

ENVIRONMENTAL SCIENCES, MS

Please click here (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/>) to see Geography and Environmental Sciences department information.

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Overview

Environmental Sciences is a multidisciplinary study of the natural/physical environment. Academic fields involved in environmental sciences include chemistry, biology and ecology, physics, geology, geography, anthropology, engineering, political science, law, economics and the health sciences. Students planning to pursue the MS in Environmental Sciences must either have earned a bachelor's degree or have taken significant course work in the natural/physical sciences or engineering and completed several other prerequisites (see the following graduate information).

Environmental careers encompass a broad range of professions, from those with a strong foundation in the natural/physical sciences or engineering to those based in the social sciences and/or humanities. Students interested in environmental issues and careers should investigate all our program options and specializations before deciding which path to follow. At CU Denver, the MS in Environmental Sciences emphasizes the natural/physical sciences and engineering with the addition of the social sciences and humanities.

The MS in Environmental Sciences degree is designed to provide training in natural/physical sciences and social sciences. The goals of the program are (1) to enhance the interdisciplinary communication and analytical skills of the student, and (2) to provide a multidisciplinary approach for intensive and hands-on studies of particular environmental issues. Students will receive instruction in the physical and biological dynamics of various ecosystems, environmental engineering and socioeconomic issues associated with environmental analysis.

Graduates of the MS in Environmental Sciences program are involved in many different areas, such as reviewing environmental impact statements, monitoring groundwater quality or air quality and communicating with the public. Our students have great success finding employment in various agencies (U.S. Environmental Protection Agency, U.S. Geological Survey, Colorado State Department of Public Health and Environment) and private-sector environmental consulting and engineering firms.

These program requirements are subject to periodic revision by the academic department, and the College of Liberal Arts and Sciences reserves the right to make exceptions and substitutions as judged necessary in individual cases. Therefore, the College strongly urges

students to consult regularly with their program advisor to confirm the best plans of study before finalizing them.

Financial Aid

There are four types of financial aid available: student hourly teaching assistantship; research assistantship positions funded by grants to specific program faculty; paid internships and part-time employment organized through the department with professional organizations; and the regular package of financial aid (primarily loans) available through the financial aid office on the Denver campus. Our program also accommodates working students and offers many of core classes one/week or in the evening to accommodate work schedules. Incoming students will be automatically considered for program-distributed assistance at the time of admission to the program. Continuing students will be regularly apprised of available aid and positions. All other aid should be requested through the CU Denver Financial Aid Office, Student Commons Building 5th floor, Campus Box 125, P.O.Box 173364, Denver, CO 80217-3364. Telephone: 303-315-1850.

Internships

Students in the MS in Environmental Sciences program are strongly encouraged to contact the Experiential Learning Center for internships and paid positions related to environmental sciences. The Experiential Learning Center is located in the Tivoli Student Union, Suite 260. Telephone: 303-556-2250. The LynxConnect Career Center also located in the Tivoli Student Union Suite 439. Many students have had internships in federal agencies, such as the U.S. Environmental Protection Agency and the U.S. Geological Survey.

Graduate Education Policies and Procedures apply to this program.

Program Requirements

1. Students must complete a minimum of 36 credit hours from approved courses.
2. Students must complete a minimum of 36 graduate (5000-level) or higher credit hours.
3. Students must earn a minimum grade of B (3.0) or better in all core courses, a B- (2.7) in all other courses applied to the degree and must achieve a minimum cumulative program GPA of 3.0. All graded attempts in required and elective courses are calculated in the program GPA. Courses taken using P+/P/F or S/U grading cannot apply to degree requirements.
4. Students must complete all coursework with CU Denver faculty.

Program Restrictions, Allowances and Recommendations

1. Many of the elective courses have prerequisites; student must have met these requirements in order to take the course.
2. A given course may only be used for one option, even if it is listed in several options. Other courses maybe offered that will be acceptable as electives with approval of the option advisor and the director of the program.
3. Courses applied to either a certificate* or an MS degree may later be applied toward the other if all pertinent coursework is completed within a five year time period.
4. Students should fill out and submit all relevant department forms for their files. Importantly, all petitions for course substitutions and

identification of where courses fit as electives, with the subsequent approval/denial, should be submitted to this file.

