0.13
2010	3	1	0.14	0.03
2009	2	1	0.10	0.03

Table C-8. Lists the peak number of least tern adults observed downstream of the Project diversion (Max # Bypass), and peak number of least tern adults per river mile observed upstream of the Project diversion (Peak # per RM). The potential maximum number of birds for the Loup River bypass area was calculated by multiplying (Peak # per RM) by 34.2 river miles. The difference in the maximum number of birds in the Loup River bypass area (Max # Difference) was calculated by subtracting (Max # Bypass) from (Max # Potential).

	Max # Bypass	Peak # per RM	Max # Potential	Max # Difference
2011	25	1.51	52	27
2010	28	1.79	61	33
2009	38	1.70	58	20

Table C-9. Lists the number of least tern nests observed downstream of the Project diversion (Nests Bypass), and number of least tern nests per river mile observed upstream of the Project diversion (Nests per RM). The potential number of nests for the Loup River bypass area was calculated by multiplying (Nests per RM) by 34.2 river miles. The difference in the number of nests in the Loup River bypass area (Max # Difference) was calculated by subtracting (Nests Bypass) from (Nests Potential).

	Nests Bypass	Nests per RM	Nests Potential	Nest Difference
2011	16	1.24	42	26
2010	7	0.46	16	9
2009	2	0.18	6	4

Table C-10. Lists the number of nesting colonies observed downstream of the Project diversion (Colony Bypass), and number of least tern nests per river mile observed upstream of the Project diversion (Upstream Colonies # per RM). The potential number of nests for the Loup River bypass area was calculated by multiplying (Upstream Colonies # per RM) by 34.2 river miles. The difference in the number of nests in the Loup River bypass area (Colony Difference) was calculated by subtracting (Colony Bypass) from (Colony Potential).

	Colony Bypass	Upstream Colonies per RM	Colony Potential	Colony Difference
2011	4	0.19	6	2
2010	1	0.14	5	4
2009	1	0.10	3	2

Table C-11. Piping plover adult and nesting information from annual surveys (Nebraska Game and Parks Commission Nongame Bird Database).

	Downstream of Diversion		Upstream of Diversion	
	Birds	Nests	Birds	Nests
1985	0	0	0	0
1986	0	0	0	0
1987	4	0	14	3
1988	4	0	25	4
1990	8	0	14	0
1992	15	8	17	6
1993	7	0	14	5
1995	15	1	40	15
1998	3	0	9	0

Table C-12. Piping plover adult and nesting information for the North Sand Management Area. Cells classified as NA was used for years when data was insufficient in quantifying a use type.

Year	Adults	Fledglings	Chicks	Nests
1987	25	1	NA	10
1988	2	3	NA	1
1989	7	0	NA	4
1990	6	2	NA	2
1991	0	0	NA	0
1992	4	0	NA	2
2008	12	0	12	8
2009	10	2	2	5
2010	12	3	5	7
2011	9	0	6	3

Table C-13. Peak number of piping plover adults (Peak #), total number of piping plover nests (Nests) observed on the Loup River upstream of the Project diversion for the 2009 through 2011 surveys. Peak number of piping plover adults per river mile (Peak # per RM) and total number of piping plover nests per river mile (Nests per RM) were calculated using the stream length of 21 miles.

	Peak #	Nests	Peak # per RM	Nests per RM
2011	11	4	0.50	0.18
2010	9	3	0.41	0.14
2009	4	2	0.18	0.09

Table C-14. Peak number of piping plover adults (Peak #), total number of piping plover nests (Nests) observed on the Loup River downstream of the Project diversion for the 2009 through 2011 surveys. Peak number of least piping plover per river mile (Peak # per RM) and total number of piping plover nests per river mile (Nests per RM) were calculated using the stream length of 34.2 miles.

	Peak #	Nests	Peak # per RM	Nests per RM
2011	6	1	0.18	0.03
2010	1	0	0.03	0.00
2009	3	1	0.09	0.03

Table C-15. Lists the peak number of piping plover adults observed downstream of the Project diversion (Max # Bypass), and peak number of piping plover adults per river mile observed upstream of the Project diversion (Peak # per RM). The potential maximum number of birds for the Loup River bypass area was calculated by multiplying (Peak # per RM) by 34.2 river miles. The difference in the maximum number of birds in the Loup River bypass area (Max # Difference) was calculated by subtracting (Max # Bypass) from (Max # Potential).

	Max # Bypass	Peak # per RM	Max # Potential	Max # Difference
2011	6	0.50	17	11
2010	1	0.41	14	13
2009	3	0.18	6	3

Table C-16. Lists the number of piping plover nests observed downstream of the Project diversion (Nests Bypass), and number of least piping plover per river mile observed upstream of the Project diversion (Nests per RM). The potential number of nests for the Loup River bypass area was calculated by multiplying (Nests per RM) by 34.2 river miles. The difference in the number of nests in the Loup River bypass area (Max # Difference) was calculated by subtracting (Nests Bypass) from (Nests Potential).

	Nests Bypass	Nests per RM	Nests Potential	Nest Difference
2011	1	0.18	6	5
2010	0	0.14	5	5
2009	1	0.09	3	2

