

USGS NSF GRIP, GSP Opportunity

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- USGS Center:** National Research Program
- Project Title:** Geomorphic influence on resilience of tidal freshwater wetlands to sea level rise
- Summary:** Want to conduct collaborative eco-geomorphic research at the forefront of climate change impacts? We have a novel landscape-scale ecosystem experiment, using two adjacent tidal rivers with a 9x difference in watershed sediment loads, to determine how sediment availability regulates the resilience or loss of tidal freshwater wetlands as the result of sea level rise and salinization. We have existing sites and data as part of this multidisciplinary study, and welcome additional researchers that can learn additional skills and contribute to improving predictions of wetland and river changes in the future.
- Project Hypothesis or Objectives:** Sea level rise is occurring and is almost certain to accelerate in the near future due to global warming. Current knowledge of the responses of tidal wetland ecosystems to sea level rise is not sufficient to predict their dynamics and enable effective and efficient resource management. Changes in water depth and salinity due to sea level rise are likely to change the resilience of these ecosystems as well as their carbon, nutrient, and sediment trapping functions. However, little is known about the sensitivity of tidal freshwater wetlands, especially forested wetlands (TFFW), to sea level rise. TFFW occur at the interface of nontidal watershed and estuarine tidal, salt-impacted wetlands – they are the most upstream estuarine wetlands. Next to nothing is known about ecogeomorphic changes at the interface of tide and watershed in TFFW. Furthering understanding of material transport at the edge of tidal influence has important consequences for predicting future impacts of rising sea level as well as estuarine eutrophication. We predict that high rates of allochthonous riverine deposition on upper TFFW, coupled with more frequent inundation and the resulting greater prevalence of soil anoxia resulting in lower soil greenhouse

gas emissions, should lead to enhanced soil C (and sediment, N, and P) accumulation at locations switching from nontidal to tidal.

Duration: Up to 12 months

Internship Location: Reston, VA

Field(s) of Study: Geoscience, Life Science

Applicable NSF Division: EAR Earth Sciences, DEB Environmental Biology

Intern Type Preference: Either Type of Intern

Keywords: Sea level rise
Salinization
Tidal wetland
Chesapeake
Sediment

Expected Outcome: The intern project would leverage an existing USGS study by generating additional information on climate change impacts on ecosystems. The intern would benefit from learning new field and laboratory skills and by contributing to a multidisciplinary collaboration, as well as likely publication of their results. The USGS would benefit from the new understanding developed by the intern.

Special skills/training Required: Wetland biogeochemistry

Duties/Responsibilities: The proposed intern research opportunity would focus on measurement of sediment and associated C inputs, greenhouse gas emissions, and long-term soil C accumulation at the nontidal/tidal transition of tidal rivers. Our existing TFFW project has newly established sites on the adjacent Mattaponi and Pamunkey rivers (Chesapeake Bay watershed, Virginia). Along each river, five sites were established from non-tidally inundated floodplain, upper reach TFFW, lower reach TFFW, salt stressed and transitioning TFFW, to oligohaline marsh. The intern research would complement the existing long-term research designed to identify ecosystem changes in response to sea level rise. We seek collaboration in the measurement of sediment and C and/or N and P inputs, cycling, and loss. For example, one research topic could be measurement of long-term soil C (and N and P) accumulation using ^{210}Pb and ^{137}Cs dating of sediment cores. Alternatively, the research could focus on changes in biogeochemical processes in response to sea level rise. The intern would also integrate their findings with the modeling and synthesis efforts of the USGS Blue Carbon Working Group.