

Authentic Undergraduate Geoscience Research (AUGR)

Bella Bennett

AGeS-DiG funding helped us develop and run an exploratory summer research program for undergrads - AUGR. Our model immersed participants in multidisciplinary geo- and environmental science research, beginning with field sampling and concluding with formal research presentations. We designed AUGR to meet several goals:

- 1) provide a financially and academically accessible research experience
- 2) Introduce students to widely applicable skills and concepts
- 3) Create and maintain a safe and fun learning environment
- 4) Facilitate the development of a supportive and enjoyable student cohort
- 5) Model collaborative and non-extractive research methods
- 6) Build multi-level and multi-institutional mentoring webs
- 7) Facilitate interactions with scientists across many STEM fields and career paths to expand participants' networks and perceptions of the STEM community
- 8) Create a space where students' can build confidence and a sense of belonging in the STEM community

The research project centered around using *in situ* cosmogenic ^{10}Be to measure background erosion rates. We incorporated synergistic field and lab methods to broaden the experience and learning outcomes. To focus and connect these learning experiences, we developed four research questions, shown in the figure below.

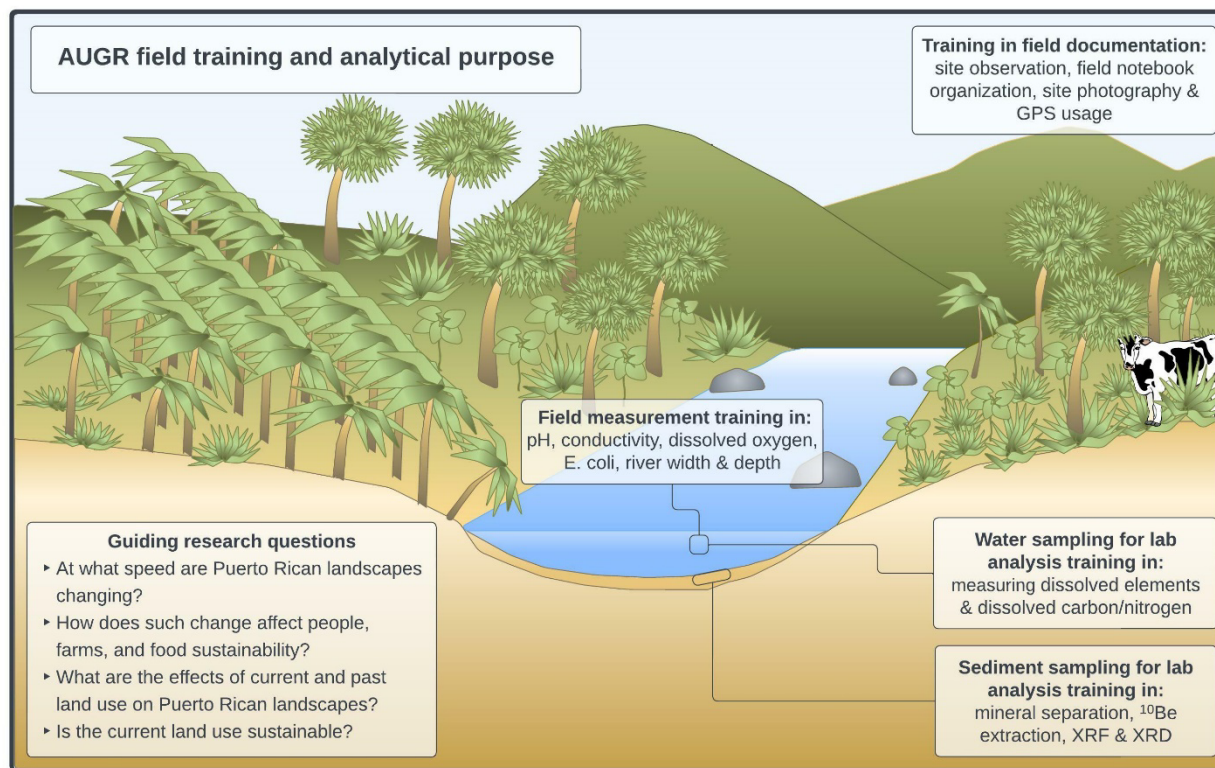


Figure by Bella Bennett

We ran the first iteration of AUGR during the summer of 2022, with an inaugural cohort of students from Jackson State University (MI) and the University of Puerto Rico system (PR). The program had six major components – shown in the illustration below.

