For students seeking to pursue graduate work in the fall 2017, the following research opportunities are available in the River, Watershed, and Landscape Dynamics program, Department of Geography and Geographic Information Science, University of Illinois at Urbana Champaign (https://www.geog.illinois.edu). Please contact the faculty member or members identified with each project for more information.

**Geomorphology and sedimentology of bars and channels in the Amazon River, Brazil**
How do bars and channels evolve in large channels, such as the Amazon River, how does this differ to channels that are much smaller and how is their evolving geomorphology expressed in the subsurface? This project will assess the form and product of large bars and channels within the Solimões and Madeira rivers, Brazil, and focus on measurements of river morphology, flow structure and subsurface sedimentology. The project will involve close collaboration with colleagues in Brazil and provide an opportunity for an interdisciplinary study of the world's largest river.
Skills Preferred: a degree in Geography or Earth Sciences, with knowledge of survey techniques, GIS, remote sensing and fluvial geomorphology an advantage.
Faculty: Jim Best, jimbest@illinois.edu

**Spatial and temporal patterns of fish habitat: geomorphic, hydrological, and biotic controls.**
This research integrates multiple disciplines -- including geomorphology, hydrology, and ecology -- and diverse methods (e.g. field work, remote sensing & GIS, modeling) to better understand what controls distribution, quality, and dynamics of fish habitat in a dynamic, mountainous landscape. We examine scales ranging from microhabitat to watershed. This work will also directly inform specific river restoration activities. Current field sites include mountain watersheds in British Columbia and Washington State.
Skills Preferred: Background in geography, ecology, earth and environmental sciences, forestry, natural resources or other related discipline. Skills in GIS and/or remote sensing are an advantage but are not required.
Faculty: Piotr Cienciala (piotrc@illinois.edu)

**The Role of Large Wood in Sediment, Carbon, and River Dynamics in Midwestern Agricultural Landscapes**
This PhD-student opportunity, part of the NSF-funded Critical Zone Observatory in Intensively Managed Landscapes (http://criticalzone.org/iml), will examine the movement, storage, and arrangement of large wood in Midwestern rivers flowing through agricultural landscapes with forested riparian corridors. It will explore the influence of large wood on the movement and storage of sediment and particulate carbon within river channels and on floodplains. It will also investigate how large wood contributes to river morphodynamics through its effects on bar formation and channel change. The project will focus mainly on field work in the Sangamon River basin in Illinois, but may also include comparative analysis of watersheds in Iowa and Minnesota. This project offers an exciting opportunity to be part of a large interdisciplinary, multi-university research effort.
Skills Preferred: Bachelor's or Master's degree in Geography, Earth Science, Environmental Science or related field with a commitment to pursuing PhD level research. Training and field experience in geomorphology and/or biogeochemisty as well as a background in GIS and remote sensing would be advantageous.
Faculty: Bruce Rhoads, brhoads@illinois.edu

**Historical Reconstruction of Human-Water Relations in Central Valley, California**
This study is aimed at reconstructing the history of changing water systems, social uses and attitudes towards water in the Sacramento-San Joaquin River Basin, California. It will involve data analysis and synthesis and development of a distributed (stylized) numerical model that reproduces essential features of the changes that have occurred in the basin and their relationship to social, political and economic drivers. The model will be used to explore scenarios of future co-evolution of the coupled human-water system in the basin.
Skills Preferred: a degree in Geography, Earth Sciences or Civil Engineering. Knowledge of GIS and competence with computer programming would be considered an advantage.
Faculty: Murugesu Sivapalan, sivapala@illinois.edu

**The evolution of large meandering rivers: Wabash, Mississippi and Amazon**
This project will examine the evolution of large meandering rivers across channels of different scale, and seek to identify similarities and differences in the geomorphology and sedimentology of meandering channels, and processes of meander growth, evolution and cutoff. The project will largely focus on field study of modern channels and their depositional product, with the Wabash (IL-IN), Mississippi and Amazon rivers being target sites, and involve close collaboration with geoscientists in Brazil.
Skills Preferred: a degree in Geography or Earth Sciences, with knowledge of survey techniques, GIS, remote sensing and fluvial geomorphology/sedimentology an advantage.
Faculty: Jim Best, jimbest@illinois.edu and Drew Phillips (Illinois State Geological Survey), aphillps@illinois.edu

**Interactions between river channel and its riparian zone: geomorphic, hydrological, and ecological connectivity.**
This research examines the exchanges of water, sediment, and nutrients between river and its riparian zone/floodplain and their consequences for channel processes and riparian vegetation dynamics. To this end, we use a combination of field work, remote sensing, GIS, and modeling. Current field sites include California, British Columbia, and Washington State. Opportunities also exist to conduct this research in other rivers, especially in the Midwest.
Skills Preferred: Background in geography, ecology, earth and environmental sciences, forestry, natural resources or other related discipline. Skills in GIS and/or remote sensing are an advantage but are not required.
Faculty: Piotr Cienciala (piotrc@illinois.edu)

**Hydrodynamics, Morphodynamics, and Mixing at River Confluences**
This Master's- or PhD-student opportunity is part of an ongoing project funded by the National Science Foundation to determine the hydrodynamic and morphodynamic factors that control mixing of water, sediment, and dissolved constituents at river confluences. This project is part of an international collaborative effort involving colleagues at the University of Iowa and the Institute of Freshwater Ecology in Berlin, Germany. It includes field, laboratory, and numerical modeling components with opportunities for field work both in the midwestern United States and in Europe.
Skills Preferred: Bachelor's or Master's degree in Geography, Earth Science, Engineering, Environmental Science or related field. Training and field experience in geomorphology and/or hydrology would be advantageous.

