

Greater Yellowstone Coordinating Committee

Project Completion Report

FY 2007

Unit: Grand Teton National Park

Project Name: Evaluating the effect of flow regulation on the Distribution, Abundance, and Movement of Native Cutthroat Trout in the Snake River below Jackson Lake

Project Description: Undisturbed river networks are characterized by numerous channel processes and structures that act as behavioral cues or habitat for organisms. In response to this environmental variability, organisms evolve adaptations that allow them to persist. When river systems are impounded and discharge is regulated, organisms may not be able to respond to the novel environmental conditions, and the range of behavioral adaptations (e.g., life-history types) expressed by organisms may be constrained. However, the effects of flow regulation on fish species are directly related to individual dam operation. As such, it is difficult to generalize about the effects of flow regulation on downstream fish communities. As non-native species invasions and the effects of climate change (including altered dam operation) become more prevalent, it is increasingly important to characterize the effects of flow regulation on individual fish communities.

The upper Snake River below Jackson Lake Dam, Wyoming, provides a unique opportunity to evaluate the effects of variable annual and interannual flow regimes on a native fish assemblage. Jackson Lake Dam was constructed on the Snake River in 1905 and was initially managed to provide irrigation water for agriculture interests in Idaho. From 1916-1957, the peak of the spring flood was generally delayed by 2 months, and no water was released October 1 – March 30. Following the construction of Palisades Dam in 1958, management of Jackson Lake Dam changed. Minimum winter flows were obtained, and the peak of discharge in the spring occurred concurrently with tributary run-off; however, above-average discharge was released throughout the summer until October 1. Despite this shift in management, there is still considerable interannual variation in the flow regime (i.e., timing, magnitude, frequency, duration, and rate-of-change) associated with releases from Jackson Lake Dam.

Through a century of flow regulation, a predominantly native fish community has persisted downstream of Jackson Lake Dam. Perhaps the most charismatic member of this community is the native finespotted cutthroat trout *Oncorhynchus clarkii sp.*, a morphologically distinct ecotype of the Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*). Non-native species (i.e., rainbow trout *Oncorhynchus mykiss*, lake trout *Salvelinus namaycush*, brown trout *Salmo trutta*, and brook trout *Salvelinus fontinalis*) have existed in the upper Snake River since the late 1800's. Collectively, these non-native species present a threat to the native fish community. The effects of flow regulation or climate change on the distribution and prevalence of non-native species are unknown; however, the potential for increased competition, predation, or hybridization with native cutthroat trout provides an impetus to gather comprehensive information on the distribution of the native and non-native assemblage and the movement patterns of native finespotted cutthroat trout.

Unfortunately, information concerning distribution and movement of Snake River cutthroat trout

Note: You may expand and reduce size of blocks.

is incomplete, and it is difficult to predict how a change in discharge management would affect these native fish. The objective of our 2007 pilot study was to identify techniques with which we could detail the distribution and movement patterns of finespotted cutthroat trout, and gather preliminary movement data using radio telemetry tags and PIT-tags. In an effort to gather comprehensive data on fish distribution and movement, we initiated preliminary snorkel surveys, implanted passive integrated transponder tags (PIT-tags) in 145 fish (representing 3 species), and radio tagged 49 finespotted cutthroat trout June-November 2007. Ultimately, we hope to develop new insights into the management of this portion of the Snake River and potential for restoring some elements of ecosystem function that may have been lost since the construction of Jackson Lake Dam.

GYCC Funding Received: \$10,000

Partner Funding/In-Kind Received: NFWF- \$60,000

Status of the Project: In progress. Expected completion date: December 2010

Products that can be shared across the GYA: (GIS data layers, maps, new protocols and methods)

Temperature and depth profile of the Snake River thalweg from Jackson Lake Dam to the confluence with the Gros Ventre (and technique for acquiring data)

Project results: (Information worth sharing on methods, results, partnerships, etc)

Our first research task was to identify sampling methods that would be effective in a large system and statistically robust for evaluating fish distribution. Several complementary methods (i.e., upstream snorkel counts in shallow side channels, partner-assisted downstream snorkel counts in deep side channels, and raft-towed snorkel counts in the main-stem) were used to determine the distribution of fish species in the study area. In sections of the river where the water was too fast or debris-filled to snorkel, a Plexiglas viewing box (bottom dimensions are 1 m X 0.5 m) was mounted to the front of the raft. This viewing box allowed us to identify the species of any fish that passed beneath the box. Snorkel counts and view box counts in July and August 2007 provided preliminary information concerning the distribution of fishes in the study area. Although patterns among sample sections were probably affected by sampling limitations, it was possible to identify techniques for assessing presence/absence and fish length in a semi-continuous manner. For example, preliminary snorkeling data suggest that the fish assemblage may differ from the dam downstream, and that nonnative species (e.g., rainbow trout and brown trout) are distributed throughout the entire study area.

Our second research task was to gather preliminary data on the movement patterns of finespotted cutthroat trout. In September and October, PIT tags were implanted into 128 finespotted cutthroat trout (mean TL = 307 mm, range = 175-393 mm), 13 bluehead sucker (mean TL = 421 mm, range = 363-446 mm), and 4 brown trout (mean TL = 409, range = 335-457 mm). Most fish (85%) were captured via raft electrofishing with Wyoming Game and Fish personnel in October, and the remaining 15% of fish were captured via fly fishing with barbless hooks in August and September. Capture locations occurred throughout the river. Of the 128 finespotted cutthroat trout that were implanted with a PIT tag, 49 also received a radio tag (mean TL = 405 mm, range = 332-493 mm; Lotek Wireless MCFT series: 3EM, 3FM, 3A, 3L; MHz frequencies: 164.200, 164.280, 164.400, 164.560). All fish recovered from both surgeries, and we detected no

mortalities. From November 9-11, we attempted to relocate radio tagged fish. Although some areas of the river were inaccessible to tracking fish from a raft at base flow, we were able to relocate 36 of 49 radio-tagged fish.

In addition to identifying cutthroat trout movement and distribution, thalweg depth and temperature (at the stream bed) of the Snake River were recorded from Jackson Lake Dam to the confluence with the Gros Ventre River using a piezometer. This data will be used to identify physical habitat characteristics that are associated with the distribution of the fish assemblage. To collect temperature and depth data, the piezometer was encased in PVC, padded with foam, weighted down, and dragged behind a raft. As data were collected in long (3 hour) time blocks, some degree of warming was expected to occur in the downstream direction due to the change of time. As such, temperature loggers were temporarily installed at equidistant points in the Snake River so that we could adjust the longitudinal temperature profile for changes due to time. This data will be available in July, 2008.

Project contact: (include phone number, email)

NPS: Susan E. O’Ney, 307-739-3666; susan_o'ney@nps.gov

USGS/Bob Gresswell (406) 994-7085 or MSU/Kris Homel (435) 640-7026

Report Date: 30 January, 2008

Submit to Virginia Kelly: vkelly@fs.fed.us 406-587-6704. Contact Virginia with questions.