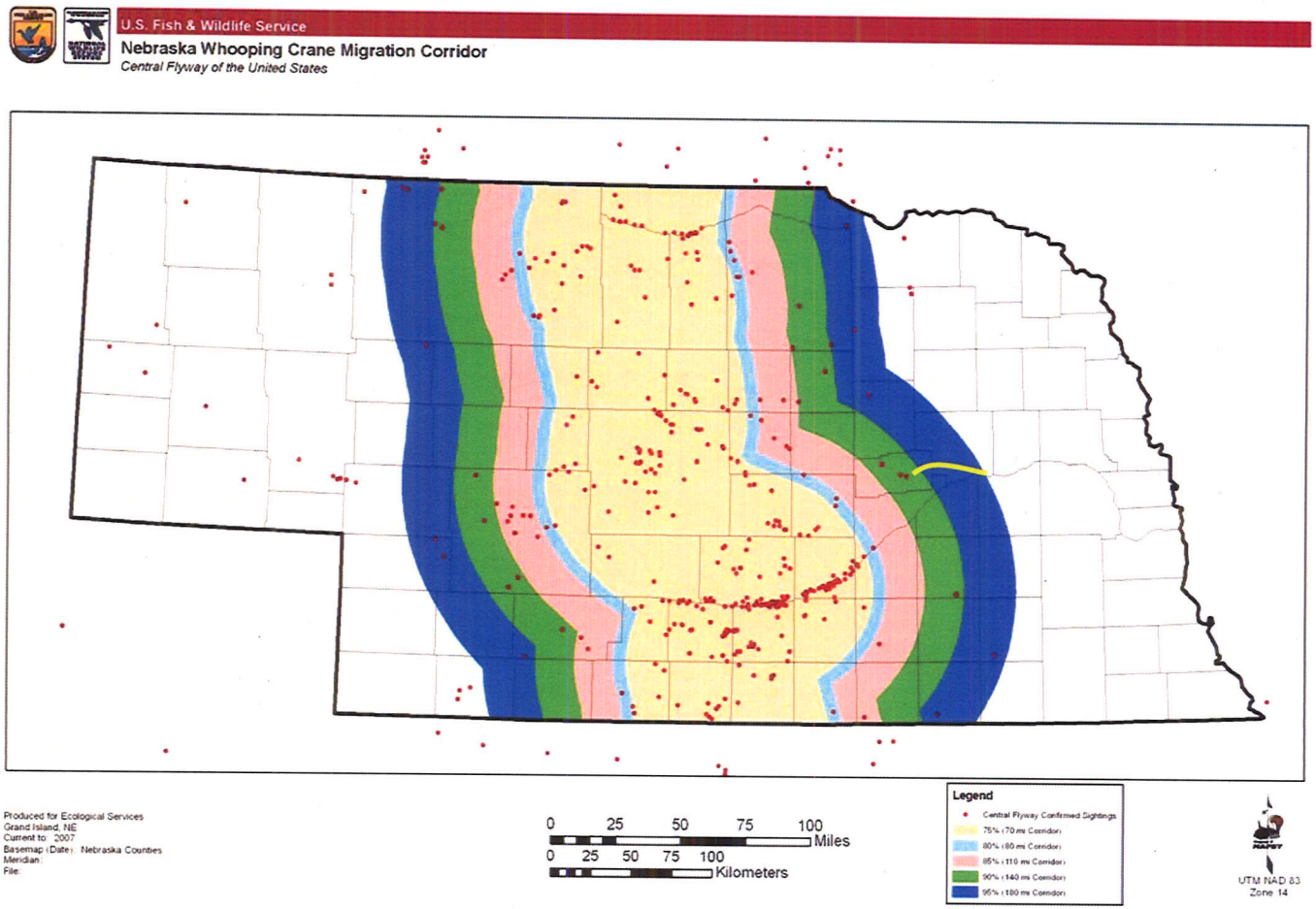

Figure C-1. Range map for the whooping crane in Nebraska. The yellow line represents the approximate location of the Loup River bypass within the 90-percent and 95-percent corridors.
http://www.fws.gov/nebraskaes/Library/Central_Flyway_State_Specific_NE.jpg

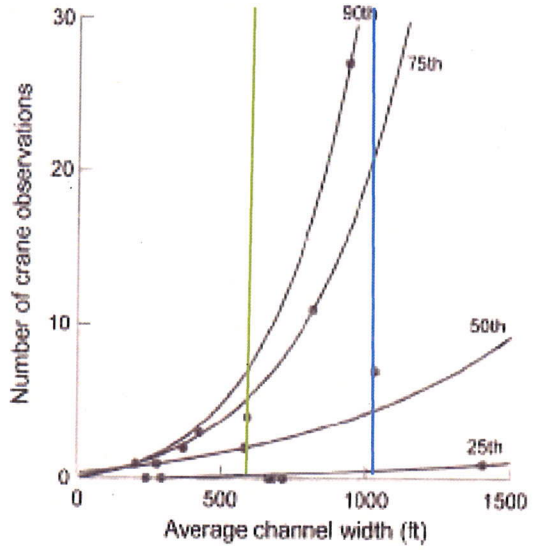

Figure C-2. A comparison of the number whooping crane observations versus the average channel widths of study segments in the central Platte River (Farmer et al. 2004). The unobstructed channel widths downstream (652 to 669 feet) and upstream of the diversion (1,050 to 1,077 feet) are represented by the green and blue lines, respectively.

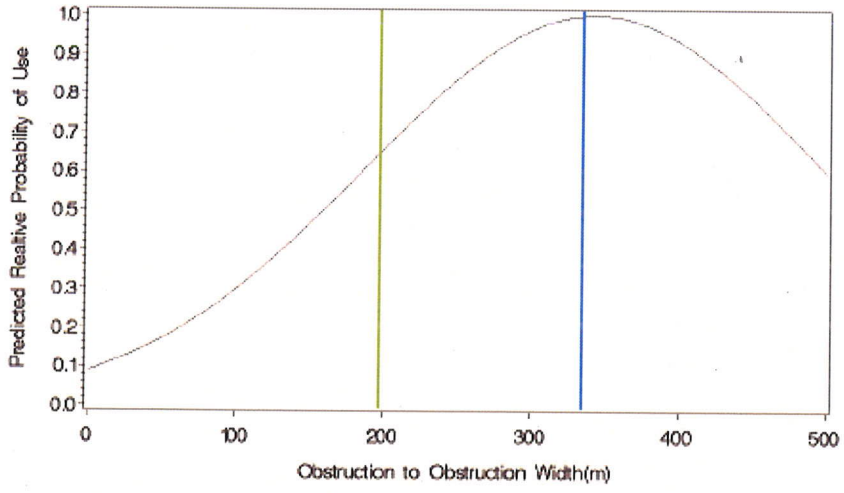

Figure C-3. Predicted quadratic relationship between relative probability of use and unobstructed width (Howlin et al. 2008). The unobstructed channel widths downstream (652 to 669 feet) and upstream of the diversion (1,050 to 1,077 feet) are represented by the green and blue lines, respectively.

