Focus Areas

Environmental Studies & Environmental Science
Environmental Studies and Environmental Science

The Environmental Studies and Environmental Science programs are designed to fill a need for quality, interdisciplinary undergraduate education. Several government and industry studies have identified the need for qualified experts with training that is holistic, multi-disciplinary with a ‘big picture’ approach of how their expertise can be used in conjunction with other specialists to solve practical environmental problems.

Undergraduate students in either program receive both a solid scientific background complimented by a core of environmental information, and also have the opportunity to specialize in one of a diverse range of focus areas. You will gain access to some excellent and unique resources. Among these are field courses on ecological and environmental topics, linkage with the Centre for Earth Observation Science, exposure to the work of the federal government’s Freshwater Institute researchers, including nearby ecosystem research at the Experimental Lake Area.

What is a Focus Area?

A focus area is an individualized approach to undergraduate education. The student, in collaboration with a student advisor, will organize a body of courses from several subject fields around a central theme, topic, or set of related issues. The approach and coursework draw on different subjects, enabling a truly multi-disciplinary education to be obtained. The focus area must articulate a coherent field of study and provide a theoretical context for the focal issues.

How do I decide on a Focus Area?

Through student driven research and by identifying areas and careers that you are interested in, you will be able to develop a focus area to acquire the knowledge and skills required to enter further research programs and the workforce.

You should begin thinking about your focus area during your second year. Use some of the activities and information outlined in this brochure to narrow down your interests. From here, you can begin to characterize and develop the content that will make up your focus area.

Key activities

- Brainstorm, brainstorm, brainstorm
- Use the outline tools provided through websites like Environmental Careers Organization www.eco.ca
- Visit the Career Resource Centre and take advantage of the many services they offer
- Make a list of courses you would like to take in the future
- Talk to your student advisor, cooperative education coordinator, instructors, classmates, employers, family and alumni

By performing these activities, you should be able to make a list of important skills required in your chosen field.
Focus Areas

Students must complete a minimum of 9 credit hours in the General program, and 33 credit hours (to include at least 21 credit hours at the 3000/4000 level) in the Major and Honours program in one of the following focus areas:

- natural resource management
- conservation & biodiversity
- environmental assessment
- sustainable development
- environmental health
- wildlife management
- sustainable building
- northern studies
- water resources
- land systems
- policy & law
- stewardship
- toxicology

Individualized Study is available to those students who wish to tailor their program to their specific needs, including those of potential employers and certification. Consultation with Faculty members, employers, professionals in the field, and student advisors is required in building your own focus area. Note that courses that are used in the focus area are subject to the approval of a Riddell Faculty Student Advisor.

If a student is considering Individualized Study as their Focus Area, they should be meeting with a student advisor. In advance of the meeting, the student is encouraged to provide the full list of courses and brief description of their proposed Individualized Study Focus Area.

Note that external agency requirements, ie ‘courses will meet Wildlife Biologist Certification requirements’ would not normally be reason to deviate from the approved Focus Area’s and the courses that are already approved to be part of a Focus Area.’
### Registration Holds

Prior to registration for the Fall and Winter term, you are encouraged to meet with an Academic Advisor to discuss your course selection. Advisors are available on a drop-in basis from 9am-4pm, Monday through Friday in the Riddell Dean’s Office, 440 Wallace Building, by e-mail: riddell.faculty@umanitoba.ca or schedule an appointment here: https://outlook.office365.com/owa/calendar/RiddellFacultyStudentAffairs@umanitoba.onmicrosoft.com/bookings

Remember, not all registration holds are from academic departments. Some holds may be the result of past due balances, outstanding library fees, parking fees, or other administrative fees. You can always check your holds on Aurora under “View Holds”.

### Registration Tips

**Pre-requisites:** Be sure you have the necessary pre-reqs before you try to register for a course. Prerequisites are in place to assist students to academically succeed. If you feel you have grounds for a professor to waive a prerequisite, you may start by emailing the prof and asking for a prerequisite waiver.

