2019 Cooperative Summer Field Training Program

🟠 **Project Title:**		The intern will work primarily on two projects, full descriptions for each are available on Dr. Clint Muhlfeld's staff page on the USGS NOROCK website. (Ostroff et al. 2017). Both projects involve close collaboration with the 1) Experimental suppression of invasive lake trout: Implications for conservation of imperiled bull trout in Glacier National Park; 2) Measuring Streamflow and Understanding Spatial and Temporal Streamflow Variability in the North Fork Flathead River Basin, MT-part of the USGS Integrated Drought Science Plan National Park Service and/or Montana Fish, Wildlife and Parks, providing interns with experience on collaborative multiagency projects.
🔴 **Project Scientists:**		Vincent S. D'Angelo, Clint C. Muhlfeld
🔵 **USGS Center:**		USGS Northern Rocky Mountain Science Center
🟣 **Location:**		Glacier National Park, West Glacier MT will be the duty station

Project Description:

Background Information:

Project 1: The experimental suppression of invasive lake trout project began as a response to the decline of bull trout *Salvelinus confluentus* in western Glacier National Park (GNP) lakes (Logging Lake and Quartz Lake) due to the invasion and establishment of nonnative lake trout *S. namaycush*. The overall goal is to protect Logging Lake's ecologically unique bull trout population from further declines and potential extinction and provide an opportunity for rescue via translocation and conservation of bull trout. This project involves a unique multifaceted approach to conservation and nonnative species control. On one hand we are implementing aggressive lake trout control measures in Logging Lake-gillnetting, trapnetting and telemetry- that are also used to glean demographic data needed to develop statistical models predicting susceptibility of lake trout to exploitation under various future gillnetting regimes. Depletion and mark-recapture techniques will be used to develop population estimates for subadult and adult lake trout in Logging Lake and the results will inform future efforts and measure success to date. Simultaneously, we will continue to translocate bull trout to nearby Grace Lake to ensure the persistence of Logging Lake bull trout into the future. As of 2018, 1400 bull trout have been re-introduced to Logging Lake and 2733 have been translocated to Grace Lake; a mix of wild and hatchery born fish. We plan to introduce more fish in 2019 and continue population monitoring efforts via mark-recapture trap-netting and fish telemetry. This information is critical to understanding the feasibility of suppressing nonnative lake trout in a small, backcountry lake that contains native bull trout, as well as the feasibility of the first conservation introduction of bull trout in GNP's history. Results from these collaborative USGS and National Park

Service studies will be applied to management of other lakes in GNP and possibly other systems throughout the native range of bull trout.

Project 2: Over the past 15 years, there have been many calls to extend monitoring of hydrologic variability and ecological responses to entire riverscapes. Extending to riverscapes means a strong focus on headwater streams (tributary networks located upstream of main-stem river USGS gaging stations). Headwater streams are the water towers for our Nation's waterways, playing a critical role in sustaining water resources, biodiversity, and human services, particularly under extreme periods of drought. Despite their importance, we have limited understanding of spatial and temporal variability of headwater streamflow regimes, and how that variation affects surface and groundwater supplies and interacts with the structure and function of aquatic ecosystems. Our ability to monitor and model potential changes in streamflow across diverse freshwater systems and habitats is limited by existing monitoring stations that are predominantly focused on large, lower elevation rivers. The USGS is uniquely positioned to develop and implement an integrated ecohydrological research and monitoring network that will advance understanding of drought effects and climatic resilience across stream systems and associated aquatic, terrestrial, riparian, and wetland ecosystems, including critical data and information gaps in headwater streams.

This effort requires collecting ecohydrologic data to describe spatial and temporal variation in headwater stream hydrology, identify key drivers influencing the duration and magnitude of biologically important streamflow events, and advance our understanding of how hydrologic and thermal variation affects aquatic species and ecosystems. These enhanced networks will aid in quantifying how climatic variation influences ecological processes across multiple biological and spatial scales. Our efforts will contribute to technological advances for future monitoring, modeling, and ecosystems assessments of our Nation's water resources

The overarching goal of this project is to integrate aquatic ecosystem research and drought monitoring throughout the entire range of aquatic environments especially where natural resource management and conservation are needed. Since 2017, USGS NOROCK Glacier Field Station has been working on a subset of this project's pilot study in the North Fork Flathead basin in and around GNP.