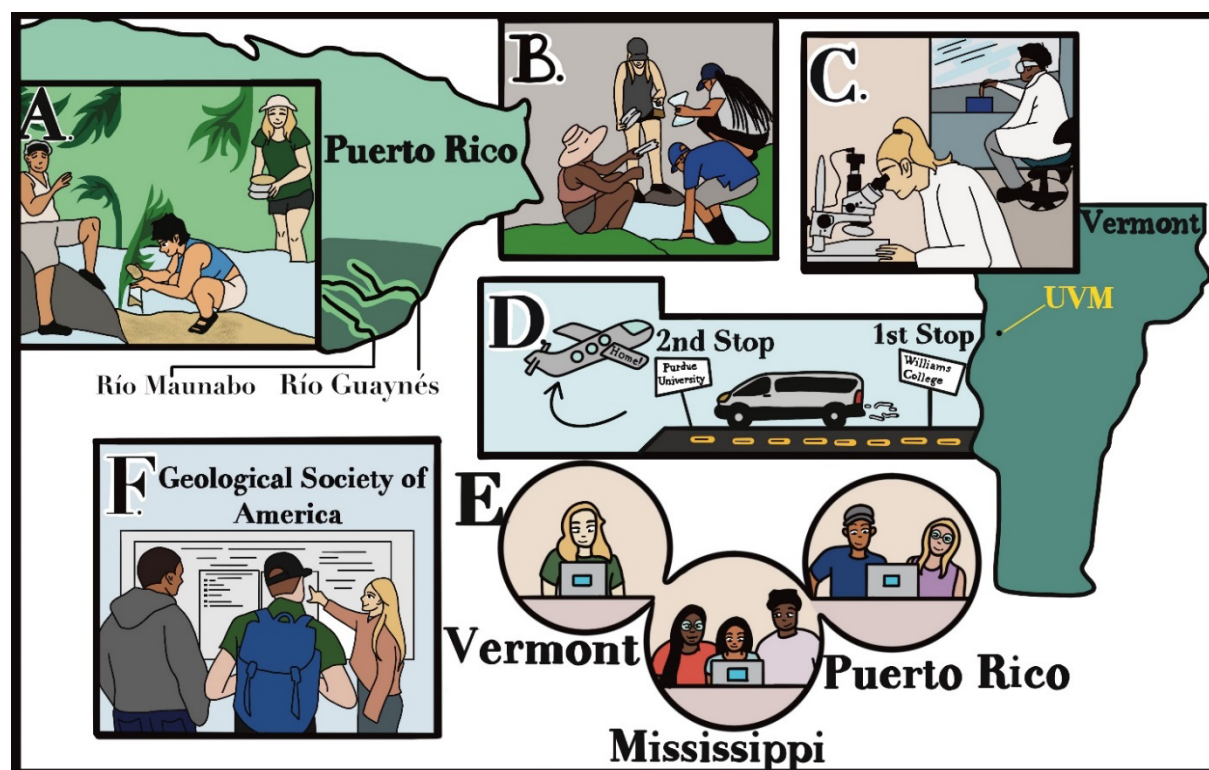


Illustration by Shay Taylor

First, the program co-leads, Bella Bennett (me) and Krizzia Soto-Villanueva, traveled to Puerto Rico to select accessible and scientifically relevant field sites and build connections with community members and stakeholders in the area (A). Then, after a successful application process, we met the five-student cohort for the first time in Puerto Rico, where we did a week of field training and sampling (B). Here, students learned to collect environmental data such as stream water conductivity, pH, and E. coli measurements. We also collected water and sediment samples, to be analyzed at a series of labs over the following three weeks. We then traveled as a group to Vermont, to begin three weeks of laboratory training and analysis (C). Here, students participated in the cosmogenic ^{10}Be extraction process to determine the background erosion rates in their field area, using samples from their field sites along Río Maunabo and Río Guayanes. During this visit, students also met and learned from more than a dozen environmental scientists, whose work spanned from spatial analysis using drones to pollinator research, to X-ray Fluorescence (XRF) analysis. With new data in hand, we hopped in a van for a science road trip (D). First, we visited Williams College in Williamstown, MA to work with collaborators Jay Racela and David Dethier on our water sample analysis. After measuring major cation and anion concentrations in each of our stream water samples, we drove to West Lafayette, IN, by way of Niagara Falls (a first for all of us) and Oberlin College. There, we met Marc Caffee and Thomas Woodruff, and watched the AMS count the beryllium atoms in our samples for a day.

After this exciting and intensive month of training, the students traveled to their homes for the rest of the summer, but their work wasn't done yet. Over the next three months, they worked remotely with AUGR leadership (E) to develop abstracts and posters for the 2022 annual Geological Society of America meeting in Denver, CO. We then reconvened in Denver in October to attend the meeting and gain skills and confidence presenting research in a conference setting (F). The conclusion of GSA 2022 was the official end of the AUGR experience.

We are presently evaluating the AUGR student experience through semi-structured interviews to assess how well this model met our goals and discern what elements of the program should be improved. We hope to continue to refine this model and implement this program again in the future, using the feedback from our inaugural cohort as the basis of future program development.

Some snapshots of the AUGR experience:

