STUDY 3.0 WATER TEMPERATURE IN THE PLATTE RIVER

The Project is located in Nance and Platte counties, where water is diverted from the Loup River and routed through the 35-mile-long Loup Power Canal, which empties into the Platte River near Columbus. The Project includes various hydraulic structures, two powerhouses, and two regulating reservoirs.

Because of the configuration and operation of the Project, water temperatures may be altered to some extent in the Platte River downstream of the Outlet Weir. Resource agencies have expressed concern that changes in water temperature resulting from hydrocycling operations may affect spawning and migration cues of pallid sturgeon in the Lower Platte River. The pallid sturgeon (*Scaphirynchus albus*) is Federally and state-listed as endangered, and temperature is thought to influence the behavior of the pallid sturgeon as well as its use of habitat. No critical habitat is designated for the species in Nebraska. However, the Lower Platte River, between its confluence with the Elkhorn River and its confluence with the Missouri River, is considered to be "associated habitat" for the pallid sturgeon as defined by the Platte River Recovery Implementation Program (PRRIP) (PRRIP, October 24, 2006). This associated habitat reach begins approximately 68 stream miles downstream of the Project.

The U.S. Geological Survey (USGS) has monitored both stream flow and water temperature at key gaging stations on the Platte River, Elkhorn River, and Salt Creek in the study area (see Section 5, Study Area and Study Sites). In addition, weather station data are available for ambient air temperatures in the area. However, no study has investigated specific thermal effects of Project operations on the pallid sturgeon's associated habitat reach. This study will fill this information gap.

1. GOALS AND OBJECTIVES OF STUDY

"Describe the goals and objectives of each study proposal and the information to be obtained;" 18 CFR §5.11(d)(1)

The goal of the study of water temperature in the Platte River is to determine if Project operations materially affect water temperature in the pallid sturgeon's associated habitat reach of the Lower Platte River.

The objectives of the study of water temperature in the Platte River are as follows:

1. To collect existing flow and temperature data from selected USGS gages on the Platte River, the Elkhorn River, and Salt Creek.
2. To analyze gage data to determine if the water temperatures monitored at the Platte River gage at Louisville, Nebraska, are consistent with water temperatures monitored at the Elkhorn River gage and the Salt Creek gage.

2. RELEVANT RESOURCE MANAGEMENT GOALS

"Address any known resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;" 18 CFR §5.11(d)(2)

USFWS is responsible for the conservation and management of fish and wildlife resources under a number of authorities, including the Endangered Species Act of 1973, the Fish and Wildlife Coordination Act, the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. In particular, USFWS has concern for endangered and threatened species, migratory birds, and other important fish and wildlife resources as well as for Federal and state wildlife refuges, management areas, and other areas that support sensitive habitats. USFWS gives special attention to proposals that include modifications to wetlands, streams, and riparian woodlands. USFWS recommends methods to avoid, minimize, rectify, reduce, or compensate for damaging impacts on important fish and wildlife resources and their habitats that may be attributed to land and water resource development proposals.

USFWS has developed a recovery plan for the pallid sturgeon that is continually updated as newer information on the species becomes available (USFWS, 1993).