5. By the end of the first semester, each student should identify and declare whether or not they are pursuing the thesis or non-thesis option. If intending to pursue the thesis option, the student should identify and gain agreement from a content advisor for guiding the thesis, filling out and submitting the appropriate departmental form.
6. Students may count up to six credit hours of independent study, with a maximum of three credit hours per independent study towards elective credit in the major as approved by the Graduate Director. No more than three credit hours of independent study may be taken with the same instructor and they may not be taken in the same term.
7. Students may count up to six credit hours of internship in total, but three credit hours per internship and per entity (sponsorship may be with same professor sponsor).
8. Students may not count 4000-level courses towards electives in the program; this may be petitioned to the Graduate Committee in exceptional cases.
9. Students may take a maximum of two online courses, or petition to the GES Graduate Committee beyond two.
10. Students may enroll in thesis preparation and writing hours only after submission of a signed committee form, which requires approval of the thesis proposal.
11. Students will not receive a grade for thesis preparation and writing hours until the thesis is successfully defended.
12. Students must follow the graduate admissions deadlines for submission of paperwork for the graduation application, comprehensive exam, and any other deadlines. Links to these can be found on the GES/MS website.
13. Work submitted for the environmental sciences options must have a grade of B (3.0) or better.
14. All students must complete two GES-approved, graduate-level techniques/methods-based class (not including the practicum).
15. Elective credits may be completed using up to three credit hours of Independent Study and/or three credit hours of Internship Study.
16. The Geospatial, Environmental Education, and Sustainable Urban Agriculture options of the program lead towards independent graduate certificates. These certificates may be earned without entrance into the MS in environmental sciences program. (See the Geographic Information Science Graduate Certificate, Sustainable Urban Agriculture Graduate Certificate, and Environmental Science Education Graduate Certificate descriptions.)
17. The number of credits required to reach 36 total credits will depend on (a) whether a student is on Plan 1 or Plan 2, and (b) how many credit hours are compiled in the core classes.
18. See the MS in Environmental Sciences courses are offered in both GES and our partner departments. The degree is offered through the College of Liberal Arts and Sciences with the cooperation of the College of Engineering, Design and Computing. In addition, some courses offered by the College of Architecture and Planning, the School of Public Affairs and the Business School are relevant and applicable to the program.

The MS in Environmental Sciences is a 36-hour program that provides students with two alternate plans: Plan I is a thesis path, while Plan II is a non-thesis path.

| Code | Title | Hours |
|---|--|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| ENVS 6002 | Research Topics in Environmental Sciences | |
| GEOG 5265 | Sustainability in Resources Management | |
| | or GEOG 5448 Science, Policy and the Environment | |
| <i>Complete a minimum of 12 Physical/ Ecological Core credit hours, with one course from each of the content spheres: atmosphere, biosphere, hydrosphere, lithosphere/cryosphere.</i> | | 12 |
| Atmosphere | | |
| ENVS 5720 | Climate Change: Causes, Impacts and Solutions | |
| ENVS 5730 | Air Quality Modeling and Analysis | |
| Biosphere | | |
| ENVS 5010 | Landscape Biogeochemistry | |
| ENVS 5731 | Mountain Biogeography | |
| ENVS 5750 | Beeography: Geography of Bees | |
| Hydrosphere | | |
| ENVS 5280 | Environmental Hydrology | |
| ENVS 5410 | Aquatic Chemistry | |
| GEOG/GEOL 5251 | Fluvial Geomorphology | |
| Lithosphere/Cyrosphere | | |
| ENVS 5340 | Equity & Culture in Science Education: Local/ Global | |
| ENVS 5740 | Soil Science and Geography | |
| GEOG 5240 | Applied Geomorphology | |
| <i>Complete a minimum of 12 elective credits from the approved elective list or complete the required coursework for a specialization option.¹</i> | | 12 |
| Approved Elective Courses (p. 3) | | |
| Climate Systems (p. 3) | | |
| Ecosystems (p. 3) | | |
| Environmental Health (p. 3) | | |
| Environmental Science Education (p. 4) | | |
| Environmental Science, Policy and Management (p. 4) | | |
| Geospatial Analysis Option (p. 4) | | |
| Sustainable Urban Agriculture (p. 4) | | |
| Water Systems (p. 4) | | |
| <i>Complete the Thesis or Non-Thesis option to complete the degree.</i> | | 6 |
| Plan I Thesis Option (p. 4) | | |
| Plan II Non-Thesis Option (p. 4) | | |
| Total Hours | | 36 |

