

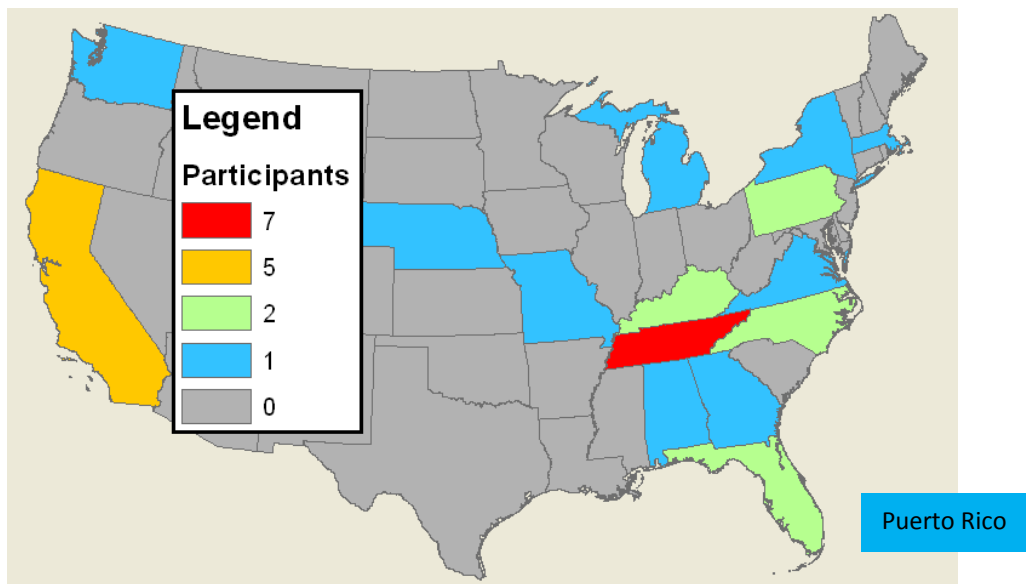
5. The *Geoenvironmental Challenges* Summer Research Experience for Pre-service STEM Teachers

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A First in Pre-service Teacher Education

The third and final cohort of ten pre-service STEM teachers completed the National Science Foundation (NSF) *Geoenvironmental Challenges* summer research experience during June and July, 2015 at Middle Tennessee State University (MTSU) in Murfreesboro, Tennessee. This Research Experience for Undergraduates (REU) was the Geosciences Directorate's first REU specifically designed for pre-service teachers. Each year, the project recruited five pre-service Earth science, three pre-service chemistry, and two pre-service biology middle school and high school teachers. *Geoenvironmental Challenges* participants were 67% female, 33% underrepresented minority, and 10% Asian. Participants were enrolled in universities all over the nation (including Puerto Rico), but most came from Tennessee and California (see Figure 1). Slightly more than half of participants were enrolled at universities where pre-service teacher research opportunities might be regarded as limited because the universities do not have replicates of the U-Teach pre-service teacher education program and the universities are not research university/very high activity or research university/high activity in the Carnegie classification scheme. The application process was fairly competitive in 2014 and 2015 with 90 and 95 applicants, respectively.

Table 1. *Geoenvironmental Challenges* pre-service teacher-participants by state.



What the Pre-service Teachers Did

As with most Geosciences Directorate REU's, the heart of *Geoenvironmental Challenges* was the involvement of pairs of pre-service teachers in nearly eight weeks of research mentored by a MTSU faculty member. Options included structural geology, water quality, pavement systems, air quality, and plant ecology research investigations. During the rest of the nine-week experience, participants were involved in a five-day field trip to Mammoth Cave and Great

Smoky Mountains National Parks, a single-day field trip to Nashville's Adventure Science Center, and other pre-service teacher professional development activities. In addition, participants were encouraged to present at the Geological Society of America (GSA) Annual Meeting during the year that followed their research experience. For example, some Summer 2014 participants will present at the 2015 GSA meeting in Baltimore, Maryland, and many Summer 2015 participants will present at the 2016 GSA meeting.