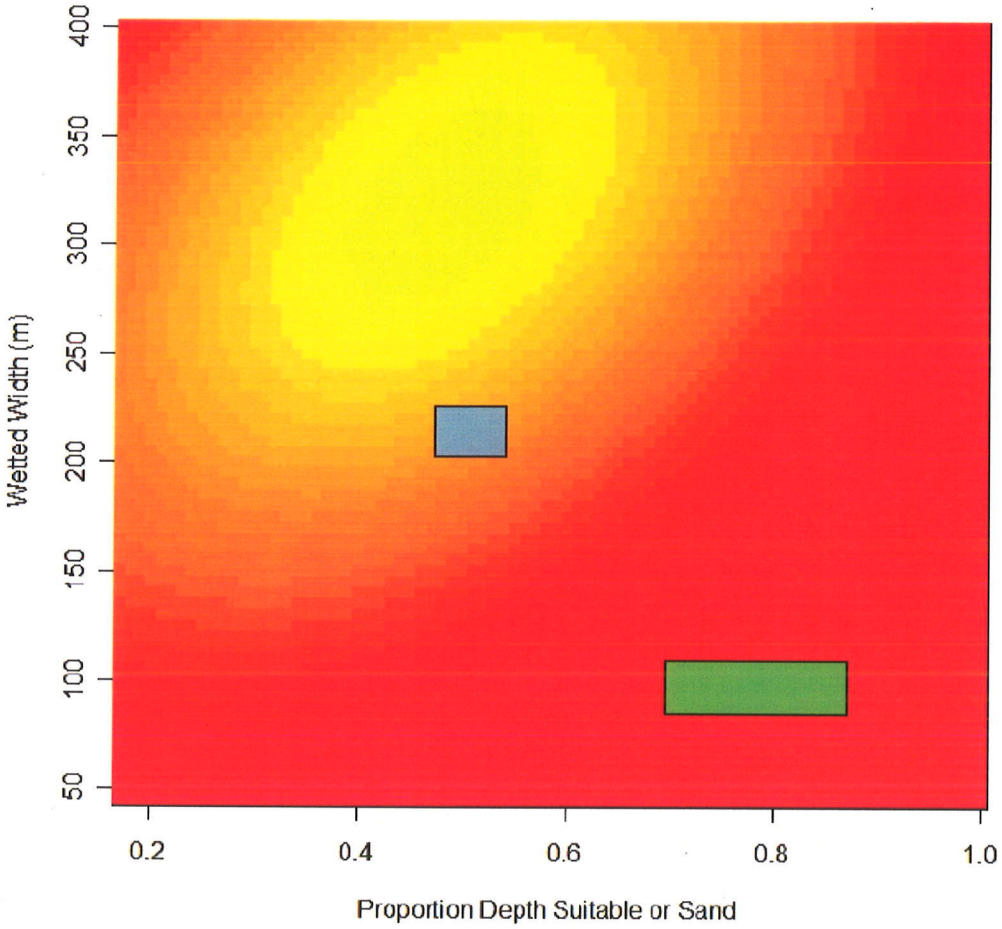

Figure C-4. Predicted probability of use comparing wetted width to proportion of depth suitable/sand from Howlin et al. (2008). Red and yellow portions of the graph represent areas of low and high suitability, respectively. The green and blue boxes represent range of wetted width and proportion of depth suitable/sand for Loup River study sites downstream and upstream of the Project diversion, respectively.

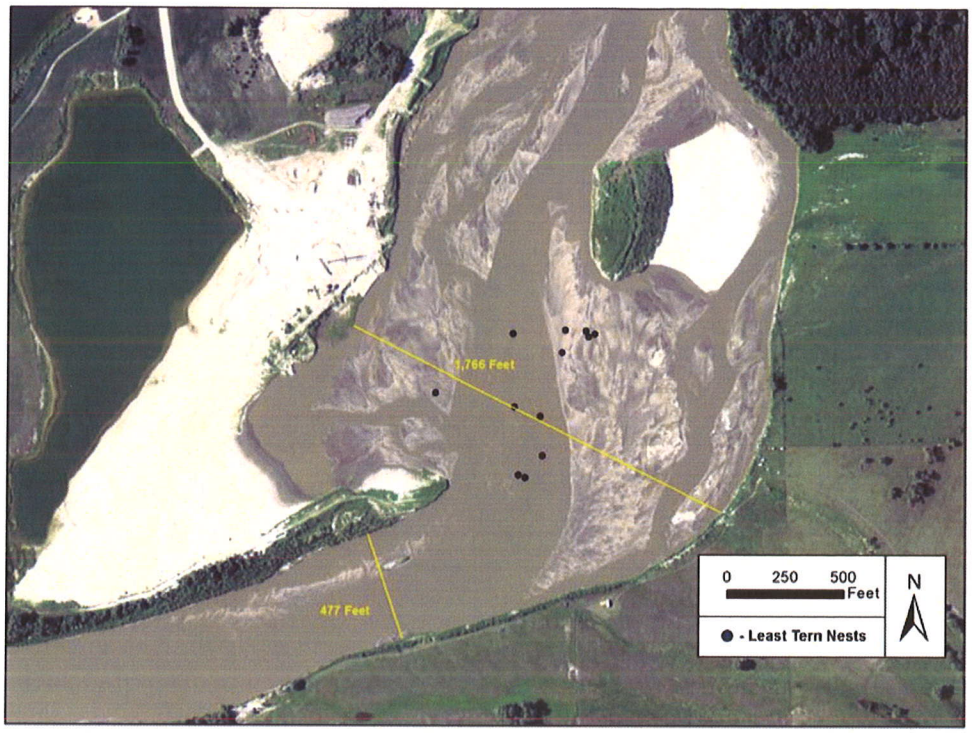

Figure C-5. A comparison of channel widths of the Loup River at the Central Sand and Gravel sandpit. Least tern nests represent locations collected by GPS from 2010 and 2011 surveys (2009 Photography from the Farm Service Agency, National Agricultural Imagery Program).

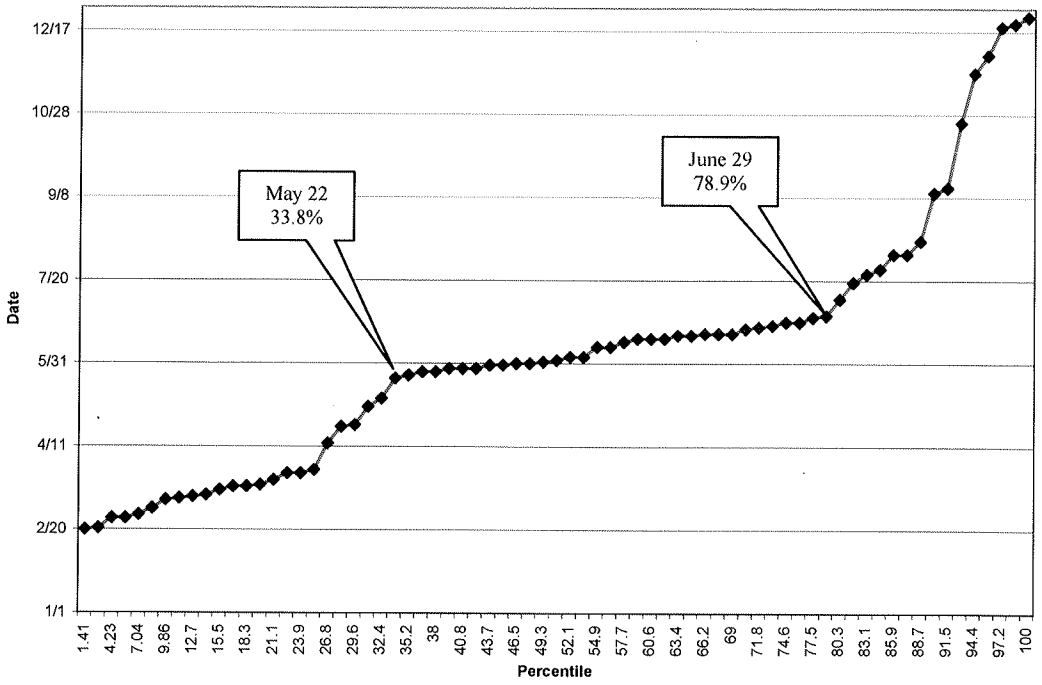

Figure C-6. Cumulative percentiles for peak flows at the Genoa streamgage from 1929 to 2010. May 22 and June 29 represents a time period when approximately 45-percent of peak flows have been documented.