Prereq waiver e-mails from the prof should be forwarded to riddell.faculty@umanitoba.ca so that an Academic Advisor can load the permission.

Prerequisites are listed in brackets after courses in this brochure. Unless otherwise noted, a minimum grade of ‘C’ is required in a prerequisite course.

**Department Head Approval:** Why do some courses require ‘department head approval’ and how do I get it? Start by emailing the professor of the course and ask permission to complete the course. The prof will want to know what program and year you are in and why you want to take their course. E-mails granting permission to take the course should be forwarded to riddell.faculty@umanitoba.ca.

**Topics Courses**
Topics courses are marked with a T (T). Topics may vary each term and must be suitable to the Focus Area.

**Crosslisted Courses**
A cross listed course is one that is offered by more than one discipline, department or faculty, but has the same content and in which students should expect to have the same or similar experience.

### Courses applicable to all Focus Areas

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ENVR 2020(T)</td>
<td>Introduction to Sustainability</td>
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<tr>
<td>ENVR 3020(T)</td>
<td>Applications in Field Readiness</td>
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<tr>
<td>ENVR 3350</td>
<td>Environmental Management Systems</td>
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<tr>
<td>ENVR 4000(T)</td>
<td>Decision-Making for Sustainability</td>
</tr>
<tr>
<td>ENVR 4000(T)</td>
<td>Project Management for Environmental Practitioners</td>
</tr>
<tr>
<td>ENVR 4000(T)</td>
<td>Data Science with R for Environmental Research</td>
</tr>
<tr>
<td>ENVR 4000(T)</td>
<td>Programming for Environmental Science Data Analysis</td>
</tr>
<tr>
<td>GEOG 3200</td>
<td>Introduction to Remote Sensing</td>
</tr>
<tr>
<td>GEOG 3390</td>
<td>Introduction to Climate Change and Its Causes</td>
</tr>
<tr>
<td>GEOG 3730</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>GEOG 4390</td>
<td>Global Climate Change</td>
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</tbody>
</table>
Co-operative Education Option

The Clayton H. Riddell Faculty of Environment, Earth, and Resources Cooperative Education Option is a four-year undergraduate program with mandatory courses and work terms in addition to regular studies. Co-op students are renowned for their high academic standards and a strong work ethic. Technical knowledge, professional development, and maturity are only a few of the skills that students acquire from their participation in the program. To enroll in the program, contact:

Leslie Goodman, Coordinator  
Cooperative Education Option  
440 Wallace Bldg.  
Phone: (204) 474-7252

Jodena Baertsoen, Assistant  
Cooperative Education Option  
440 Wallace Bldg.  
Phone: (204) 474-6225

The Clayton H. Riddell Faculty of Environment, Earth, and Resources operates a Cooperative Education program, which is designed to provide bright and motivated students with an opportunity to gain practical work experience. The program has been connecting students and employers since its inception in 1994. The goal of the program is for students to gain valuable skills by combining university education and employment training.

Benefits to the Student:

• Earn while you learn!
• You will be provided career information and guidance to help make important course choices and career decisions.
• Your performance will be evaluated and this is available to you for further promotion and employment recruitment.

Career Opportunities

Graduates from the Environmental Studies and Science programs have found successful employment in a wide range of fields. These include ecology, parks management, Geographic Information Systems land evaluation, trace contaminant and hazardous waste management, environmental education, and global environmental issues. The primary employers are private consultants, multinationals, government departments, crown corporations, and environmental non-governmental organizations. Other opportunities exist with Parks Canada, Provincial Parks, Dept. of Conservation, Federal Fisheries and Oceans, Nunavut Wildlife Management Boards, wildlife non-government agencies, Nature Conservancy, Ducks Unlimited, and World Wildlife Foundation.