¹ To fulfill the elective requirement, students may choose to fulfill one of the following Specialization Options offered in environmental sciences: Climate System; Ecosystems; Environmental Health; Environmental Science Education; Environmental Science, Policy and Management; Geospatial Analysis; Sustainable Urban Agriculture; or Water Systems. Students must have the prerequisites for each course and must meet the requirements listed in the notes below. Contact the option advisor for the particular option of interest

before starting. Upon graduation, the option will be noted on the student's transcript.

Electives

| Code | Title | Hours |
|--|--|-------|
| <i>Complete 12 elective credits from the following</i> | | 12 |
| BIOL 5154 | Conservation Biology | |
| BIOL 5335 | Plant Structure and Development | |
| BIOL 5345 | Flora of Colorado | |
| BIOL 5415 | Applied Microbial Ecology | |
| BIOL 5460 | Environmental Toxicology | |
| BIOL 6764 | Biological Data Analysis | |
| CVEN 5333 | Surface Water Hydrology | |
| CVEN 5334 | Groundwater Hydrology | |
| CVEN 5335 | Vadose Zone Hydrology | |
| ENVS 5020 | Earth Environments and Human Impacts | |
| ENVS 5305 | Water Quality and Resources | |
| ENVS 5450 | Urban Food and Agriculture: Perspectives and Research | |
| ENVS 5460 | Sustainable Urban Agriculture Field Study I | |
| ENVS 5470 | Sustainable Urban Agriculture Field Study II | |
| ENVS 5650 | Environmental Education | |
| ENVS 5939 | Internship | |
| ENVS 6200 | Risk Assessment | |
| ENVS 6230 | Environmental Epidemiology | |
| ENVS 6800 | Community-Based Research Practicum | |
| ENVS 6840 | Independent Study: ENVS | |
| GEOG 5050 | Applied Spatial Statistics | |
| GEOG 5060 | Remote Sensing I: Introduction to Environmental Remote Sensing | |
| GEOG 5070 | Remote Sensing II: Advanced Remote Sensing | |
| GEOG 5080 | Introduction to GIS | |
| GEOG 5081 | Cartography | |
| GEOG 5085 | GIS Applications for the Urban Environment | |
| GEOG 5090 | Environmental Modeling with Geographic Information Systems | |
| GEOG 5091 | Open Source Software for Geospatial Applications | |
| GEOG 5092 | GIS Programming and Automation | |
| GEOG 5095 | Deploying GIS Functionality on the Web | |
| GEOG 5230 | Hazard Mitigation and Vulnerability Assessment | |
| GEOG 5235 | GIS Applications in the Health Sciences | |
| GEOG 5335 | Contemporary Environmental Issues | |
| GEOG 5350 | Environment and Society in the American Past | |
| GEOG 5420 | The Politics of Nature | |
| GEOG 5710 | Disasters, Climate Change, and Health | |
| GEOG 5995 | Global Study Topics | |
| GEOG 6700 | Integrated Methods | |
| GEOG 6800 | Community-Based Research Practicum ¹ | |

¹ Thesis students may also count ENVS 6800 Community-Based Research Practicum as an elective (the course is required for non-thesis students).

