2020 Cooperative Summer Field Training Program

**USGS Project Scientist**
Meagan Gonneea

**Project start date**
6/1/2020

**Duration**
12 weeks (flexible)

**Location**
Woods Hole, MA

**Type of Intern**
ESA

**Title of Project**
Interaction of environmental variables on methane production in managed wetlands

**Background**
Coastal wetlands provide a wealth of ecosystem services, including bird and fish habitat, storm surge protection and a net climate cooling effect through CO2 uptake and low CH4/N2O, potent greenhouse gases, emissions. On Cape Cod and in many other areas, culverts, impoundments, and similar structures were installed in the past in many tidal creeks during construction of railways, roads, and walking paths, fundamentally altering carbon cycling processes. In marshes where tidal flow is restricted, salinity decreases while water levels can be higher or lower depending on the degree of impoundment the former wetland experiences. The net result is an altered wetland ecosystem consisting of vegetation that would not occur naturally, such as freshwater emergent like phragmites and cattails, and conditions that promote greenhouse gas emissions and reduce carbon burial, resulting in net climate warming. The Environmental Geochemistry group at the Woods Hole Coastal & Marine Research Center is partnering with Massachusetts Division of Ecological Restoration, NOAA, local towns, and conservation groups interested in quantifying the carbon cycle impacts of hydraulic impoundment.

The Herring River Estuary is a 1000-acre former salt marsh that was diked in 1910 and is now within the NPS Cape Cod National Seashore. The Herring River estuary provides a natural laboratory to study carbon cycling within impounded and drained tidal wetlands. This summer we will collect field data on greenhouse gas emissions and below-ground cycling within impounded wetland sites across important salinity gradients and vegetation species to provide the basic scientific data required to determine environmental drivers of emissions within these environments.

**Objectives**
We will collect gas flux data and dissolved gas samples from a variety of field locations to compare carbon cycles in impounded and natural marshes. To support these measurements, environmental drivers, such as water depth, salinity and redox conditions will be measured with in situ sensors as well as in discrete samples. Additional carbon species, including dissolved organic and inorganic carbon, will be measured to facilitate full understanding of important carbon cycle processes.

**Intern Tasks**
The intern will assist in the field with sample collection in a variety of emergent wetland environments, including phragmites and cattails. We will use portable greenhouse gas
analyzers in the field to measure CO2 and CH4 fluxes using chamber-based approaches. Laboratory-based greenhouse gas analyses will be done with a gas chromatograph to measure dissolved concentrations. Additional laboratory work will include assisting with sample analyses of dissolved organic and inorganic carbon and major ion concentrations. Intern will assist with data interpretation and have the opportunity to present the research to the local scientific community.

Expected Results and Benefits to the Intern

Intern will gain field skills in greenhouse gas flux measurements; learn how to operate a gas chromatography; learn the described laboratory methods; gain experience wetland carbon cycle research; and learn methods for record keeping, data analysis, and data presentation. Such activities are excellent preparation for geoscience careers. In addition, the candidate will have the opportunity to prepare and present the research results at a Center meeting at the culmination of their internship.

Skills and Interests of Candidates

Intern should have an interest in coastal ecology and a desire to learn new field and laboratory techniques. An interest in geochemistry is desirable but not essential. Intern should anticipate work in adverse field conditions, as salt marshes, while beautiful, can be hot and buggy during the summer. Attention to detail and excellent record keeping are needed.

Project Type

Field Work; Lab Work; Office Work;

Project Discipline

Ecology; Groundwater; Surface Water; Climate Science;