PhD in Natural Resources with Emphasis in Water Resources

The Water Resources emphasis area is an interdisciplinary graduate degree program within the School of Natural Resources. It encompasses all fields of natural sciences represented in the School and, through collaboration, involves related expertise from throughout the University of Missouri and beyond. Participating faculty in the Water Resources emphasis area are engaged in both the scientific understanding of water resources (biological, chemical and physical) and its management, and the decision-making processes used to address competing societal values (social, economic and legal). The program has no geographic boundaries but the location of MU suggests most research will be directed to better understanding of water movement, biogeochemical cycling and biological processes of forested-agricultural and urban landscapes of the midcontinent. The lakes, rivers, streams, wetlands and subsurface waters of the region are prime areas for basic and applied research. One of the program's major global impacts is the training of highly qualified graduate professionals that are equipped to address many of the complex contemporary water resource problems around the world.

The Water Resources graduate emphasis area offers Ph.D. degree programs specializing in (but not limited to) the occurrence, circulation, distribution, chemical and physical properties, and environmental interaction of surface and subsurface waters, including groundwater. Specific areas of investigation could include lakes and reservoirs, floods and droughts, groundwater aquifers, water use, water quality, water contamination, plant water use, measurement methods, hydrologic modeling and international water resources.

Participating faculty in the Water Resources emphasis area are engaged in both scientific understanding of water resources (biological, chemical and physical) and its management, and the decision-making processes used to address competing societal values (social, economic and legal). The program has no geographic boundaries but benefits from a distinct midcontinent climate, and physiography. Multi-use watersheds (e.g., forest, agriculture, urban), streams, lakes, rivers, wetlands and subsurface waters are ideal areas for basic and applied research that is easily transferable to other regions. One of the program's major global impacts is the training of highly qualified graduate professionals that are equipped to address many of the complex contemporary water resource problems around the world.

Upon successful completion of the School of Natural Resources Water Resources graduate program, students will possess strong technical skills in water resources and related sub-disciplines. Graduates will have developed a holistic understanding of the hydrologic cycle related to ecosystem processes as and the interdisciplinary background necessary to understand and address contemporary water resources problems. Graduates will have an appreciation of the complex interactions of biophysical processes and tightly coupled socioeconomic interactions necessary to implement water resource policy.

Degree Requirements

Please see the PhD in Natural Resources (http://catalog.missouri.edu/undergraduategraduate/collegeofagriculturefoodandnaturalresources/phd-naturalresources/phd-naturalresources) page for major program requirements in addition to the emphasis area requirements below, including information on qualifying and comprehensive examinations.

Must take at least 9 credit hours from the following:

**Aquatic Ecosystem Science**
- F_W 8460 Wetland Ecology 3
- F_W 8520 Stream Ecology 3
- NAT_R 7001 Topics in Natural Resources 1-99
- NAT_R 7300 Methods in Aquatic Ecology 3
- NAT_R 7100 Lake Ecology 3
- FOREST 7390 Watershed Management and Water Quality 3
- NAT_R 8450 Advanced Limnology (offered Spring 2020) 3

**Climate and Climatology**
- ATM_SC 7400 Micrometeorology 3
- ATM_SC 7590 Radar Meteorology 3
- ATM_SC 9300 Introduction to Chaos Theory 3
- ATM_SC 8400 Atmospheric General Circulation 3
- ATM_SC 8600 Advanced Climate Dynamics 3

**Hydrologic Science and Water Quality**
- ATM_SC 7550 Physical Meteorology 3
- ENV_SC 7320 Hydrologic and Water Quality Modeling 3
- ENV_SC 7305 Environmental Soil Physics 3
- ENV_SC 7306 Environmental Soil Physics Laboratory 2
- CV_ENG 7710 Soil and Water Conservation Engineering 3
- ENV_SC 8400 Solute Transport in the Vadose Zone 3
- GEOL 7130 Groundwater Modeling 3
- GEOL 8240 Hydrogeologic Processes 3
- GEOL 7100 Groundwater Hydrology 3

**Water Management Technology**
- NAT_R 8290 Hydrologic Measurement and Synthesis 2
- ATM_SC 7510 Remote Sensing for Meteorology and Natural Resources 3
- ATM_SC 7590 Radar Meteorology 3
- ATM_SC 9590 Advanced Applications of Weather Radar 3

**Elective Courses**
- AG_S_M 7420 Surface Water Management 3
- AG_S_M 7440 Water Quality and Pollution Control 3
- AG_S_M 7460 Irrigation and Drainage 3
- CV_ENG 7230 Introduction to Water Quality 3
- CV_ENG 7240 Water Quality Analysis 3
- CV_ENG 7290 Wastewater Treatment and Process Design 3
- CV_ENG 7700 Hydraulics of Open Channels 3
- CV_ENG 8200 Water Quality Modeling 3
- CV_ENG 8215 Environmental Transport Phenomena 3
- CV_ENG 8225 Aquatic Chemistry 3
- CV_ENG 8270 Design of Water and Wastewater Treatment Facilities 3
- GEOL 7300 Introduction to Low-Temperature Geochemistry 3
- GEOL 7500 Organic Geochemistry 3
Admissions

Water Resources program applicants must meet the general requirements set forth by the University of Missouri Office of Graduate School for the Ph.D. degree, and meet any additional application criteria of the Water Resources graduate emphasis area. Students often self-fund, apply for teaching assistantships, or are supported by grant-funded research assistantships. Other opportunities may be available to eligible students. Applicants should contact specific faculty to determine the availability of position(s) in the potential advisor’s research program and assistantships or scholarships prior to applying. If encouraged to apply by Water Resources faculty, please apply through the University of Missouri’s online application program.

Director of Graduate Studies:

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