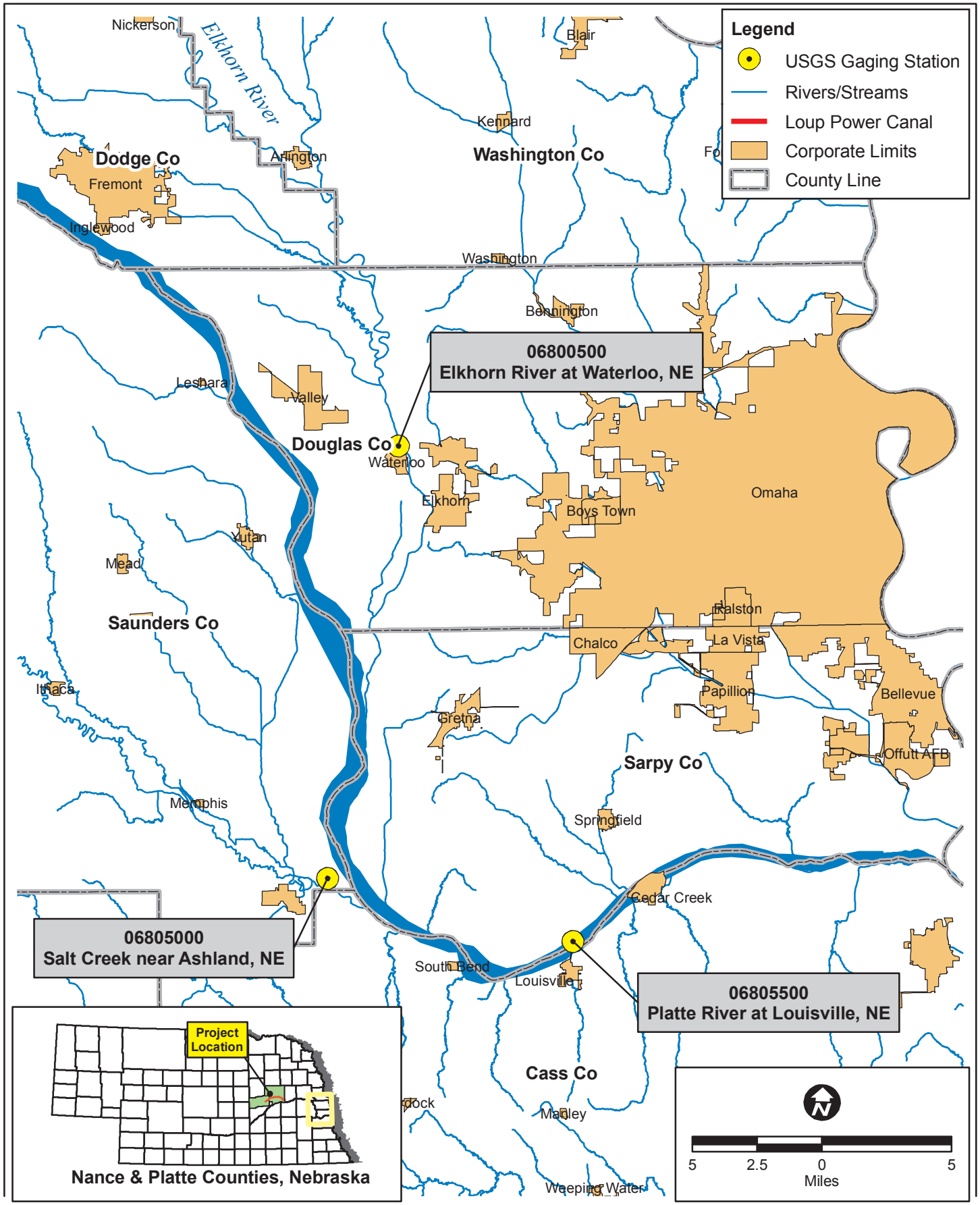
3. BACKGROUND AND EXISTING INFORMATION

"Describe existing information concerning the subject of the study proposal, and the need for additional information;" 18 CFR §5.11(d)(3)

Atmospheric data is an important factor exerting influence on the temperature of the water in the Lower Platte River. Atmospheric data is available through the High Plains Regional Climate Center in Lincoln, Nebraska, from their weather gage at Mead, Nebraska. Air temperature is collected on an hourly basis and can be found at http://www.hprcc.unl.edu/.

Flow is another important factor exerting influence on the temperature of the water in the Lower Platte River. USGS data at the following gage stations, shown in Figure 3-1, will provide temperature and flow data relevant to this study:

- USGS Gage 06805500, Platte River at Louisville, NE – At this flow station, 15-minute increment temperature data collection began on May 16, 2007, and are still being collected. Hourly discharge and gage height data are also available during the same time period for this location.
- USGS Gage 06805000, Salt Creek near Ashland, NE – At this temperature gage station, 15-minute increment temperature data collection began on August 29, 2007, and are still being collected. Although no flow or gage data are being collected at this site, USGS Gage 06803555, Salt Creek at Greenwood, NE, is a flow station at which discharge and gage height data are available during the same time period as the temperature collected at the Ashland gage.



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Loup Power District Hydro Project

Lower Platte River Temperature Study Area

Loup River Hydroelectric Project
FERC Project No. 1256
Proposed Study Plan

DATE
March 2009

FIGURE
3-1

- USGS Gage 06800500, Elkhorn River at Waterloo, NE – At this flow station, 15-minute increment temperature data collection began on April 25, 2002, and are still being collected. Discharge and gage height data are also available during the same time period for this location.

4. PROJECT NEXUS

"Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied;" 18 CFR §5.11(d)(4)

The Project diverts water from the Loup River near Genoa into the Loup Power Canal and then releases diverted water into the Platte River through the Tailrace Canal at Columbus, just downstream of the confluence of the Loup and Platte rivers. The Columbus Powerhouse and the Tailrace Canal are designed for the flow variation of hydrocycling operation. Hydrocycling refers to the method of producing hydroelectricity "on-demand" by temporarily ponding water in a regulating reservoir until the water is needed to produce electricity, typically within the same 24-hour period. Hydrocycling has the potential to affect the temperature in the Lower Platte River because canal flows leaving the Project may be cooler than the naturally shallow river flows experienced in this type of river. Therefore, a nexus exists between Project operations and thermal effects on the aquatic environment in the pallid sturgeon's associated habitat reach of the Lower Platte River.

A variety of environmental cues, including water temperature, are important guidance mechanisms for fish migration, which begins in April (Swigle, 2003). Therefore, assessing water temperature measured at the USGS gage at Louisville is necessary to determine if Project operations impact water temperature in the pallid sturgeon's associated habitat reach of the Lower Platte River.

5. STUDY AREA AND STUDY SITES

The study area includes the Lower Platte River between its confluence with the Elkhorn River and its confluence with the Missouri River. It also includes the Elkhorn River and Salt Creek as they drain to the Platte River. The focal point of the study is the USGS gage at Louisville. It is the only established temperature and flow monitoring location within the pallid sturgeon's associated habitat reach.