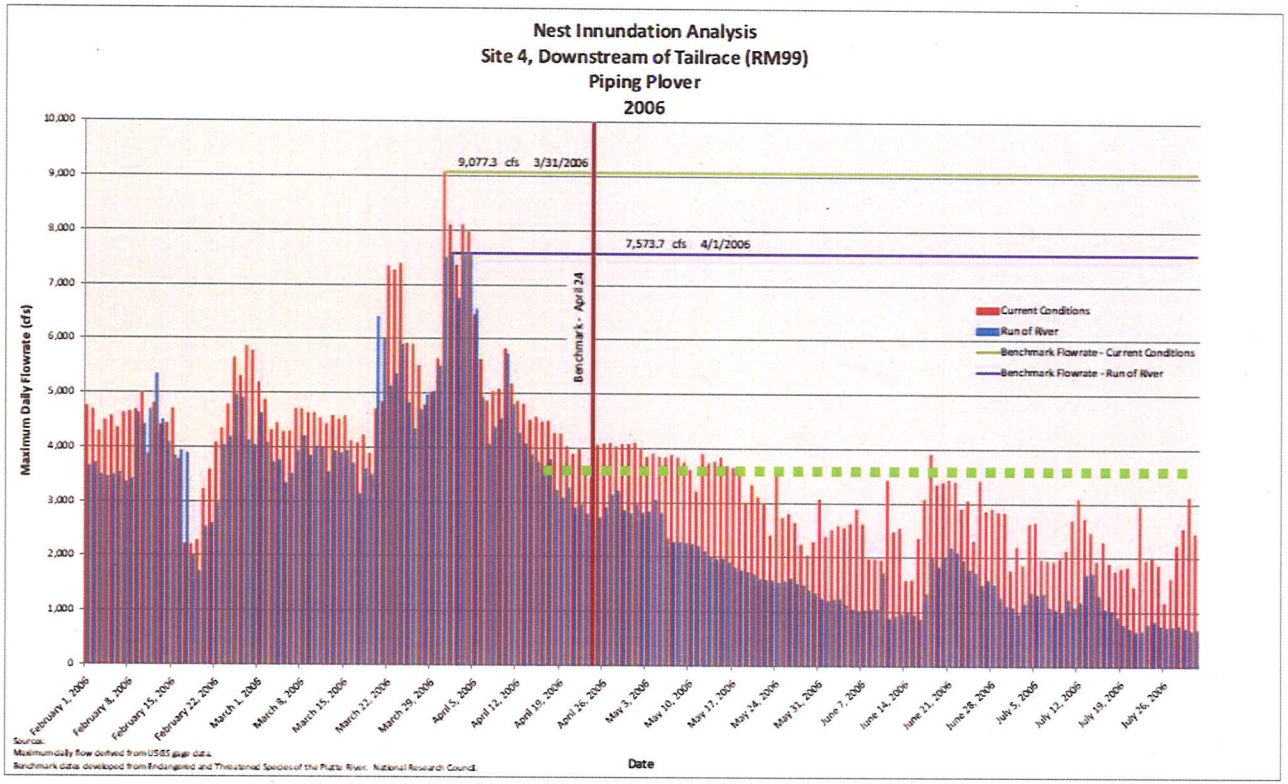

Figure C-7. Nest inundation analysis for the piping plover using 2006 hydrology (SISR Hydrocycling Attachment I). The green dashed line represents a hypothetical nest whose elevation is equivalent to 3,700 cfs.

Appendix D.

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United States Department of the Interior

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

January 12, 2012

FWS NE 2012-091

Mr. Matt Pillard
HDR Engineering
8404 Indian Hills Drive
Omaha, NE 68114

RE: Request for Updated Species List, Loup River Hydroelectric Project, FERC Project Number 1256

Dear Mr. Pillard:

This is to confirm the species list previously provided as part of our section 7 consultation for relicensing of the Loup River Hydroelectric Project by the Federal Energy Regulatory Commission, Project Number 1256. The U.S. Fish and Wildlife Service previously provided a species list and determined that the proposed relicensing action may affect the federally endangered pallid sturgeon *(Scaphirhynchus albus)*, least tern *(Sternulla antillarum athalassos)*,and whooping crane *(Grus americana)* and federally threatened piping plover *(Charadrius melodus)* and western prairie fringed orchid *(Platanthera praeclara)*.

Should you have questions, please contact Mr. Robert Harms within our office at Robert_Harms@fws.gov, (308)382-6468, extension 17.

Sincerely,

Martha Tacha (for)

Michael D. George
Nebraska Field Supervisor

cc: NGPC; Lincoln, NE (Attn: Frank Albrecht)

Meeting Notes

Project:	Loup River Hydroelectric Project FERC Project No. 1256
Subject:	Section 7 ESA and Section 10J FPA – Meeting #2
Meeting Date:	November 2, 2011 1:00 PM – 3:00 PM
Meeting Location:	Loup Public Power Headquarters – Columbus, NE
Notes by:	HDR

Attendees:

Robert Harms, USFWS
Jeff Runge, USFWS
Frank Albrecht, NGPC
Richard Holland, NGPC
Joel Jorgensen, NGPC
Michelle Koch (NGPC)
Neal Suess, LPD
Melissa Marinovich, HDR
Matt Pillard, HDR
Lisa Richardson, HDR

A meeting was held with the U.S. Fish and Wildlife Service and the Nebraska Game and Parks Commission to continue discussion of Section 7 of the Endangered Species Act, the consultation process, potential effects of the Project, Section 10J of FPA, and possible protection, mitigation or enhancement (PM&E) measures.

Discussion at the meeting is documented according to the meeting agenda noted below.

Meeting Agenda:

1. Intro/Summary
2. Species effects/Avoidance, minimization, and mitigation
   - Loup Bypass
   - Sculpting/Maintain Flow
   - Hydrocycling
3. Next Steps

1. Intro/Summary

OLD BUSINESS

The October 21, 2011 FERC letter to the District was discussed. USFWS indicated they view the letter as FERC's attempt to evaluate project operations to meet a variety of needs, specifically related to ESA. USFWS noted that the alternatives identified by FERC are not exactly what USFWS is interested in reviewing, but along similar lines.

CLARIFICATIONS

USFWS had provided clarifications to the October 3 meeting notes and those clarifications were discussed. HDR provided the following clarification to the first bullet on page 6, bullet 1, under Hydrocycling:

- Accelerated erosion of bars. Studies have shown that sediment transport is greater under current operations than under a run-of-the-river scenario. This indicates erosion of sandbar habitat that is used by terns plovers, and pallid sturgeon below the tailrace. This effect also may have a negative impact on riverine process and functions, which are beneficial to the three species, through channel entrenchment and reduction of river channel and floodplain connectivity.

2. Species Effects – Avoidance, minimization, and mitigation

North SMA MOU

USFWS would like the District to be a signatory to the Preferred MOU because the land that Preferred is mining is District property.

The District indicated that they can not be a signatory to the Preferred MOU because the adaptive management plan and other aspects of the MOU are specific to Preferred's activities and are not relevant to the District if Preferred is not operating. Further, the District noted that Preferred's lease agreement states that any company that takes over operations must take over Preferred's responsibilities under the MOU (also covered in Section D of the Preferred MOU).

