USGS NSF GRIP Opportunity

USGS Center:	Nebraska Water Science Center
Project Title:	Large Rivers Ecosystem Connectivity: Middle Missouri River project
Project Hypothesis or Objectives:	River connectivity restoration of nutrient delivery from the Niobrara River to the Missouri River reaches downstream from Gavins Point Dam could alleviate hypothesized impairment of aquatic productivity that was the postulated cause for observed emaciated fish body conditions (G. Mestl, Nebraska Game and Parks Comm., written commun., 2015). Hypothesis to test is that storage and uptake of phosphorus in the deltaic reaches is causing the reaches downstream from the dam to be relatively unproductive. Science Questions: What are the incoming and outgoing loads of phosphorus to/from the deltaic and open-lake reaches of the riverine system between Verdel, Nebraska, and Yankton, South Dakota? How is primary production in the aquatic system affected by the pathways of phosphorus movement through this system? What is the magnitude and relative mass balance of exchanges of nutrients (phosphorus) between channels and backwater habitats along the deltaic reaches? How extensively were hydraulic habitats in the Niobrara River delta altered by the Missouri River 2011 flood? Have backwater habitats become more disconnected from the main channel? FY2016 Activities Proposed: • Compare phosphorus and N-to-P ratio in river channels upstream of the deltaic reaches (2 stations) with those within the delta (3 stations, each with a channel and backwater substation), and downstream of the lake (1 station). • Measure phosphorus and C-to-N ratios in fine-grained sediments of deltaic and open-lake reaches. • Using chlorophyll-a as a surrogate for aquatic production (measured in discrete samples), examine how contrasts in and exchanges of phosphorus along the riverine system are affecting productivity. • Analyze pre- and post-flood aerial and satellite imagery.

	Identify riparian areas that have become disconnected from the channel. Determine the change in areal coverage of selected habitat types, such as marshes and backwaters. • Check accuracy of chlorophyll surrogate by collecting one round of benthic macroinvertebrate samples, to be analyzed for biomass by taxonomic Order.
Duration:	4 to 6 months
Internship Location:	Lincoln, Nebraska
Area of Discipline:	Environmental/Nutrients Geochemistry, Hydrology, Wetland Ecology, River Ecology
Expected Outcome:	Multiple competing hypotheses exist concerning what is limiting pallid sturgeon recovery in the Missouri River; this project will address the nutrients-productivity line of inquiry and either confirm it or rule it out. The project is also testing methods to quantify large river lateral connectivity in a fairly unique environment where flooding of an aggrading river valley is almost continual in many areas and very frequent elsewhere. This methods work will benefit the overall USGS initiative on large rivers and the Midwest Region initiative on river ecosystem connectivity. The intern will gain insights on a large river delta, highly productive backwaters, contrasts among ecosystem components, and experience developing and testing new metrics for river connectivity and applying them at large spatial scales. Interaction with researchers at USGS-UMESC, La Crosse, Wisc., also is planned.
Special skills/training Required:	Expertise with nutrient cycling in streams and lentic aquatic systems is necessary. Expertise with river-floodplain connectivity is a strong advantage. Skill with ecosystem productivity measures is desirable. Skill with data analysis and statistical methods is desirable.
Duties/Responsibilities:	Intern will work closely with the P.I.'s to develop data analysis strategy and implementation, interpretation of results, and reporting. Some field work for final seasonal survey is possible if intern reports by about June 1, 2016. Analysis of nutrient ratios (C:N, N:P, others), differences between types of backwaters (isolated v connected); between primary channels and backwaters; and between upstream v downstream sites of each type. Interpretation of how these differences relate to likely dynamics of nutrient cycling in a complex river delta network of channels, backwaters, tributaries, and reservoir receiving water. Interpretation of how our results affect productivity of the river ecosystem in the deltaic reaches, lake ecosystem in the reservoir, and downstream in lower Missouri River.

Point of Contact or Mentor:	Ronald B Zelt
Point of Contact e-mail:	rbzelt@usgs.gov