Watersheds are a key feature of the geologic, hydrologic, and ecologic landscape. They are the fundamental unit in which many landscape-scale management decisions regarding vexing societal problems are addressed including erosion control, storm water management, contaminant transport, and water resource development. Typically, the study of watersheds and the training of watershed-science students and educators are fragmented with geologists addressing erosion, hydrologists gathering flow data, ecologists monitoring communities, and engineers designing remediation strategies. Students trained in specific disciplines often see only one part of a problem or one approach to characterizing the complex natural systems we call watersheds.

Given the scientific and societal importance of watersheds, we propose to develop, test, refine, and implement a new and different way of training undergraduate natural science and science education students as well as science educators: a four-week interdisciplinary watershed field camp that poses real-life questions that the students will answer in a series of reports. The camp will use a place-based model incorporating an intensive residential learning community, long a successful method of teaching geology in the field. However, our approach will depart from this education tradition in that we will incorporate faculty instructional teams from a variety of watershed-germane science disciplines including Geology, Hydrology, Engineering, and Ecology. The problems we pose to students, and the solutions they create, will require integration across disciplinary boundaries.

The Winooski River watershed, home to the field camp, stretches from the alpine peaks of the Appalachian Mountains to the urbanized, lowland margins of Lake Champlain, providing an ideal transect for training students in humid-temperate watershed systems. Students will work across a continuum of elevation and human impact beginning in paired high-altitude, mountain basins and working down tributaries and the main stem river to the lake. For each of 4 weeks, students will spend 3.5 days in the field, 1 day in the lab, and 1.5 days collating their data. They will learn specific data collection skills: landscape and geologic mapping using both traditional paper and state-of-the-art GPS tools; flow, water quality, physical property, and geochemical data acquisition both in the field and in laboratory; and, ecological assessment using a variety of proxy data. Higher-level, integrative skills will be refined by report writing and revision. Breadth and context will be augmented by repeated informal exposure to a variety of watershed professionals.

Intellectual merit

Our pedagogy is designed specifically to integrate disciplines in the training of watershed scientists and educators – a new approach and one critical to producing students and educators with a skill set and analytical capabilities needed to approach societally relevant issues in science and land management. Using a learning community, faculty will actively model the interdisciplinary approach needed to solve and teach difficult environmental problems at the watershed scale. Formative assessment of student learning and our pedagogical approaches will allow us to improve the camp structure and teaching approach over time. Summative assessment will determine whether the students in the camp achieved our stated learning goals.

Broader Impacts

Developing, implementing, refining, and disseminating a rigorously assessed, interdisciplinary watershed field camp will have significant and long-lasting impacts. Together, faculty will create and document a transportable pedagogical model with the goal of spawning similar camps in other regions. The female doctoral student coordinating this effort will gain leadership and curricular development experience under experienced mentors. Masters-level students involved as teaching assistants will practice working across disciplines in an intellectually diverse learning community. Science and education students trained to work across disciplinary boundaries will become far more adept problem solvers and thus be able to approach and teach relevant watershed science issues with greater facility and rigor. The inclusion of faculty at all ranks in our project team will facilitate peer-to-peer mentoring and enrichment. The field camp is a logical, synergistic outcome of the NSF-EPSCoR-supported integrated Research on Water in the Environment initiative at the University of Vermont, now in its fourth year.