Climate Systems

Advisors: Ben Crawford (Benjamin.Crawford@ucdenver.edu) & Kathy Kelsey (%20Katharine.Kelsey@ucdenver.edu)

| Code | Title | Hours |
|--|--|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| ENVS 5500 | Topics in Environmental Sciences (Urban Climate and Air Quality) | |
| ENVS 5720 | Climate Change: Causes, Impacts and Solutions | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| ENVS 5010 | Landscape Biogeochemistry | |
| ENVS 5730 | Air Quality Modeling and Analysis | |
| ENVS 5731 | Mountain Biogeography | |
| GEOG 5270 | Glacial Geomorphology | |
| Total Hours | | 12 |

Ecosystems

Advisor: Christy Briles (Christy.Briles@ucdenver.edu)

| Code | Title | Hours |
|--|---|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| BIOL 5415 | Applied Microbial Ecology | |
| ENVS 5010 | Landscape Biogeochemistry | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| BIOL 5154 | Conservation Biology | |
| BIOL 5335 | Plant Structure and Development | |
| BIOL 5345 | Flora of Colorado | |
| BIOL 5415 | Applied Microbial Ecology | |
| BIOL 5460 | Environmental Toxicology | |
| BIOL 6764 | Biological Data Analysis | |
| ENVS 5410 | Aquatic Chemistry | |
| ENVS 5720 | Climate Change: Causes, Impacts and Solutions | |
| ENVS 5740 | Soil Science and Geography | |
| ENVS 5750 | Beeography: Geography of Bees | |
| ENVS 5731 | Mountain Biogeography | |
| Total Hours | | 12 |

Environmental Health

Advisor: Peter (Peter.Anthamatten@ucdenver.edu)Anthamatten

| Code | Title | Hours |
|---|---|-------|
| <i>Complete a minimum of one of the following methods courses:</i> | | 3 |
| BIOS 6601 | Applied Biostatistics I | |
| GEOG 5235 | GIS Applications in the Health Sciences | |
| ENVS 6220 | Toxicology | |
| | or EHOH 661 Toxic Effects of Environmental and Workplace Agents | |
| ENVS 6230 | Environmental Epidemiology | |
| | or EHOH 661 Environmental & Occupational Epidemiology | |
| <i>Complete a minimum of one of the following applications courses:</i> | | 3 |
| EHOH 6619 | Environmental Exposures and Health Effects | |
| EHOH 6624 | Infectious Diseases, Environmental Contexts | |
| EHOH 6627 | Water Quality and Public Health | |
| EHOH 6635 | Climate Change and Health | |
| GEOG 5230 | Hazard Mitigation and Vulnerability Assessment | |

| | | |
|---|---------------------------------------|-----------|
| GEOG 5710 | Disasters, Climate Change, and Health | |
| <i>Complete six additional elective credits from the approved methods and applications courses.</i> | | 6 |
| Total Hours | | 12 |

Environmental Science Education

Advisor: Bryan Wee (Bryan.Wee@ucdenver.edu)

| Code | Title | Hours |
|--|---|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| ENVS 5650 | Environmental Education | |
| GEOG 5150 | Place, Landscape, and Meaning | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| GEOG 5300 | Children's Geographies | |
| | or ENVS 5300 Children's Geographies | |
| GEOG 5440 | Science, Policy and the Environment | |
| GEOG 5995 | Global Study Topics | |
| ENVS 5340 | Equity & Culture in Science Education: Local/Global | |
| | or SCED 534 Equity & Culture in Science Education: Local/Global | |
| Total Hours | | 12 |