Faculty: Bruce Rhoads, brhoads@illinois.edu

**Comparative Watershed Scale Study of Co-evolution of Coupled Human-Water Systems**
The proposed study is aimed at a comparative study of the long-term co-evolution of human-water system behavior in three different agricultural basins in Australia, China and the United States. The study will involve identifying emergent dynamics based on data analysis, discovering their causes through numerical modeling, and developing new theories of human-water system behavior through attribution of the similarity and differences between the basins to hydro-climatic and socio-economic factors.
Skills Preferred: a degree in Geography, Earth Sciences or Civil Engineering. Knowledge of GIS and competence with computer programming would be considered an advantage.
Faculty: Murugesu Sivapalan, sivapala@illinois.edu

**The geomorphology and sedimentary dynamics of river channel confluences**
River junctions form key elements within the fluvial landscape and are vital, and often dynamic, nodes of geomorphological, sedimentological and ecological change. This project will center around field work to investigate the evolving morphology of river confluences of different scale and relate this to the fluid dynamics of these sites and their depositional products. Field work will focus on sites in the USA, China and Brazil and seek to examine confluences of differing size, sediment characteristics and morphology, and involve close collaboration with colleagues in Europe, Brazil and China.
Skills Preferred: a degree in Geography or Earth Sciences, with knowledge of survey techniques, GIS, remote sensing and fluvial geomorphology/sedimentology an advantage.
Faculty: Jim Best, jimbest@illinois.edu

**Effects of turbulent flow characteristics on stream fish.**
This interdisciplinary and collaborative research will take advantage of some of the most advanced measurement techniques to examine in detail the relationship between fish and their hydraulic habitat, with particular focus on turbulent flow characteristics. The first, experimental phase on this work will be conducted in the laboratory facilities on UIUC campus. The second phase will be conducted in the field. The project involves collaboration of faculty in the RWLD program with UIUC faculty in the Department of Natural Resources and Environmental Sciences and the Department of Civil and Environmental Engineering.
Skills Preferred: Background in geography, ecology, earth and environmental sciences, engineering, or other related discipline.
Faculty: Piotr Cienciala (piotrc@illinois.edu) and Bruce Rhoads (brhoads@illinois.edu)

**The Influences of Human Landscape Modification and Watershed Geomorphology on Spatial Patterns of Sediment Flux within Midwestern Agricultural Watersheds**
This PhD-student opportunity, part of the NSF-funded Critical Zone Observatory in Intensively Managed Landscapes (http://criticalzone.org/iml), seeks to determine the extent to which human factors, along with geomorphic characteristics of watersheds inherited from glacial and post-glacial conditions, influence spatial patterns of fine sediment transport and storage within intensively managed agricultural landscapes. The project will focus mainly on field work in the Sangamon River Basin in Illinois, one of the watersheds in the IML-CZO, but may include comparative analysis of watersheds in Iowa and Minnesota. It may also involve modeling of

sediment dynamics at the watershed scale. This project offers an exciting opportunity to be part of a large interdisciplinary, multi-university research effort.
Skills Preferred: Bachelor's or Master's degree in Geography, Earth Science, Environmental Science or related field with a commitment to pursuing PhD level research. Training and field experience in geomorphology and/or hydrology as well as a background in GIS and remote sensing would be advantageous.
Faculty: Bruce Rhoads, brhoads@illinois.edu

**Socio-hydrologic Modeling and Synthesis to Understand the Causes of Water Scarcity**
A meta-analysis of water security problems around the world (Srinivasan et al., 2012) produced a typology, in the form of six "syndromes": groundwater depletion, ecological destruction, drought-driven conflicts, unmet subsistence needs, resource capture by elite, and water reallocation to nature. The goal of the proposed study is to develop generic (as opposed to place-based) socio-hydrologic models that can reproduce some of these emergent phenomena, elucidate the underlying hydro-climatic and socio-economic causes, and explore trajectories of future system behavior under changing conditions.
Skills Preferred: a degree in Geography, Earth Sciences or Civil Engineering. Knowledge of GIS and competence with computer programming would be considered an advantage.
Faculty: Murugesu Sivapalan, sivapala@illinois.edu

**Evolution of Cutoffs and Oxbow Lakes on Meandering Rivers**
The goal of this project is to explore how different configurations of cutoffs influence subsequent patterns of deposition that lead to the formation of oxbows lakes on meandering lowland rivers. It will also examine spatial and temporal patterns of deposition within oxbow lakes and the factors that control these patterns. The project will involve remote sensing analysis of historical channel change, field investigation of cutoff/oxbow lake morphology and sedimentation, and modelling of hydraulic conditions and sediment dynamics within evolving cutoffs and oxbow lake environments. Field sites include cutoffs and oxbows lakes along the Wabash River and other lowland rivers in the Midwest.
Skills Preferred: Bachelor's or Master's degree in Geography, Earth Science, or Environmental Science or related field. Training and field experience in geomorphology and/or sedimentology, as well as a background in GIS, remote sensing, and surveying, would be advantageous.
Faculty: Bruce Rhoads, brhoads@illinois.edu and Drew Phillips, Illinois State Geological Survey, aphillps@illinois.edu

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