C-StREAM Fellowship Program Position

Elemental Analysis for Sediment Sourcing and Tracking

The Chesapeake Student Recruitment, Early Advisement, and Mentoring Program (C-StREAM) is an inclusive program focused on recruiting, advising, and mentoring college students who identify as people of color, persons with disabilities, members of the LGBTQAI+ community, persons from economically disadvantaged backgrounds, and first-generation college students who are currently pursuing an undergraduate degree. C-StREAM is designed to advance the participation of students from diverse communities in environmental science, protection, restoration, education, management, and policy careers. C-StREAM endeavors to support this goal by developing inclusive career pathways that result in greater diversity in the environmental workforce.

Project Description

Excessive sediment runoff is a major concern for the Chesapeake Bay's ecological health. Coupled with the fact that sediments are frequently transport vectors for excessive nutrients and other contaminants of concern, identifying where sediments are coming from and their transport times via sediment fingerprinting is a vital first step by stakeholders when focusing remediation efforts. The Geomorphology Team at the USGS MD-DE-DC Water Science Center has recently acquired a portable XRF (X-Ray Fluorescence) analyzer to supplement the needs of our Sediment Lab. XRF analyzers are able to measure a wide array of elemental signatures within sediment samples, a process necessary for sediment source tracking via sediment fingerprinting models. By allowing for these analyses to be done in-house, this unit has the potential to reduce laboratory costs by ~50%. However, this type of elemental analysis has not been compared thoroughly to the more commonly used elemental analyses used when tracking the sources of sediments in a watershed, namely inductively coupled plasma mass spectroscopy (ICP-MS) and optical emission spectroscopy (ICP-OES). This fellowship would allow for a student to take the lead on innovative work (with the support of our team of geomorphologists, geologists, and GIS experts with cumulative decades of experience in sediment sourcing and tracking) and investigate one or several issues surrounding XRF analyzers prior to our adoption of the technique:

- What does a viable Standard Operating Procedure for using an XRF analyzer for elemental analysis look like, and how are other labs throughout the country utilizing it?

How replicable are the results produced by this unit, and does replicability vary with geography, land cover, etc.?

- How do results produced by an XRF analyzer compare to those produced by ICP-MS & ICP-OES? Furthermore, do these XRF-derived results produce the same results when used as inputs into a sediment fingerprinting model as ICP-MS and ICP-OES-derived results?
- How similar are results produced from an XRF analyzer prior to wet-sieving a sediment sample, a time-intensive procedure that removes all particles >63µm in diameter, to those after sieving?

Opportunities

This fellowship provides a unique opportunity to contribute to necessary research critical for advancing our understanding of sediment dynamics within the Chesapeake Bay watershed, with implications for the field at large. This position provides insights into careers in hydrology, geomorphology, and geochemistry, and the opportunity to create meaningful connections with working researchers in the public sector. The position will also provide an opportunity to expand the Fellow's knowledge of prior and ongoing restoration and sediment remediation efforts within Chesapeake Bay, the scientists and managers studying such efforts, and the technologies used to meaningfully assess the efficacy of these efforts.

Responsibilities and Deliverables

- Develop a workflow for XRF analysis of sediments alongside USGS staff.
- Database maintenance of XRF analysis results, including assistance with a USGS data release of all findings.
- Identify two to three personal professional development goals to achieve during the internship, determine steps to achieve those goals, and report on that progress. Examples of professional development goals include developing professional skills, learning particular topics related to USGS, developing a broader professional network, or attending professional and/or academic conferences.
- Develop a novel XRF analytical project to work on with USGS staff and report out on the outcomes of the work.
- Presentation in the C-StREAM symposium at the conclusion of the fellowship summarizing the experiences gained and work conducted.
- Present your findings to USGS MD-DC-DE WSC staff at the conclusion of the fellowship summarizing your findings and experience.

Eligibility

- Must be a college-level student entering sophomore, junior, or senior year of undergraduate study in the fall of 2025 or current seniors graduating in May of 2025.

- Must be legally authorized to work in the United States as a US citizen or national, asylee, refugee, or lawful permanent resident and willing to undergo a security background check.

Desired Qualifications

- Willingness to engage in physically demanding work, typically taking place indoors with the possibility of exposure to outdoor sampling practices. If outdoors there should be the expectation of occasional adverse weather conditions and partial water immersion.
- Timeliness and ability to adhere to planned work schedules.
- Ability to maintain open and frequent communication with mentors using Microsoft Office applications.
- Basic knowledge of data structures such as spreadsheets and tables required. Experience with database and statistical software such as MS Access and R a plus.
- Some course and/or lab experience in the fields of chemistry, geomorphology, GIS analysis, and/or hydrology are encouraged but not required.
- Motivated, scientifically curious individuals with the ability to work proactively and reason independently, and willingness to inquire/recommend next steps toward project completion. Applicants should be comfortable thinking holistically about problems as interdisciplinary systems to be understood, and willing to think outside of their areas of expertise/familiarity.
- Ability to work well with others, and to seek out and incorporate feedback into work products.

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Work Location and Duration

We envision that this position will be an in-person position and will be based out of the MD-DC-DE Water Science Center in Catonsville, Maryland. Some field days may be required to familiarize the Fellow with field collection techniques. The fellowship is scheduled to begin on May 19, 2025, and end Friday, August 8, 2025. These are our preferred dates, but the dates can be adjusted to accommodate a student's school schedule if required. We plan on providing interns with access to a USGS computer, email and in-office phone services.

Compensation

The Fellow will receive a stipend at the end of each month, for a total of up to $6,000 for the equivalent of 12 weeks of full-time activities. Candidates should expect to follow a normal weekday work schedule (roughly 9-5, M-F) with occasional variations for possible field work or other activities. No benefits are provided. A one-time housing and transportation allowance of $1,000 is available to each Fellow to assist with living and transportation expenses. Funds are also available to compensate Fellows for occasional work-related travel and professional development activities.

Diversity and Inclusion

The Chesapeake Research Consortium and the USGS MD-DE-DC Water Science Center are committed to supporting a diverse and inclusive science-oriented workforce. Our fellowship program endeavors to recruit from a diverse, qualified group of potential applicants to secure a high-performing workforce drawn from all segments of American society. We are strongly supportive of broadening the participation of historically black colleges and universities, Hispanic serving institutions, tribal colleges and universities, and institutions that work in underserved areas. We highly encourage applications from students at any of the above institutions as well as students that identify as people of color, persons with disabilities, members of the LGBTQAI+ community, persons from economically disadvantaged backgrounds, and first-generation college students.

Application Instructions

Application instructions, required materials, and the C-StREAM application portal can be found on the C-StREAM website (http://chesapeake.org/c-stream/).

The deadline for applications is February 14, 2025.