The District indicated that they have ceased dredging operation annually during the nesting season in accordance with a verbal agreement and are willing to continue to do so, even though there is anecdotal evidence that continued dredging operations during nesting season is beneficial to bird numbers.

USFWS suggested an agreement between the District, USFWS and NGPC that covers just the cessation of dredging. It was discussed that a new MOU or a "parent" MOU could be developed for the District and USFWS/NGPC specific to dredging. The parties agreed in principle with this concept.

The District will prepare a draft MOU between District, NGPC and USFWS with the assistance of HDR. Timing would likely not be sooner than mid-January.

LOUP BYPASS

Minimum Flow:
Prior to the meeting USFWS had indicated to HDR that USFWS/NGPC were looking for 300 to 400 cfs as a minimum flow with primary focus on summer months (July/August). The District indicated that 300 to 400 cfs was not feasible for their operations. This flow represents 21 to 29 percent of average diverted flow in July and 23 to 31 percent of average diverted flow in August.

The District noted that the previous gentlemen's agreement did not require flow for all of July/August, but rather a few days during that period. The District asked why the change?

NGPC indicated that there are two issues related to minimum flow:

- One is to have minimum flows to keep water temperature at an acceptable level.
- Two is to provide minimum flow to keep fish from stranding. However, if the flow is raised on some days and drops on others, then the chance of stranding and mortality increase. Isolation of fish in pools can also result in fish kills.

HDR asked for clarification on how this relates to tern food source and didn't think the reason for doing this was for a food source for the terns and plovers. USFWS and NGPC clarified that this is an issue related to concern for the fish community and isolation of sandbar habitat. USFWS noted that HEC-RAS modeling indicates that depth changes with flow and that depths are not uniform

USFWS noted that a high proportion of the Loup River bypass reach is in a degraded to poor condition during the July/August timeframe and continues into October. USFWS noted that a flow of 372 cfs was needed to achieve a "good" rating relative to the Montana Method. HDR clarified that the flow required for a "good" rating according to Montana is 297cfs.

USFWS indicated that "Alternative 4" of the FERC letter of October 21, 2011, which includes modifying operations to maintaining a minimum or maintenance flow in the bypass reach. USFWS indicated that this alternate analysis could consider what the minimum flow should be. HDR noted that the October 21, 2011 FERC letter is a comment letter and that the District doesn't necessarily agree with the letter and intends to provide responses to it. A determination letter would be issued in December 2011.

USFWS stated that even if FERC agrees not to pursue "Alternative 4", USFWS would seek a minimum flow determination under ESA.

USFWS stated that they would consider alternate proposals from the District for minimum flow, but that the District needs to provide rationale to justify their proposal. USFWS indicated that they would need to consider what makes sense and consider the current science available to them – in this case, the study reports. They are willing to negotiate what the District needs vs. avoiding fish kills and are looking to the District to tell them what that amount is, recognizing that any proposal has to be defensible and supportable.

Sculpting/Maintenance Flow:
USFWS would like to see a sculpting or maintenance flow between May 22nd and June 29th to cause bar erosion and provide mid-channel bars to protect birds from predators. They indicated that this time period was chosen because historically the majority of high flows have occurred in this time period.

USFWS noted that minimum flow and sculpting flows are separate but not mutually exclusive. The intent is to move more sediment and shape bars. They would like to see a constant pre-determined flow during the May – June time period; the goal being to increase the effective discharge. Another measure of the sculpting flow would be to improve the active channel width – essentially shift point bars to mid-channel bars.

USFWS tried to recognize the limitations that the District is under when looking at the timeframe. USFWS noted that they would like a suggestion from the District/HDR on what the flow should be to increase the effective discharge.

Sandbar Shaping:
USFWS noted that there are 5 areas where they have seen repeat bird activity and that they would like have some mechanical sandbar shaping to convert existing point bars to mid-channel bars. They suggested that machinery can shape the bar and then the maintenance/sculpting flows could maintain what is constructed. They'd also like on-going maintenance to keep it vegetation-free. USFWS will provide a map of the areas they suggest.

The District noted that they do not own any land in the bypass reach - it's all private property. USFWS understood that property ownership could be a challenge and suggested that shaping could be accomplished under several scenarios:

- Purchase of property
- Purchase of easements
- Agreements with landowners

USFWS noted an example on the Central Platte where land clearing was wanted for hunting purposes and an agreement was reached with landowners to clear the islands, which the owners wanted for goose hunting areas. USFWS suggested identifying landowners in areas where lots of bends and turns occur because of a narrower channel. USFWS noted that in sinuous section of the channel that straightening associated with mechanical bar creation could increase stream power and transport more sediment.

The District indicated they would have to look at the sites before agreeing to this. USFWS noted they are willing to negotiate the areas; however, they feel that the suggested locations, such as the Lyman Richie sand and gravel pit area, would be the right areas for the birds based on past use.

HYDROCYCLING

USFWS inquired about the District's analysis of a potential reregulating reservoir and where it might be constructed. HDR stated that several alternatives had been reviewed at a preliminary level:

- Tailrace Park – there is some potential for attenuation at the tailrace. Tailrace Park can only hold ~100 acre-feet.
- Tailrace Canal – storage in the tailrace was also considered. For every one foot increase in water level in the canal, 100 acre-feet could be stored. However, due to infrastructure at the Columbus Powerhouse, there are limitations to how much the water level could be raised and thus how much water could be stored in the Tailrace canal. Additionally, it was noted that in 1952, the outlet weir was shortened 18 inches due to sedimentation issues in the canal. Trying to use the tailrace canal to store water would cause significant maintenance issues.
- Reregulating Reservoir – To provide full attenuation of the hydrocycling peak, 300 to 400 acres of land would be required. This option was deemed to be uneconomic – HDR estimated potential land cost at $20,000/acre, which equates to $6 to 8 million. The District noted that land along the tailrace is substantially more expensive – land near ADM recently sold for $40,000/acre – so the land cost would be double. In addition to cost issues, a reregulating reservoir would be difficult to maintain due to sedimentation issues.

The District asked what the critical time periods are for potential attenuation. USFWS noted May to July and September to October as the critical time periods.

The District asked what magnitude of attenuation USFWS and NGPC hope to achieve. USFWS agreed that full attenuation was likely not feasible, but would like to see some analysis of partial attenuation. NGPC suggested performing an analysis of 10, 20, and 50% attenuation of the hydrograph. That would provide a starting point to determine how reregulation might affect the lower Platte River. This type of analysis would inform the amount of storage needed.

The District indicated that just performed the suggested analysis represents a substantial cost, but that they would have HDR evaluate the cost of the analysis for the District's review.

The District asked what is the key issues are related to hydrocycling, i.e., what would attenuation accomplish? NGPC identified the following:

- Reduce potential for nest inundation due to hydrocycling is nest inundation
- Productivity of aquatic life – maintaining normal flows that provide habitat for various organisms and increase primary and secondary productivity
- Connectivity – providing stable flows that maintain connectivity
- Sandbars – providing more sand bars for bird nesting.

