WATER INNOVATION FOR THE FUTURE

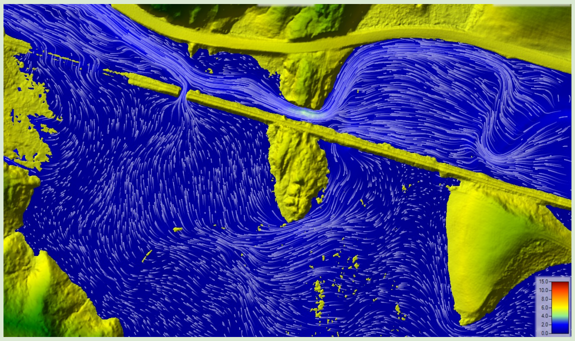
RESEARCH AREA

ENGINEERING HYDROLOGY & FLUVIAL GEOMORPHOLOGY

Monitoring, modeling, and predicting water resources above and below the Earth's surface is essential for effective management of the Nation's water resources. As climate change driven challenges of drought, groundwater contamination, increased flooding, and extreme events become ever more pressing, engineers play a vital role in developing predictive understanding of water resources. CEE efforts in this area focus on novel solutions to studying flood risks, erosion and sediment transport, groundwater contamination, stormwater management, and ecosystem responses.

Research Topics

Surface water hydrology
Stormwater management
Hydrogeology
Groundwater hydrology
Wetland conservation
Floodplain management



Graduate study in engineering hydrology and fluvial geomorphology aims to develop skills for tackling the ambitious challenge of leveraging engineering knowledge and systems thinking to understand how humanity can optimally change our infrastructure and lifestyles to respond to climate change. Highlighted courses are listed below:

Graduate Programs

Ph.D. in Civil & Environmental Engineering

M.S. in Civil & Environmental Engineering - thesis, project, and coursework-only options available

Students also work with CEE faculty while pursuing graduate programs in Natural Resources. Students will typically take a range of courses across engineering, statistics, computer science, complex systems, and natural resources. Highlighted coureses:

- CE260 - Hydrology
- CE262 - Advanced Hydrology
- CE263 - Applied River Engineering
- CE265 - Groundwater Hydrology
- CE395 - Stormwater Engineering
- CE395 - Data Science for Environmental Site Characterization
- GEOG246 - Snow Hydrology
- NR343 - Introduction to GIS
- NR243 - GIS Practicum

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Civil & Enviornmental Engineering

Engineering for the people and our planet

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ENGINEERING

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Water Innovation for the Future

The UVM CEE **Water Innovation for the Future** Initiative seeks to address grand challenges in water sciences including new technologies for treating of drinking water, recovery and treatment of wastewater, surface water management, characterizing groundwater and subsurface conditions, and harnessing the data revolution emerging across the water sciences. The ambitious challenge of leveraging engineering knowledge and systems thinking to understand how humanity can optimally change our infrastructure and lifestyles to respond to climate change is a driving force across our water research agenda.

We welcome researchers and students from a variety of backgrounds and disciplines to join us in this 21st century challenge.

Faculty

Kristen Underwood

Donna Rizzo

George Pinder

Arne Bomblies

Eric Roy

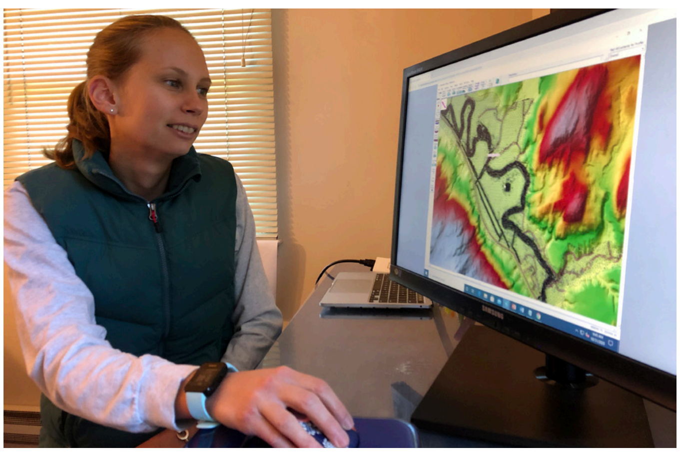
Scott Hamshaw

Joshua Faulkner

Research Funding and Partners

Research in this area is funded by federal and state agencies including the National Science Foundation, Department of Energy, U.S. Geological Survey, and state agencies. Additionally, CEE faculty often partner with local environmental research and consulting companies to bring additional capabilities (and opportunities for graduate students) to research projects.

Student Research



Optimizing tools to identify effective floodplains and river restoration techniques

Flooding events around the world account for billions (USD) in damages each year. For decades, engineers have combated flood related damages by implementing flood mitigation controls such as channelization, levees or berms, and armoring. Alternatively, floodplain reconnection allows floodwaters to overtop the channel banks more frequently to dissipate flood energies, slowing stream flow and decreasing damages. **Ph.D. student Lindsay Worley**'s research is developing new tools and approaches to allow planners to optimize both the location and techniques for floodplain reconnection.

Understanding hydrology and limiting phosphorus loss from agricultural lands

Agricultural runoff is one of largest contributors of phosphorus, nitrogen, and sediment affecting freshwater systems. However, limited data exists on the effects of best management practices (BMPs). To address this need, **M.S. student Cameron Twombl**y developed edge-of-field monitoring sites that were used to compare water-related ecosystem services provided by conventional and alternative management regimes. He then utilized watershed models to test the use of phosphorus runoff risk identification tools and develop recommendations for improving them to better account for field-scale hydrologic processes.