# 2020-2021 Curriculum Guide for Master of Science degree program with a specialization in WATER ISSUES

As a part of the Ohio State Environmental Sciences Graduate Program (ESGP), this specialization focuses on issues relating to water. Research on Earth’s water is interdisciplinary and requires the ability to bridge social and natural sciences and engineering. The water issues specialization research areas include:

- Water quantity, hydrologic forecasting and remote sensing
- Water quality and the role of water in biogeochemical cycles
- The relationship between the human activities, aquatic ecosystems services and conditions, and public health
- Water contaminant fate and ecotoxicity
- Collaborative watershed planning and transboundary water governance

Students admitted to the MS degree program are assigned a faculty advisor who will provide guidance throughout the program. Students are encouraged to get to know their advisor and meet with him/her at least twice each semester. This document serves as a resource to be used by the student and the advisor in planning a program with a specialization in WI, but is not inclusive of all important degree, college(s), and university requirements. All students are expected to be familiar with the ESGP Handbook (https://esgp.osu.edu/sites/default/files/2020-08/esgp_handbook_2020-2021.pdf) and with The Graduate School handbook (available at http://www.gradsch.ohio-state.edu/).

## PROGRAM OF STUDY

The MS-Water Issues curriculum consists of a minimum of 30 credits.

### ESGP Required Courses (13 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVSCI 7899</td>
<td>ESGP Seminar</td>
<td>1, 1, 1 (3 credits total)</td>
</tr>
<tr>
<td>ENR 8890.02</td>
<td>Ecological Restoration Seminar</td>
<td>1 credit</td>
</tr>
<tr>
<td>Biological Science</td>
<td>Select from courses in Appendix</td>
<td>3 credits</td>
</tr>
<tr>
<td>Physical Science</td>
<td>Select from courses in Appendix</td>
<td>3 credits</td>
</tr>
<tr>
<td>Social Sciences &amp; Policy</td>
<td>Select from courses in Appendix</td>
<td>3 credits</td>
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</tbody>
</table>

### Electives (3 credits)

With advisor’s guidance and ENR 5280 approval, select from the following list of ESGP courses:

- Stream Ecology 4 credits
- Methods in Aquatic Ecology 4 credits
- Aquaculture 3 credits
- Watershed Ecology and Restoration 3 credits
- Transport Phenomena in Water Resources Engineering 3 credits
- Remote Sensing of Environment 3 credits
- Numerical Models in Water Resources Engineering 3 credits
- Advanced Environmental Biotechnology 3 credits
- Environmental Engineering Unit Operations 3 credits
- Advanced Oceanography 3 credits

*****Questions regarding the student’s program of study should be directed to their advisor*****
EARTHSC 5655  Land Surface Hydrology  3 credits
EARTHSC 5751  Quantitative Ground-Water Flow Modeling  4 credits
EARTHSC 5752  Contaminants in Aqueous Systems  4 credits
FABENG 5730  Design of Agricultural Water Management Systems  3 credits
FABENG 5750  Stream Geomorphology and Watershed Hydrology  3 credits

Research Credits (14 credits)

Research hours in advisor’s home department  14 credits minimum

Grade Policy:
In addition to the general Graduate School requirements of a cumulative grade point average of 3.0 or higher, students must meet specific college policies regarding grades in courses.

Support Staff

Environmental Sciences Graduate Program
(614) 292-9762/Smith Laboratory/174 W. 18th Ave/Columbus, Ohio/43210/esgp.osu.edu

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Appendix

Core and Elective Courses in Biological Sciences

The objective of this core course area is to ensure that students are familiar with the diversity and functioning of organisms and the interactions among species and between organisms and the environment. Because the environmental sciences focus on the relationships between living organisms and their environment, the basic principles of ecology and a solid understanding of ecosystems structure and function is the focus of the ESGP core. This understanding can be gained through coursework that focuses on a particular taxon or a particular kind of ecosystem but must be broadly applicable to any environment.