USFWS suggested that several things could be put in place to deal with Hydrocycling effects. One idea may be to touch base with PMRNRD about the water conservation program. These measures may help provide a less flashy system with less risk of nest inundation. USFWS also suggested as an example to look into the PMRNRD agreement with NRCS for water conservation by converting cropland into CRP. Although USFWS also noted that the conservation practices could be more costly than a re-regulation reservoir.

3. Next Steps

HDR will evaluate the effort required to developing the information requested that includes:

- Developing a MOU for the North Sand Management Area
- Minimum and Maintenance Flows
- Sandbar shaping

- Hydrocycling reductions

USFWS will provide a map of potential locations for sandbar shaping.

Lisa Richardson of HDR will contact Bob Harms to set up the next meeting.

Meeting Notes

Project:	Loup River Hydroelectric Project FERC Project No. 1256
Subject:	Section 7 ESA and Section 10J FPA
Meeting Date:	October 3, 2011 1:00 PM – 3:00 PM
Meeting Location:	Loup Public Power Headquarters – Columbus, NE
Notes by:	HDR

Attendees:

Robert Harms, USFWS	Richard Holland, NGPC	Melissa Marinovich, HDR
Jeff Runge, USFWS	Joel Jorgensen, NGPC	Matt Pillard, HDR
Frank Albrecht, NGPC	Neal Suess, LPD	Lisa Richardson, HDR

A meeting was held with the U.S. Fish and Wildlife Service and the Nebraska Game and Parks Commission to discuss Section 7 of the Endangered Species Act, the consultation process, potential effects of the Project, Section 10J of FPA, and begin discussions for working collaboratively on development of the Biological Assessment (BA).

Discussion at the meeting is documented according to the meeting agenda noted below.

Meeting Agenda:

1. Introductions/Opening – Harms/Suess
2. Processes
   - Section 7 of the Endangered Species Act - Harms
   - Section 10J of the Federal Power Act - Albrecht
3. Environmental baseline - Harms
4. Species effects/Avoidance, minimization, and mitigation - All
5. Monitoring – Harms
6. Next Steps – Harms

Discussion:

1. Processes

SECTION 7 - ESA

Bob Harms provided a brief summary of the ESA Section 7 formal consultation process and noted that the goal of this meeting and future meetings is to determine what concepts can be agreed upon for inclusion in the Biological Assessment (BA) prior to formal consultation, so that a Jeopardy call on the species can be avoided.

Bob emphasized the following points:

- The federal agency's action can not jeopardize the continued existence of the species or critical habitat.
- When a "may affect" decision is reached, Section 7 consultation is required; it was noted that USFWS expects the "may affect" standard to have been met, thus consultation will be required.

The Nebraska Field Office of the USFWS would like to work collaboratively to identify measures to be included in the BA to avoid a jeopardy call. USFWS noted that at this time, the USFWS does not know if a jeopardy call is warranted.

NGPC requested clarification on the timeline of the NEPA process. HDR provided the following general timeline:

- November – the draft license application (DLA) will be submitted to FERC; agencies will have an opportunity to provide comment on the DLA.
- April – License application will be filed with FERC; FERC will review and make a determination of whether the application is ready for Environmental Analysis (REA), typically within 30-60 days.
- If the application is ready, FERC initiates EA process
- FERC is expected to issue an EA in the Summer of 2013
- The final BA for consultation will be developed by FERC and issued with the NEPA document.

HDR re-iterated that the official Section 7 time clock does not start for quite a while. USFWS agreed and re-iterated the hope of getting the BA pulled together ahead of time and get early agreement on measures in the BA.

SECTION 10J – FPA

Section 10(J) provides fish and wildlife agencies an opportunity to make recommendations related to fish and wildlife issues. NGPC noted the similarities in language of all regulations involved (NEPA, FWCA, FPA 10(J)). All have similar processes and NGPC has recommendations to offer. NGPC was unsure if the Nebraska Nongame Endangered Species Act (NESCA) would have a tie to this project.

HDR noted that a Section 401 Water Quality Certification (WQC) is required for the Project and that provides a link that would tie in NESCA. USFWS asked if the 401 WQC would be requested soon. HDR noted that the 401 WQC is required for issuance of a new license and that Nebraska Department of Environmental Quality (NDEQ) has indicated a letter of request is required and that NDEQ can take up to one year to issue the certification. USFWS asked if there was a timeline for the 401 WQC. HDR indicated that FERC can not issue the license without it, so it will probably be submitted around the time of the license application.

USFWS pointed out that both Section 7 and Section 10J could be handled together and eliminate the need for separate processes.

2. Environmental Baseline

USFWS acknowledged that the Project has been in operation for many years but noted that endangered species issues are new to this relicensing with the exception of the whooping crane. Below is the general timeline related to Project licensing and endangered species listings:

Project Timeline

- Project was built in 1934 – initial license lasted 50 years
- Relicensed in 1984 – issued a 30 year license (current license)
- Next license would be issued in 2014 – expected to last 30 years
- Relicensing would be required in 2044

T&E Timeline

- Whooping crane listed in 1967
- Interior least terns and piping plovers listed in 1985
- Pallid sturgeon listed in 1990

USFWS noted that most of these species were not considered in the previous licenses because they were not listed at the time.

USFWS noted that the Environmental Baseline they will be considering for evaluation of Project effects is not pre-project, but what the environment would look like if there were no license and the Project was no longer operating. However, the project facilities would still be in place. With water no longer being diverted, over 30 years, USFWS would expect conditions in the bypass reach to improve. The beginning of the evaluation would be 2014 (new licensing period) and should look out 30 years compared to current conditions.

The District asked where the costs of no license would be evaluated. It was clarified that the "no license" scenario is not an alternative being considered, but is setting the baseline conditions of the river and decommissioning costs and impacts are not considered. USFWS noted that there may be differences in the environmental baseline yet to be considered.

3. Species Effects – Avoidance, minimization, and mitigation

USFWS noted that the better understanding they have of how the Project operates, then they are better able to pinpoint where mitigation could be useful and how. They want to get a better understand the District's limitations and gain an understanding of what is technically feasible for the Project.

USFWS categorized the effects to the afore-mentioned species in 3 categories:

1) Effects in the bypass reach – terns, plovers, whooping crane
    - Acknowledged the Project is at the periphery of the range for whooping crane
    - Noted that studies show that there are differences in flow area and flow width comparing upstream to downstream
    - Noted that the Montana Method indicated effects to fish
2) Effects at the North Sand Management Area
    - Preferred MOU
3) Hydrocycling effects – pallid sturgeon, terns, plovers
    - Focus on attenuation

HDR asked how the magnitude of effect came into play with respect to these categories and potential mitigation. USFWS responded that it was not their intent to discuss magnitude of effect at this meeting but they noted that effects are meaningful and the intent of the meeting is to start to identify how to offset.

USFWS encouraged the District to think about both limitations and flexibility with relation to effects and possible mitigation.

