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 courses:

- 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
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.

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 Twombly 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.