6. PROPOSED METHODOLOGY

"A detailed description of the study and the methodology to be used;" 18 CFR §5.11(b)(1)

"Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers any known tribal interests;" 18 CFR §5.11(d)(5)

The methodology for the study of water temperature in the Platte River includes two tasks, described below.

Task 1 Data Collection

Existing pertinent temperature and flow data from 2007 to the present will be collected from identified sources and organized in a database by week, month, and season. Any data gaps will be described. The descriptive statistics add-in available in Microsoft Excel will be used to provide descriptive statistics, such as count, maximum, mean, minimum, and standard deviation, for the grouped data.

Task 2 Data Analysis

Data will be plotted to identify general patterns and distinguish trends. These plots will consist of the data that was measured in the shortest time interval that is available grouped by week, month, and season for the migration time frame of the pallid sturgeon. The time period that will be assessed will be March through June. A select number of daily plots will also be created. The types of plots that will be created for each grouping of data are as follows:

- Plot temperature of the water in the Elkhorn River measured at the USGS gage at Waterloo against the time the data were collected. On the same graph, plot temperature of the water in the Platte River measured at the USGS gage at Louisville against the time the data were collected. These two lines will be compared to discern differences in the time series trends. For example, if the plot of temperature of the water in the Platte River measured at the USGS gage at Louisville shows a sub-daily sinusoidal pattern that is not present in the plot of temperature of the water in the Elkhorn River measured at the USGS gage station at Waterloo, then that pattern is most likely not explained by normal diurnal temperature changes. The two lines will be compared in terms of the peak temperature measured, the lowest temperature measured, the number of peaks and troughs, and the time each peak and trough occurs.
- Plot temperature of the water in Salt Creek measured at the USGS gage near Ashland against the time the data were collected. On the same graph, plot temperature of the water in the Platte River measured at the USGS gage at Louisville against the time the data were collected. These two lines will be compared to discern differences in the time series trends. For example, if the plot of temperature of the water in the Platte River measured at the USGS gage at Louisville shows a sub-daily sinusoidal pattern that is not present in the plot of temperature of the water in Salt Creek measured at the USGS gage near Ashland, then that pattern is most likely explained by hydrocycling at the Project. The smaller size of the watershed upstream of the Salt Creek USGS gage near Ashland may result in the water temperature of the water of Salt Creek measured at the USGS

gage near Ashland having a shorter response time to ambient conditions; this characteristic will be taken into account in this analysis. The two lines will be compared in terms of the peak temperature measured, the lowest temperature measured, the number of peaks and troughs, and the time each peak and trough occurs.

- Plot ambient air temperature obtained at the Mead weather station against the time the data were collected. On the same graph, plot temperature of the water in the Platte River measured at the USGS gage at Louisville against the time the data were collected. These two lines will be compared to discern differences in the time series trends. The ability of the atmosphere to change temperature more rapidly than water will be taken into account.
- Plot all four data series—ambient air temperature obtained at the Mead weather station, temperature of the water in Salt Creek measured at the USGS gage near Ashland, temperature of the water in the Elkhorn River measured at the USGS gage at Waterloo, and temperature of the water in the Platte River measured at the USGS gage at Louisville—against the time the data were collected and compare the plotted time series to discern differences in the time series trends.

If it is found that one or more of the above-described plots show a direct and distinct relationship, then it can be assumed that the temperature of the Platte River at Louisville is not affected by Project operations.

7. CONSULTATION WITH AGENCIES, TRIBES, AND OTHER STAKEHOLDERS

This study plan was developed based on discussions with agencies prior to submittal of the PAD. The District will work with agencies to resolve any issues or concerns during the course of the study plan meetings prior to preparation of the revised study plan.

8. WORK PRODUCTS

"Provisions for periodic progress reports, including the manner and extent to which information will be shared; and sufficient time for technical review of the analysis and results;" 18 CFR §5.11(b)(3)

The intended work product for the study of water temperature in the Platte River is a study report. The study report will document the thermal effects of Project operations on the pallid sturgeon's associated habitat reach. Along with the study report, a database of the data gathered and used in the analysis will be available.

Updates regarding the study of water temperature in the Platte River will be included in the study progress reports to be submitted to FERC in December 2009, March 2010, and June 2010.

9. LEVEL OF EFFORT AND COST

"Describe considerations of level of effort and cost, as applicable." 18 CFR §5.11(d)(6)

It is estimated that the study of water temperature in the Platte River will cost approximately $50,000. This work will be completed by qualified water resources engineers.

10. SCHEDULE

"A schedule for conducting the study;" 18 CFR §5.11(b)(2)

"The potential applicant's proposed study plan must also include provisions for the initial and updated study reports and meetings provided for in §5.15." 18 CFR §5.11(c)

The collection of data is scheduled to begin in the fourth quarter of 2009, and the final study report is to be submitted in the second quarter of 2010.

11. REFERENCES

PRRIP. October 24, 2006. Platte River Recovery Implementation Program Cooperative Agreement.

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

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