**Evolution, Ecology and Organismal Biology**

<table>
<thead>
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<tbody>
<tr>
<td>EEOB 5420</td>
<td>Aquatic Ecosystems- Ecology of Inland Waters</td>
<td>1.5-4</td>
<td></td>
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<tr>
<td>EEOB 6210</td>
<td>Ecotoxicology</td>
<td>2-4</td>
<td></td>
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**Environmental and Natural Resources**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>ENR 5250.01 and ENR 5250.02</td>
<td>Wetland Ecology and Restoration and Field Laboratory</td>
<td>3</td>
<td>AU</td>
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</tbody>
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**Public Health**

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<tr>
<th>Course Code</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PUBHEHS 7360</td>
<td>Water Contamination: Sources and Health Impact</td>
<td>3</td>
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</tbody>
</table>

**Core and Elective Courses in Physical Sciences**

The objective of this core area is to provide an understanding of physical structure and processes in which ecosystems must function. Physical structure includes soil, water, air, geological media, climate, nutrients, and contaminants. Physical science processes include movement of “abiotic” matter and energy through ecosystems. Core courses must (1) study fundamental physical, hydrological, chemical, or biogeochemical processes and (2) study and emphasize the effects of physical structure and processes on ecosystem biotic components and function and the interactions between the biotic and abiotic components of the ecosystem.

**Environment and Natural Resources**

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<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>ENR 5273</td>
<td>Environmental Fate and Impact of Contaminants in Soil and Water</td>
<td>3</td>
<td>SP</td>
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**Civil and Environmental Engineering**

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>CIVILEN 5130</td>
<td>Applied Hydrology</td>
<td>3</td>
<td></td>
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<tr>
<td>ENVENG 6100</td>
<td>Environmental Engineering Analytical Methods</td>
<td>3</td>
<td>SP</td>
</tr>
<tr>
<td>ENVENG 5430</td>
<td>Principles of Risk Assessment</td>
<td>3</td>
<td>SP</td>
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**Earth Sciences**

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<tbody>
<tr>
<td>EARTHSC 5621</td>
<td>Introduction to Geochemistry</td>
<td>3</td>
<td>AU</td>
</tr>
<tr>
<td>EARTHSC 5651</td>
<td>Hydrogeology</td>
<td>3</td>
<td>AU</td>
</tr>
<tr>
<td>EARTHSC 5718</td>
<td>Aquatic Geochemistry</td>
<td>3</td>
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**Food, Agricultural and Biological Engineering**

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<th>Term</th>
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<tbody>
<tr>
<td>FABENG 5550</td>
<td>Design of Sustainable Waste Management Systems</td>
<td>3</td>
<td>SP</td>
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</tbody>
</table>

**Core and Elective Courses in Social Sciences and Policy**

The objective of the social science core is to provide an understanding of concepts related to the study of human society and/or individuals and their relationships to the structure and function of the ecosystem(s) of which they are a part. Methodology includes a range of approaches, both qualitative and quantitative. Core social science courses must engage social science in a combined theoretical and/or applied study of a physical, cultural, regulatory, or economic relationship between humans and the natural and physical environment.

**Environment and Natural Resources**

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<tbody>
<tr>
<td>ENR 5451</td>
<td>Water Law</td>
<td>3</td>
<td>SP</td>
</tr>
<tr>
<td>ENR 8350</td>
<td>Ecosystem Management Policy</td>
<td>3</td>
<td>AU</td>
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**Law**

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<th>Course Code</th>
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<th>Credits</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law 8890.02</td>
<td>Environmental Law</td>
<td>2-4</td>
<td>AU</td>
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</tbody>
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**Water Issues Faculty**

Heather Allen  
Joel Barker  
Nick Basta  
Gil Bohrer  
Larry Brown  
Costa Michael  
Durand Casey  
Rattan Lal  
Roman Lanno  
Jiyoung Lee  
Allison MacKay  
Andy May  
Mark Moritz  
Paula Mouser  
Susan Olesik  
Shaurya Prakash  
Virginia Rich  
Mazeika Sullivan  
Linda Weavers  
Dale White  
Kelly Wrighton

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