Environmental Science, Policy and Management

Advisors: Rafael Moreno (Rafael.Moreno@ucdenver.edu) and Gregory Simon (Gregory.Simon@ucdenver.edu)

| Code | Title | Hours |
|--|---|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| GEOG 5265 | Sustainability in Resources Management | |
| GEOG 5440 | Science, Policy and the Environment | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| GEOG 5230 | Hazard Mitigation and Vulnerability Assessment | |
| GEOG 5335 | Contemporary Environmental Issues | |
| GEOG 5420 | The Politics of Nature | |
| GEOG 5680 | Urban Sustainability: Perspectives and Practice | |
| GEOG 5710 | Disasters, Climate Change, and Health | |
| GEOG 5995 | Global Study Topics | |
| ENVS 5305 | Water Quality and Resources | |
| ENVS 6200 | Risk Assessment | |
| Total Hours | | 12 |

Geospatial Analysis Option

Advisors: Peter (Peter.Anthamatten@ucdenver.edu) Anthamatten or Rafael Moreno (Rafael.Moreno@ucdenver.edu)

| Code | Title | Hours |
|--|--|-------|
| <i>Complete the following required courses:</i> | | 6 |
| GEOG 5080 | Introduction to GIS | |
| GEOG 5090 | Environmental Modeling with Geographic Information Systems | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| CVEN 5385 | GIS Relational Database Systems | |
| GEOG 5050 | Applied Spatial Statistics | |
| GEOG 5091 | Open Source Software for Geospatial Applications | |

| | | |
|--------------------|--|-----------|
| GEOG 5092 | GIS Programming and Automation | |
| GEOG 5095 | Deploying GIS Functionality on the Web | |
| Total Hours | | 12 |

Sustainable Urban Agriculture

Advisor: Amanda Weaver (Amanda.Weaver@ucdenver.edu)

| Code | Title | Hours |
|--|--|-----------|
| <i>Complete the following required courses:</i> | | 6 |
| ENVS 5450 | Urban Food and Agriculture: Perspectives and Research | |
| ENVS 5460 | Sustainable Urban Agriculture Field Study I | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| ENVS 5470 | Sustainable Urban Agriculture Field Study II | |
| GEOG 5060 | Remote Sensing I: Introduction to Environmental Remote Sensing | |
| GEOG 5085 | GIS Applications for the Urban Environment | |
| GEOG 5235 | GIS Applications in the Health Sciences | |
| GEOG 5640 | Urban Geography: Denver and the U.S. | |
| GEOG 5680 | Urban Sustainability: Perspectives and Practice | |
| Total Hours | | 12 |

Water Systems

Advisors: Anne Chin (Anne.Chin@ucdenver.edu) and Tom Duster (Thomas.Duster@ucdenver.edu)

| Code | Title | Hours |
|--|---|-----------|
| <i>Complete the following required courses:</i> | | 7 |
| ENVS 5280 | Environmental Hydrology | |
| ENVS 5410 | Aquatic Chemistry | |
| <i>Complete two of the following elective courses:</i> | | 6 |
| CVEN 5333 | Surface Water Hydrology | |
| CVEN 5334 | Groundwater Hydrology | |
| CVEN 5335 | Vadose Zone Hydrology | |
| CVEN 5401 | Introduction to Environmental Engineering | |
| ENVS 5305 | Water Quality and Resources | |
| ENVS 5380 | Anthropocene Futures | |
| GEOG 5240 | Applied Geomorphology | |
| GEOG 5251 | Fluvial Geomorphology | |
| GEOG 5270 | Glacial Geomorphology | |
| Total Hours | | 13 |

Plan I-Thesis Option

| Code | Title | Hours |
|-------------------------------|-----------------|-------|
| <i>Complete the following</i> | | 6 |
| GEOG 6750 | Research Design | |
| GEOG 6950 | Master's Thesis | |

Plan II-Non-Thesis Option

| Code | Title | Hours |
|---|------------------------------------|-------|
| <i>Complete additional elective credit hours from courses in an approved course list and the following:</i> | | 6 |
| ENVS 6800 | Community-Based Research Practicum | |

To learn more about the Student Learning Outcomes for this program, please visit our website (<https://clas.ucdenver.edu/ges/programs/master-science/ms-learning-goals-objectives/>).