**Coastal Critical Zone Summer Undergraduate Internship**

Dates of internship: June 3 – August 9, 2024

Location: Agroecology Lab, College Park, MD 20742

Number of positions available: 1

Faculty Mentor: Kate Tully kltully@umd.edu

Graduate Student Mentor: Nate Spicer, nspicer@umd.edu

Lab Technician Mentor: Brian Moyer, bmoyer@umd.edu

**Overview:** The Coastal Critical Zone Network is an interdisciplinary team project researching the effects of changing climate and sea level rise on the Delmarva Peninsula, which includes Delaware and parts of Maryland and Virginia. The project is funded by the National Science Foundation, a prestigious, taxpayer-supported federal science agency. The Critical Zone team is inviting applications for paid undergraduate research internships for summer 2024; interns will be part of sub-teams in hydrology, biogeochemistry or ecosystem research. Research will involve a combination of laboratory, outdoor field work and/or computational environments. We seek a diverse group of undergraduate students to join our team in a welcoming, collaborative environment.

**Project Title: Coastal Critical Zone: Biogeochemistry of transitioning lands**

**Project Sub-team:** Biogeochemistry

**Research Description:**

Tidal marshes are large carbon sinks, storing as much as 240 g m-2y-1, however, it is unclear how the carbon cycle will be altered in this region as marshes replace farms and forests. Marsh soils are known to produce the greenhouse gases (GHGs): methane and carbon dioxide depending on whether the redox potential of the soil is low or high. Redox conditions will change as sea levels rises and soil is more frequently inundated, which will have impacts on GHG production. Water levels in these systems shifts daily (with the tide), seasonally (spring vs. neap tide), and with storm surge. Sea-level rise and saltwater intrusion will also increase salinity and sulfate levels. While sulfate is thought to suppress methane production in soils, recent research suggests that this is not always the case, especially when systems are under human management. In addition, wetland plants interact with soils to affect soil organic matter pools and GHG fluxes through gas transport through aerenchyma and input of different substrates for GHG production through root exudates and decomposing senesced vegetation. All these factors require looking at gas fluxes from both plants and soil. The student will seek to understand the drivers behind GHG flux in salt marshes that are adjacent to agricultural fields. The project

itself can be tailored to match research goals of the student. The student will also be trained in time and data management and fieldwork skills.

**Research Questions:**

1. How does tide stage impact carbon dioxide and methane flux along a marsh to terrestrial transect in a farm and forest system?
2. How do neap tide, spring tide, and storm surge events impact carbon dioxide and methane fluxes along a marsh to terrestrial transect?

**Student Learning Objectives: Professional and Research Skills**

This internship focuses on the development of the following professional and scientific skills.

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| Broad Professional Skills | Specific Skills |
| Planning and time management | Ability to set and complete specific goals of varying scope |
| Work independently | Independent work ethic - work independently to problem-solve |
| Collaborative skills | Learning to complete tasks efficiently and effectively with others |
| Express ideas in writing and verbally | Communicate with diverse audiences - Development of impactful poster and oral presentations. Honing ability to deliver scientific results/impacts to people of multidisciplinary backgrounds. |
| Broad Scientific Research Skills | **Specific Skills** |
| Understand relationships at different spatial scales in an agroecosystem  | Make connections between biogeochemical processes at the field, farm, and landscape scale  |
| Recognize patterns in research data | Comparing changed in gas flux (over time, across gradients)  |
| Build skills in field research | Contribute to research at field sites.  |
| Understand, apply, and explain scientific concepts and theories | Express questions and plan methods for answering them. Learning to communicate results through oral presentations and posters. |

**Prerequisites:**

A background in biogeochemistry, soil science, ecology, or related fields is preferred. Fieldwork outdoors during summer will be required, and therefore, prior outdoors experience (scientific or professional) is also preferred.

**Work Environment and Expectations:**

Laboratory environment: Agroecology Labs – Plant Science Bulding and Research Greenhouse Complex in College Park, MD

Field work environment: Delmarva Peninsula sites, 3-4 hr drive from University of Maryland (transportation provided).

Computational environment:

The internship is full-time, with exact hours and expectations determined between student and mentor. Students will also participate in a June 2024 Critical Zone group orientation in person, weekly Zoom team meetings, and end of internship poster session.

**Stipend:**

$6,000 - Direct deposit is required. In addition, for undergraduate researchers who do not live locally, up to $2,000 per research intern may be available in housing assistance.

**Funding Source:**

National Science Foundation Coastal Critical Zone Network

**Application deadline:** Friday, March 15, 2024

**How to apply:**

<https://forms.gle/wb5za9Ptw6v1CqjL9>