Bypass Reach

USFWS identified that they would like to work to restore/enhance habitat, noting the grooming and shaping existing sandbars to create mid-channel bars appropriate for the birds. USFWS noted that their intent is not construction of new habitat. Instead, they'd like to focus on managing flows to naturally enhance habitat.

USFWS noted three types of flows that maintain habitat:

- Minimum Flows – mainly related to fish species and mid-summer heat

- Sculpting/Maintenance Flows – flow to cause bank and bar erosion to keep the river dynamic – Jeff Runge suggested that maintenance flows might be defined as those that increase the overall effective discharge.
- Flood Flows – spring high flows and ice jam flows develop the sandbars – USFWS acknowledged that these are natural flows that are unaffected by the Project.

NGPC noted concern for the fish community in the bypass reach and a need for minimum flows. NGPC noted that the District has worked with NGPC in the past on a version of a "Maintenance Flow" for the bypass reach, but the DNR ruled it was a misuse of appropriations, so the agreement was canceled. NGPC asked if a bypass flow is possible and the District noted that any discussions of a minimum flow would need to involve the DNR to ensure the District's water right is not affected. Rick Holland pointed out that NGPC and the District have good relationships with the NRD's and suggested that the NRD could possibly get an instream flow water right since the District doesn't have authorization to get an instream flow. Jeff Runge mentioned that for the Kingsley Dam relicensing, the Department of Water Resources (later changed to DNR) was involved with the development of the environmental account that was created for the purposes of T&E management.

USFWS pointed out that these types of ideas, such as going through the NRD for a minimum maintenance flow, are creative and would be useful in moving forward.

North Sand Management Area

USFWS discussed the Memorandum of Understanding (MOU) that has been executed with USFWS, NGPC and Preferred Sands (on which the District and TPCP are cooperators – not signatories). Thus far, things have been working quite well. Terns and plovers are using the area and the agencies are working with Preferred. USFWS noted that this MOU has been a great template for other sand and gravel mines in Nebraska.

USFWS noted the only issue with the current MOU is that the District is not a signatory. They expressed concern about what would happen if Preferred decided to leave this site and mine elsewhere; then benefits of the MOU would cease. USFWS would like the District to become a signatory to the MOU.

The District noted that they have ceased dredging operations on the North SMA during the nesting season and are willing to continue to do so; however, they do not want to be obligated for additional effort since they leave the birds alone. HDR noted that since the District does not dredge or operate on the North SMA when the birds are there, the birds would not be affected if Preferred was not there and that is why the District is not a signatory.

Hydrocycling

USFWS cited the flow and stage fluctuations in the lower Platte River during hydrocycling and that limiting the variation of the cycle as it enters the river at critical times would be beneficial. Suggestions for limiting the variation could include a detention cell (re-regulating reservoir) or use of Lost Creek. However, USFWS noted that there appears to be limited space in the tailrace area for such a detention cell, but asked if a new area could be acquired to accommodate it and if this type of measure is feasible.

USFWS pointed out their major concerns related to hydrocycling:

- Accelerated erosion of bars, but not exactly sure how it effects terns, plovers, and pallid
- Timing of hydrocycling in relation to natural events
  - Rain event plus a hydrocycle peak overtops a bar – could cause loss of eggs, nests, chicks
- River connectivity for pallid
  - Pallid is a large river fish so they move a lot; more of an issue in spring and fall as there is less movement in the summer months

The following critical times were noted for species:

- Terns & plovers – June & July
- Pallid sturgeon – March - July & September - October

USFWS would like the District to consider what they can accomplish within those timeframes to maximize benefits.

USFWS asked about turbine limitations that would affect modifications to hydrocycling. The District noted that there are concerns for the equipment and it can not physically operate below a certain level.

Detention Cell

The agencies are looking for a way to decrease the magnitude of fluctuation without causing a depletion to the lower Platte River. NGPC noted that a detention cell could flatten out the hydrocycling hydrograph a little more, not necessarily all the way. In particular, it was noted that the stage variance disturbs edges of sandbars and decreases productivity of the river system, but if this could be dampened, that would be beneficial to the system.

Jeff Runge noted that a re-regulation reservoir is being considered at the J2 project to help attenuate the water, but that it would not totally flat-line the cycle.

The District asked if the discharge point back into the lower Platte River was significant to consider. NGPC noted the water should probably be put back into the system upstream of or within the tailrace. The District also pointed out that sedimentation would likely be an issue with a detention cell.

The District also asked about water being returned to the bypass. Does water in the bypass need to be with or without sediment? NGPC stated that water with sediment is as close to pristine conditions and means the river would not be eroding. Water without sediment could mean erosion. The District noted hat if bank/bar erosion is desired in this reach to return it to a more natural system, then water without sediment might accomplish that .

4. Monitoring

USFWS is advocating for monitoring of any mitigation measures for a period of time. Past projects have had included measures to off-set effects, but USFWS does not know how successful these measures have been due to lack of monitoring. USFWS would like monitoring conducted the bypass reach and below the tailrace to evaluate the benefit to habitat and species. At this point, the type of monitoring can't be determined since the measured haven't been determined, but USFWS is willing to assist with developing a monitoring plan.

