

USGS NSF GRIP, GSP Opportunity

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 USGS Center:	California Water Science Center
 Project Title:	A Critical Assessment of Recent Soil Dating Methods in Coastal Wetlands
 Summary:	<p>Are you interested in coastal wetlands and how they form in the landscape? In this internship you will learn about wetland formation and how carbon accumulates in wetland soils over time. In addition, you will learn to learn how to critically evaluate soil dating methods that are currently being used to report carbon accumulation to the US EPA and the Intergovernmental Panel on Climate Change.</p>
 Project Hypothesis or Objectives:	<p>Coastal wetlands, including marshes and mangroves, are highly effective in accumulating carbon in their sediments due to low rates of decomposition and high plant productivity. Because restoration of coastal wetlands reduces greenhouse gas emissions through sequestering of carbon in sediments, there has been a recent surge of interest in restoring coastal wetlands throughout the United States. Accounting for reductions in greenhouse gas emissions requires careful quantification of vertical accretion (deposition of material on the wetland surface) and carbon accumulation on site. Vertical accretion and carbon accumulation rates, estimated from wetland soil cores, are strongly dependent on the correct application of soil dating techniques and careful interpretation of resulting age profiles.</p> <p>There are currently two main approaches for dating wetland soils between 50-100 years old: ^{137}Cs (cesium) dating, a single event marker using the 1963/4 peak from aboveground nuclear weapons testing, and ^{210}Pb (lead) dating, a continuous method based on excess ^{210}Pb decay in the soil profile. The relative accuracy of both ^{137}Cs and ^{210}Pb dating varies depending on soil type (mineral vs. organic content and grain-size), hydrodynamics, and geography. In the case of ^{210}Pb dating, an additional challenge is meeting the assumption of the particular model used to assign dates to a profile. If assumptions of each model are not followed carefully, the ensuing</p>

dates could contain substantial error.

The main objective of this project is to carry out a critical review of method uncertainty and in so doing, develop a vetting protocol that could be used to refine datasets to include only core profile dates that fulfill strict criteria for quality control and quality assurance.

Duration: Up to 12 months

Internship Location: Sacramento, CA

Field(s) of Study: Geoscience, Life Science

Applicable NSF Division: EAR Earth Sciences, OCE Ocean Sciences, DEB Environmental Biology

Intern Type Preference: Either Type of Intern

Keywords: coastal wetlands, carbon accumulation, soil dating, methods comparison, quantitative analysis

Expected Outcome: The project will culminate in a review article, which will provide a vetting protocol for wetland restoration practitioners and others using methods of soil dating to estimate vertical accretion and carbon accumulation in recently (past 50-100 years) deposited wetland sediments and peat soils. The goal is to improve the accuracy of carbon accumulation estimates, which are currently being reported to the US Environmental Protection Agency and the Intergovernmental Panel on Climate Change.

Special skills/training Required: I am seeking an applicant with a strong background in ecology, geology, and/or geomorphology, who is highly motivated and enjoys working independently. The applicant must have strong quantitative skills, including the ability to conduct basic statistical analyses, manipulate and analyze data in spreadsheets, and compute soil age profiles with various models. The ability to carry out uncertainty analyses and write simple programs such as macros in Excel would be helpful. The fellow must have experience conducting literature reviews and have good writing skills. Previous experience writing and publishing a scientific article is a plus.

Duties/Responsibilities: This opportunity will provide professional development to a NSF Graduate Research Fellow by enabling interaction with hydrologists, chemists, geologists, and GIS experts at the USGS California Water Science Center in Sacramento and the National Research Program in Menlo Park, CA. The fellow will assemble data, analyze data sets, conduct uncertainty analyses, and co-author part of a review article. The fellow will learn about the pitfalls of dating recent wetland sediments and peats as well as how to assemble a review on a particular subject.