

Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Tracking Lake Trout Diet and Trophic Interactions in Blue Mesa Reservoir Using Stable Isotopes

Discipline: Natural
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: 4/1/2011 - 6/30/2013
Funding Amount: \$20,00 [FY12: \$10,000; FY11: \$10,000]

Investigators and Agency Representative:

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Project Abstract: Lake trout are usually thought of as a slow-growing, late-maturing and long-lived species, owing to their typical demographic characteristics in the cold, oligotrophic lakes of their native range. As such, the species can be sensitive to overexploitation. In contrast, Blue Mesa Reservoir, within Curecanti National Recreation Area (CURE), supports one of the fastest growing, naturally reproducing lake trout populations in North America. Despite liberal harvest regulations (no size limit, 8 fish daily bag) for over a decade, this population has produced several state record fish and the population appears to have increased in abundance during the same period. Concurrently, the lake's kokanee population has declined despite a doubling of kokanee stocked from about 1.5 million per year in 1992 to 3 million per year starting in 1999. Thus, the lake trout population has at the same time become a popular trophy fishery while jeopardizing an even more popular kokanee fishery and egg supply for the state's kokanee management program. In addition, yellow perch became apparent in the creel in 2000, were not part of sanctioned stocking, and have yet unknown implications on the fishery of Blue Mesa.

Because this lake trout population appears to be more resilient than most and the consequences of yellow perch as a prey base are not fully understood, this study proposes using stable isotopes to provide clues to the cause(s) for kokanee decline and suggest future fishery management strategies for NPS and the Colorado Division of Wildlife (CDOW). Results from the project will provide information necessary to better manage the significant fishery at CURE.

Curecanti National Recreation Area will partner with the Department of Fish, Wildlife & Conservation Biology at Colorado State University. Dr. Brett Johnson offers students and post-docs with experience in stable isotope methods and analysis in aquatic systems as well as nearly 20 years of experience with the fishery of Blue Mesa Reservoir.

Tissue samples from fish (dorsal muscle) and invertebrates (whole body) were collected for each season (spring, summer, fall) in 2010. These members include kokanee salmon, lake trout, yellow perch, rainbow trout, brown trout, white sucker, longnose sucker, crayfish, zooplankton, chironomids, and amphipods. All of these samples (300) have been analyzed for $^{13}\text{C}/^{12}\text{C}$ and $^{15}\text{N}/^{14}\text{N}$ signatures. We will compare these data with data from reanalyzed samples collected from BMR in 2000 to examine effects of kokanee collapse on the food web. Additional samples will also be collected by CPW during spring and summer 2012 in order to bolster samples of prey taxa and select sizes of piscivores. We will also complete data analysis on energy content of all members of the food web to be used in bioenergetics modeling. This will allow us to recreate the current food web in Blue Mesa Reservoir with a system-specific bioenergetics component showing consumptive demand on the kokanee population both pre- and post-kokanee salmon collapse. Further insight to consequences from yellow perch introduction will also be evident from these analyses. All laboratory work will be performed by Dr. Johnson, William Pate (MS Candidate about to graduate), and undergraduate work study students.

Outcomes with Completion Dates: Field work, analysis, and reporting will be completed by December 31, 2012. Results of the evaluation of lake trout isotopic diet analysis, energy density analysis and bioenergetics modeling will be provided in a final report or Master's Thesis. The report will include summary and analysis of findings, and management recommendations for NPS and CPW biologists.

Keywords: Lake trout, diet, stable isotopes, Blue Mesa Reservoir, Curecanti National Recreation Area, Department of Fish, Wildlife & Conservation Biology, Colorado State University, National Park Service