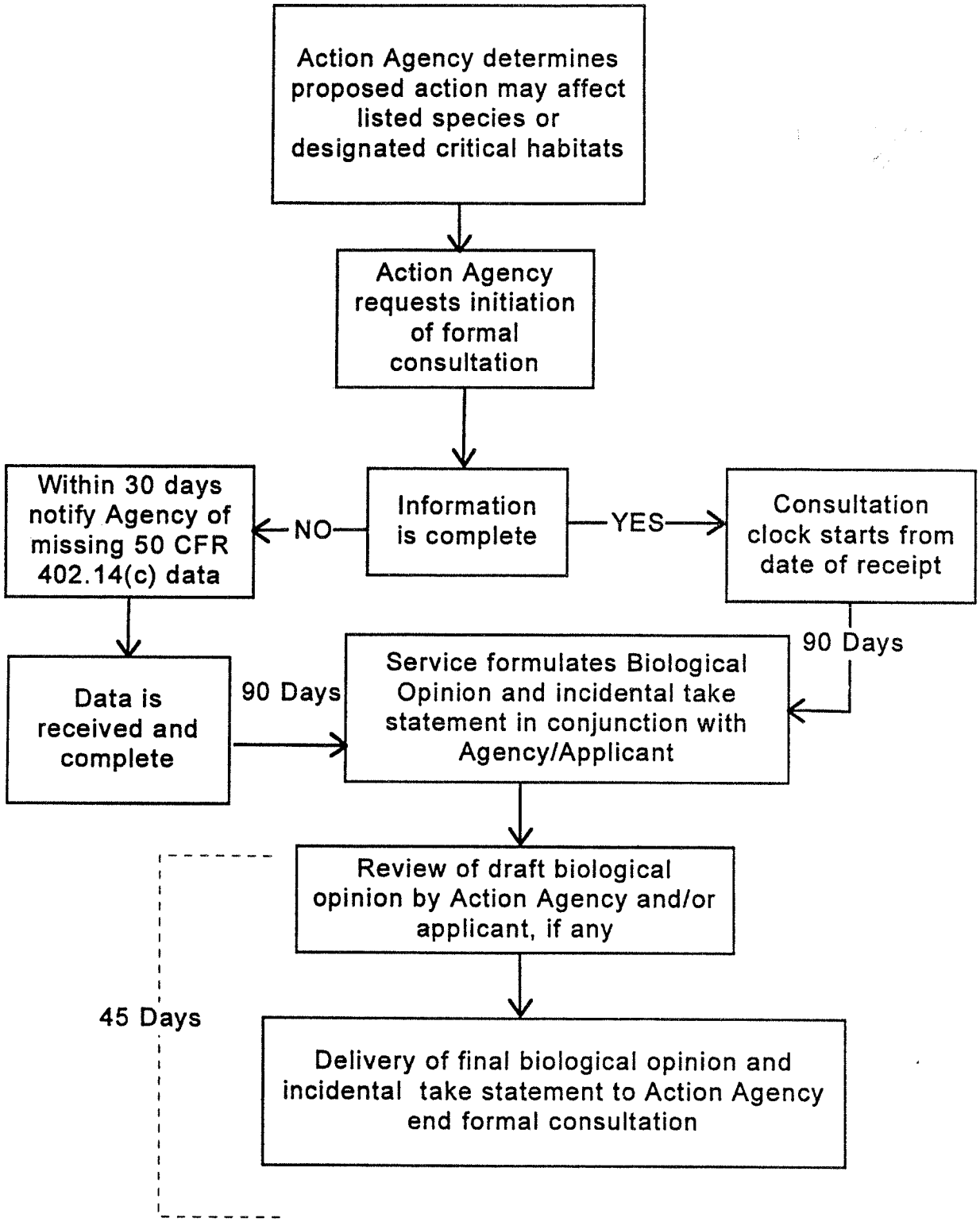
5. Next Steps

USFWS noted that the District is now aware of their concerns and needs to evaluate the suggestions and think about ways that the effects could be off-set.

The next meeting was set for November 2nd, 2:00p.m. to 4:00pm.

LPPD explained water intake and dredging operations in the spring. Early in spring, LPPD is limited on water intake. Dredging occurs from ice-out until birds arrive. Typically, dredging occurs mid-March until early-June and then mid-August until ice returns. In the spring, until the settling basin can be dredge – the system is limited on how much water can be accepted.

Figure 4-1. Formal consultation process.



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

Meeting Notes

Project:	Loup River Hydroelectric Project FERC Project No. 1256
Subject:	Agency Meeting
Meeting Date:	July 22, 2008
Meeting Location:	Loup District Office, Columbus, NE
Notes by:	HDR

Attendees:

Bob Harms – USFWS; Neil Suess - LPPD; Matt Pillard – HDR; Dick Gorton - HDR

Meeting Agenda:

The purpose of the meeting was to discuss the correlation between the ILP and ESA processes, discuss the baseline that would be used to establish impacts, and discuss potential studies that would be needed.

Discussion:

1) Process
   - Bob inquired about Loup's experience with ESA. Neil said they hadn't needed to go through it. Bob said his goal for the day was to discuss the ESA process and what it means. He said that everyone wishes to have a smooth and efficient process.
   - Bob asked if FERC had a representative yet. George said that Kim Winn is current point of contact and once the PAD is submitted she would likely be the licensing coordinator assigned after the PAD is submitted.
   - Bob said he had reviewed FERC's guidance on ESA and it was useful. Matt pointed out there was another document, the Interagency....that was also done that provides some additional information. Bob asked if we could send that to him.
   - Bob discussed that a Technical Assistance letter was sent to Neil's attention on July 21. This letter provides the parameters of their authority for Section 7, provides list of species that could be present, and identifies their list of concerns that were previously provided.
   - Bob said that we are currently in informal consultations. This is a give and take and information sharing period. Bob explained that there are two requirements on Federal agencies:
     1) identify that no jeopardy (extinction) of species or modification of critical habitat be found; and
     2) enter into formal Section 7 consultations on finding of may affect of T&E species.
   - Bob said that there is no critical habitat in this area as it has been rescinded, but identified it anyway as part of the federal agency requirement.
   - Bob explained that the biological opinion (BO) could result in a jeopardy, but with inclusion of reasonable and prudent measures, jeopardy could be eliminated. Reasonable and prudent measures address a specific species, like individual nests.
   - In the BO, the whole and complete project is considered. That is the reason for their inquiries of elements that may seem outside of the project, such as upstream irrigation. It is important for them to have an understanding of the whole project.
   - An example of US 34 project for the Iowa DOT was provided in that USFWS wished to have impacts relative to potential development discussed that were outside of that project's footprint. FHWA declined to include it, and it became an issue in the BO.
   - George asked how this affects water rights and the relationship between questions relative to water rights and relicensing. Dick provided that the US 34 project, the issue of development was related to indirect effects and that USFWS must consider indirect and cumulative effects.
   - Bob agreed and provided their guidelines reference to inter-related and inter-dependant actions and they don't need to be in the District's control to be considered. If the Project enables something else

to happen, it must be looked at. Dick provided that this is commonly call the "but for" the project approach. This terminology is no longer used due to a recent court case, but the theory is still applied.

2) Baseline
   - Bob explained that a whole and complete project is important in establishing the baseline for the project to determine effects. The effects analysis will use a with project/without the project comparison to determine effects.
   - Neil asked how other effects are considered under this approach. Bob said they need to consider cumulative effects. Bob said the baseline is tied to what would happen if the FERC license is not renewed.
   - A scenario of no relicensing was discussed and that factors such as water rights and facilities need to be considered to determine what would reasonably happen under this scenario. It was discussed that this is just used to establish the baseline and that the Service is not suggesting this as an alternative. A discussion on the water right occurred based on what might reasonably occur. No conclusion was developed, but Dick pointed out that this type of discussion is necessary to identify what would happen under this scenario and to have all agree to this outcome.

3) Studies
   - Bob discussed that the NGPC, USGS and the USFWS meet to discuss issues. Bob said it is FERC and Loup's responsibility to develop studies to address issues. They are not obligated to fill out a form that follows the 7 steps to make a study request, but they are open to discuss potential studies and provide technical assistance in getting studies developed. It was discussed that in the ESA process, it is Loup's job, on behalf of FERC, to develop the BA. The closer we are on issues in the BA, from baseline to studies, the easier the process will be in development of the BO and the reasonable and prudent measures.
   - Bob suggested we engage the USGS, as they are technical experts and can provide insight on data gaps and study formulation.
   - Bob also provided at that a one year study, depending on the study, is not a lot of time. There is an effort to identify a cause and effect, and that we may need to study design and/or operations changes as part of that and evaluate the effect of these changes.

4) It was decided that after Thursday's meeting, another small group meeting be scheduled to discuss elements of the baseline condition.

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.