How the Pre-service Teachers Benefited

Because *Geoenvironmental Challenges* was the first of its kind, there was much to discover. Perhaps most significantly, a tension emerged every year between involvement in mentored research and all other project activities, and, every year, a majority of participants wanted to spend more time on their mentored research investigations. Consequently, participants spent less time outside of their mentored research investigations during each successive year.

Participants completed the Survey of Undergraduate Research Experiences (SURE III) every year and met with project evaluator Tom Cheatham at the mid-point of each summer experience. In addition, psychologist Herschell Parker facilitated pre- and post- experience focus groups during Summer 2015. Evaluation results suggest that the first year was problematic for various reasons related to project start-up, and that the first year was an outlier. SUREIII results show that the 2014 and 2015 cohorts thought their gains were especially large for the 5 items listed in Table 1. Mr. Parker's focus group report suggests that 2015 participants believed that the project benefited them because "they view field trips, scientific fieldwork, scientific research, and networking as experiences that will make them better science teachers." Other benefits included "developing new peer relationships and mentor relationships, learning new science content, and learning about citizen science." REU participants also thought they learned "new methodologies to teach science." Also, "all but one REU participant reported experiencing connections between classroom teaching, geoscience, environmental policy, and history."

Preliminary analysis of 2015 end-of-experience papers (n=9) show that 7 of the participants plan to involve pre-college students in citizen science, and 5 of the participants plan to involve pre-college students in field-based learning including field-based citizen science. Of the two participants who did not emphasize citizen science, field-based learning, or both, one plans to mentor science fair projects and involve students in research within a classroom setting, and the other plans to implement project-based learning. Participants who plan to involve students in citizen science, field-based learning, or both also mentioned incorporating research results into teaching, including a range of topics in their teaching to capture the attention of students who have varied interests, using hands-on activities, implementing student-centered group work, using the learning cycle, early research experiences, parental involvement in research and citizen science, research within a classroom setting, involvement in summer camps, mentoring science fair projects, and mentoring in general.

Table 1. Largest self-assessed participant gains (SURE III survey). 1=no gain or very small gain and 5=very large gain.

ITEM	2014 (n=11)	2015 (n=7)	ALL SUREIII RESPONDENT S (n=2,762)
Ability to integrate theory and practice	4.18	3.86	3.61
Understanding that scientific assertions require supporting evidence	4.09	3.86	3.59
Understanding how scientists work on real problems	4	4.43	3.82
Understanding the research process	3.91	3.86	3.89
Confidence in my potential as a teacher	3.82	3.86	3.19
MEAN	4.00	3.97	3.62

6. POSITION ANNOUNCEMENT: Geoscience Education at Western Washington University

Geoscience Education. Western Washington University invites applications for a tenure-track Assistant Professor starting September 2016, with a joint appointment between the Geology Department and the Science, Math, and Technology Education Program (SMATE). Western Washington University is a nationally recognized, public, masters-granting institution located in the Pacific Northwest at the base of the North Cascade Mountains. The Geology Department and SMATE Program are committed to WWU's goal of recruiting and retaining diverse faculty, and welcome applications from diverse candidates. The ideal candidate will enhance our existing strengths in geoscience teaching and science teacher preparation. An active research program in geoscience and/or geoscience education is expected. A Ph.D. by hire date is required. Please see the full position announcement for required and preferred qualifications: <https://jobs.wwu.edu/JobPosting.aspx?JPID=6652>. To apply, submit a curriculum vita, undergraduate and graduate transcripts, statements of teaching philosophy and research plans to WWU's Electronic Application System for Employment (linked to electronic job posting). In addition, arrange for three letters of recommendation to be mailed to chris.sutton@wwu.edu or Chris Sutton, Geology Department, Western Washington University, 516 High Street MS 9080, Bellingham WA 98226. Questions regarding this position should be directed to the search committee chair, Susan DeBari (susan.debari@wwu.edu). Review of applications begins December 21, 2015; position is open until filled. WWU is an EO/AA employer and encourages applications from women, minorities, persons with disabilities, and veterans.