**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title:** Cutthroat trout hybridization and population genetics in the Lamar River, Yellowstone National Park

**Discipline:** Natural
**Type of Project:** Research
**Funding Agency:** National Park Service
**Other Partners/Cooperators:** University of Montana
**Student Involvement:** No, post doc
**Effective Dates:** 6/1/2016 to 5/31/2020
**Funding Amount:** $39,668

**Investigators and Agency Representative:**
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**Project Abstract:** In Yellowstone National Park, the introduction of Lake Trout, Rainbow Trout, and Brook Trout have had a profound impact on native Yellowstone Cutthroat Trout and active fisheries management is needed to prevent further population decline. Of particular concern is the impact of Rainbow Trout, which not only competes for resources with native trout, but also hybridizes with them and interrupt locally-adapted genetics. The Lamar River, which has long been considered a stronghold for native trout, is now being invaded by rainbow trout and their influence is spreading upstream at an unknown rate.

The overall goal of this project is to investigate key life history and genetic attributes of Yellowstone cutthroat trout, rainbow trout, and hybrid populations/metapopulations in the Lamar River Watershed (including Slough Creek and Soda Butte Creek) in order to guide management efforts to preserve genetically pure cutthroat trout. With information revealed through this study, a comprehensive strategic plan for Lamar River native trout preservation, non-native suppression, and monitoring of population status will be developed. This work is being conducted through collaboration between the NPS Fisheries and Aquatic Sciences program, University of Montana Conservation Genetics Lab, and Department of Ecology, Montana State University (MSU).

Objective - Assess spatial patterns of introgression, and determine genetic variation within and among populations, within the Lamar River system. A thorough evaluation of the extent of hybridization is critical to developing management priorities. For example, this should help to identify genetically intact native populations for conservation and populations where introgression has progressed too far to warrant preservation and protection. Assessing the spatiotemporal pattern of introgression will help to identify if Lamar River hybridization is following a stepping-stone or continent-island type invasion. Should a predominant source population of rainbow trout be identified, this could be targeted for suppression efforts, and be expected to have a significant impact on further hybridization. If stepping-stone dynamics and long-distance dispersal are facilitating hybridization, the strategic use of barriers to conserve genetically pure populations would be strongly supported.

Methods **-** NPS and MSU collaborators will use radio telemetry and passive integrated transponder (PIT) tags in order to learn about movement behavior of individual fish in the Lamar River system. Because the hybridization status of individual fish cannot be determined by morphology, molecular genetic techniques will be used by University of Montana Conservation Genetics Lab to determine the degree of hybridization for individuals used in the movement portion of this work.

Hundreds of fish will be implanted with PIT tags by NPS and MSU and monitored with stream wide antennae as the fish enter spawning tributaries. Fish that provide useful movement data will be genotyped by University of Montana Conservation Genetics Lab. These data will provide finer temporal resolution to determine differences in spawning timing among fish genotypes.

In addition, NPS and MSU will sample several populations of fish (distributed across the Lamar River watershed), collecting 25 – 30 individuals from each. These samples will be genotyped at 95 SNP loci by University of Montana Conservation Genetics Lab and used to estimate population level hybridization status and determine population genetic structure.

**Keywords:** cutthroat trout, hybridization, population genetics, Yellowstone National Park, University of Montana