

**Project Summary**  
**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title: The Spatial and Temporal Extent of the Suspected Hypoxic Zone in the Headwaters of Lake Sakakawea**

**Discipline: Natural**  
**Type of Project: Research**  
**Funding Agency: United States Geological Survey**  
**Other Partners/Cooperators: Montana State University**  
**Students Involvement: Yes**  
**Effective Dates: 11/15/2014 - 3/1/2017**  
**Funding Amount: \$186,406**

**Investigators and Agency Representative:**

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**Project Abstract:** Spawning by pallid sturgeon has been documented recently in Yellowstone and Missouri rivers (Fuller et al. 200\*), but no natural recruitment has occurred in decades. The leading, but unverified, hypothesis for the lack of recruitment is that riverine drift distance of ichthyoplankton is insufficient before entering reservoirs for free embryos to mature and settle out (Bratten et al. 2012). However, recent research strongly suggests that pallid sturgeon free embryos drift into an anoxic "dead Zone in reservoir headwaters (Guy et al. in press). Specifically, Guy (et al. in press) measured dissolved oxygen concentration of 0.0 to 1.32 mg/L, reduced current velocities, predominately silt substrate, and high sediment organic matter and respiration rates near the river bed in the transition zone between the Missouri River and the headwaters of Fort Peck Reservoir in Montana. Moreover, free embryo and 40-day past-hatch pallid sturgeon mortality was 100% at dissolved oxygen concentrations of 1.5 mg/L in a laboratory experiment (Guy et al. in press).

Expansion of Guy et al. (in press) study to include Lake Sakakawea is needed to confirm the generality of their results as well as to better define the temporal and spatial extent of any benthic anoxic zone. Specifically, will address the following questions: 1.) Do hypoxic or anoxic conditions exist in the headwaters of Lake Sakakawea? 2.) What are the longitudinal and lateral extents of benthic hypoxic or anoxic zones? 3.) How do benthic hypoxic or anoxic zones vary with discharge, water velocity, water temperature, sediment organic matter, and sediment microbial respiration within and between years?

**Keywords:** pallid sturgeon, Lake Sakakawea, United States Geological Survey, Montana State University, MT Cooperative Fishery Research Unit