Graduates are hired in the health sciences and international development agencies. They may also gain employment as community health officers, health care planners (ministry level as well as the RHAs), international aid workers and with the Red Cross.

Opportunities also exist with organizations such as the International Institute of Sustainable Development, Manitoba Habitat Heritage Corporation, Ducks Unlimited, municipal, provincial and federal parks and the Nature Conservancy.

Visit Career Services at: https://www.umanitoba.ca/career-services
Conservation and Biodiversity

Conservation and Biodiversity deals with the plight of endangered species (plants and animals) and their habitats. Students might be interested in areas such as wetland ecology, prairies restoration, boreal forest management, or alpine systems. Maintenance and protection of habitat critical for the preservation of endangered species is explored.

For students in Environmental Studies, BIOL 1030 is recommended if you are interested in a Conservation and Biodiversity focus (BIOL 1030 may be used in lieu of BIOL 1010).

Selection of Relevant Courses:

- ENVR 2180  Introductory Toxicology (BIOL 1030 and CHEM 1310 or or CHEM 1320)
- ENVR 3140  Aquatic Ecosystem Services (Permission of department head, and 60 credit hours of university credit.)
- ENVR 3250  Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- ENVR 4000 (T) Understanding Environmental Effects Monitoring (Department Head Approval and 60 credit hours of university credit)
- ENVR 4000 (T) Advanced Topics In Ecosystem Services (Department Head Approval)
- ENVR 3020/4020(T) Environmental Science Field Investigations (Department Head Approval)
- ENVR 4050  Ecosystem Management (Department Head Approval)
- ENVR 4060  Biogeography (Department Head Approval)
- ENVR 4850  Wildlife Management (Department Head Approval)
- GEOG 2200  Introduction to Thematic Cartography (three credit hours from Geography courses numbered at the 1000 level)
- GEOG 2900  Geography of Canadian Prairie Landscapes (three credit hours from Geography courses numbered at the 1000 level)
- GEOG 3770 (T)  Environment and Tourism (Department Head Approval)
- GEOG 3860  Animal Geographies (Department Head Approval)
- GEOG 4350  Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- GEOG 4670 (T)  Human Dimensions of Wildlife (Department Head Approval)
- GEOG 4750  Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)
- GEOL 2390  Environmental Geology (University Geology or GEOG 1290)
- GEOL 2570  Energy and Mineral Resources (Any university-level Geology course)
- BIOL 2200  The Invertebrates (BIOL 1030)
- BIOL 2210  The Chordates (BIOL 1030)
- BIOL 3242  Vascular Flora of Manitoba (BIOL 2240 or BIOL 2242)
- BIOL 3280  Forest Botany (BIOL 2242 (C); and one of BIOL 2300 or AGEC 2370 (C))
- BIOL 3310  Foundations of Population Ecology  (BIOL 2300*; and one of STAT 1150 or STAT 2000)
- BIOL 3312  Community Ecology  (BIOL 2300*)
- BIOL 3314  Field Ecology (BIOL 2300*; and one of STAT 1150 or STAT 2000 (D))
- BIOL 3318  Boreal Ecology (BIOL 2300* and one of STAT 1150, STAT 1000)
- BIOL 3350  Methods of Data Collection and Analysis in Ecology (BIOL 2300* and one of STAT 1150 or STAT 2000 (D))
- BIOL 3360  Animal Behavior (BIOL 2300*; and BIOL 2210)
- BIOL 3372  Wetland Ecology (BIOL 2300*)
- BIOL 3600  Biological Diversity and Sustainability (BIOL 2300* or BIOL 1030 and BIOL 2390)
- BIOL 4210  Biology of Fishes (BIOL 2210)
- BIOL 4214  Biology of Amphibians and Reptiles (BIOL 2210)
- BIOL 4216  Biology of Birds (BIOL 2210 and BIOL 3360)
- BIOL 4218  Biology of Mammals (BIOL 2210 and BIOL 2300*)
- BIOL 4220  Marine Biodiversity (BIOL 2300* and one of STAT 1150 or STAT 1000)
- BIOL 4262  Wildlife Parasitology (BIOL 3270)
- BIOL 4310  Applications of Population Ecology in Fisheries and Wildlife (BIOL 3310)
- BIOL 4362  Behavioural Ecology and Cognitive Ethology (BIOL 3360)
- ENTM 3160  Veterinary and Wildlife Entomology
- SOIL 3520  Pesticides: Environment, Economics and Ethics
- SOIL 3600  Soils and Landscapes in Our Environment
- SOIL 4500  Remediation of Contaminated Land (SOIL 3600)
- SOIL 4510  Soil and Water Management (SOIL 3600)
- WOMN 3130  Gender, Race and Environmental Justice (three credit hours of Women’s and Gender Studies courses or consent of instructor)