Objectives:

Project 1: The goal of this project is to protect Logging Lake's ecologically unique bull trout populations from further declines and potential extinction and provide an opportunity for rescue via translocation and conservation introduction. Specific objectives are:

1)   Collect data to inform population estimates of subadult and adult lake trout in Logging Lake while suppressing the overall population via targeted gillnetting.
2)   Identify the timing and location of lake trout spawning in Logging Lake using fish telemetry and maximize suppression of adult lake trout in those locations.
3)   Monitor movement of subadult lake trout in Logging Lake to ensure the success of subadult suppression.
4)   Oversee the translocation of bull trout from Logging Lake and/or Creston Hatchery to Grace Lake, GNP.
5)   Continue to monitor the bull trout population in Grace Lake via systematic live trapnetting and fish telemetry.
6)   Where possible collect relevant data to assist with food web studies in Logging Lake and Grace Lake.

Project 2: The goal of this project is to integrate aquatic ecosystem research and drought monitoring throughout the entire range of aquatic environments especially where natural resource management and conservation are needed. Since 2017, USGS NOROCK Glacier Field Station has been working on a subset of this project's pilot study in the North Fork Flathead basin in and around GNP. Specific objectives for the North Fork Flathead Study Area:

1)   Assist with data downloading and archiving, streamflow measurements, and the establishment of reference markers associated with headwater streamgages.
2)   Install and maintain headwater streamgages as needed with the help of technicians and biologists.
3)   Use NOROCK data and streamgage data to help describe variability at each site and develop flow rating curves.
4)   Explore how NOROCK data can be quality controlled and published.

Intern Tasks:
Our goal in advertising this internship is to acquire a hard-working individual interested in aquatic ecology and the interface between science and management to work as part of a small crew (2-3 people) of technicians and biologists working on the projects described in this application. Ideally, the position will be from mid-May or early June to mid-November 2018. Tasks that the intern will perform in this position will include:
Stream electrofishing
Gillnetting
Trapnetting
Passive and active fish telemetry in streams and lakes
Implanting PIT tags and sonic tags in live fish
Taking streamflow measurements using handheld flow meters and wading rods
Downloading and quality controlling streamflow data
Following protocols for tracking archiving any data collected
Hiking on and off trail with up to 45 pounds
Boating and canoeing on lakes as part of a three-person team
GPS navigation
Camping in grizzly bear habitat
Enjoy exploring Glacier National Park (required)

Expected Outcomes:
This position will involve learning numerous skills, all of which will be very valuable for career development. Specific fish sampling techniques that will be learned include gillnetting, electrofishing, trapnetting and fish telemetry. These skills are often prerequisites for fisheries technician and biologist positions throughout the state and federal government and private sector. Hydrology skills learned will be measuring streamflow in varying conditions in small to moderate stream sizes and learning to install and maintain temporary streamgages (an uncommon skill that is going to be increasingly valuable). Learning these skills in backcountry environments will give the intern a more complete education regarding these techniques due to the inevitable troubleshooting and improvisation required to perform these tasks in remote locations. The intern will have opportunities to develop skills in fish and invertebrate species identification, fish and invertebrate sampling methodology, GPS navigation and data collection, GIS and spatial analysis, and navigation in remote mountainous terrain. Perhaps most importantly, the intern will be part of a small team of field biologists and will learn how to operate as part of a small crew performing physically and mentally demanding tasks in remote locations. Developing the interpersonal skills needed to work as part of a small team in this environment is a very valuable skill for any future job, especially those related to fisheries or wildlife research. It is a skill that can't be learned in the classroom or lab, and the rigors of fieldwork in Glacier National Park provide the perfect opportunity for this type of education.

Details for Matching:

Type of Project: Field Work

Project Discipline: Ecology, Field Mapping, Modeling, Wildlife Biology, Groundwater, Surface Water, Climate Science

Project Start Date: Mon Jun 03 2019 00:00:00 GMT-0400 (EDT)

Project Duration: 5 Months

Level of Physical Demand: Level 8-2: The work requires some physical exertion such as long periods of standing, walking over rough, uneven, or rocky surfaces; recurring bending, crouching, stooping, stretching, reaching, or similar activities; or recurring lifting of moderately heavy items. The work may require specific, but common, physical characteristics and abilities such as above-average agility and dexterity.

GIS Training: ESA

Special Skills and Interests: Experience or interest in learning fisheries sampling techniques-electrofishing, gillnetting, etc. and collecting the associated biological data.
Experience cataloguing biological data in the field and office (electronic and hard copy)
Experience or interest in learning how to measure streamflow in small to moderate sized streams in varying conditions
Experience with backcountry travel
Ability or willingness to learn to navigate with a GPS in unfamiliar terrain
Backpacking experience preferred but not required
Willingness to travel and camp in grizzly bear habitat
Ability to hike up to 10 miles with a moderate pack weight~30 pounds
Comfortable hiking off-trail
Experience or willingness to learn to drive boats, rowing rafts, canoeing
Comfortable with boat travel on lakes
Comfortable walking in small streams
Must be willing to work long hours with a small crew
Proficient with Microsoft Office (Word and Excel primarily)
R Code and ArcGIS experience beneficial but not required