* or AGEC 2370

Faculty members with expertise include: Drs. Stephane McLachlan, Mary Benbow, Eric Collins and Lisa Loseto
Environmental Assessment covers an array of skills to predict the environmental effects of proposed initiatives before they are carried out by identifying possible environmental effects, proposing measures to mitigate adverse effects and by predicting whether there will be significant adverse environmental effects, even after the mitigation is implemented. (Canadian Environmental Assessment Agency)

**Selection of Relevant Courses:**

- **ENVR 3000 (T)** Introduction to Numerical Modelling and Applications in Environmental Sciences (Permission of department head, and 60 credit hours of university credit.)
- **ENVR 3110** Environmental Conservation and Restoration (BIOL 2390 or 2300*)
- **ENVR 3140** Aquatic Ecosystem Services (Permission of department head, and 60 credit hours of university credit.)
- **ENVR 3250** Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 3750** Green Building and Planning (ENVR 2000 and 57 credit hours)
- **ENVR 3850** Sustainable Manitoba (60 credit hours)
- **ENVR 4000 (T)** Understanding Environmental Effects Monitoring (Department Head Approval and 60 credit hours of university credit)
- **ENVR 4000 (T)** Advanced Topics In Ecosystem Services (Department Head Approval)
- **ENVR 4050** Ecosystem Management (Department Head Approval)
- **ENVR 4650** Advanced Issues in Environmental Law and Policy (ENVR 3160)
- **ENVR 4850** Wildlife Management (Department Head Approval)

- GEOG 2330 Place, Populations and Mobility: Geographic Perspectives (three credit hours from Geography courses numbered at the 1000 level)
- GEOG 2520 Geography of Natural Resources (three credit hours from Geography courses numbered at the 1000 level)
- GEOG 2630 Geography of Culture and Environment (GEOG 1280)
- GEOG 3340 Migration and Mobility in a Globalized World (GEOG 2330)
- GEOG 4350 Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- GEOG 4750 Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)

- BIOL 3600 Biological Diversity and Sustainability (BIOL 2300* or BIOL 1030 and BIOL 2390)
- ECON 2400 Introduction to Energy Economics (six credit hours of 1000 level Economics)
- ECON 3710 Sustainable Development: Issues and Policies (six credit hours of 1000 level Economics)

* or AGEC 2370

**Faculty members with expertise include:** Drs. Stephane McLachlan and Juliana Marson
“Environment and Health is a growing area of research and an area of influence on government policy. This wide ranging field includes things like the analysis of how polluted environments influence human health, how the state of health care systems impacts the health of both individuals and particular user groups such as the elderly or new immigrants, the relationship between access to adequate housing and food supplies in poor neighbourhoods or remote rural communities, and the causes and impacts of community-wide measures of health, such as fitness levels or disease rates.” Bonnie Hallman, Environment and Health Professor, University of Manitoba

**Selection of Relevant Courses:**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>GEOG 3870</td>
<td>Food Geographies (GEOG 1280 or HNSC 1200)</td>
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<tr>
<td>GEOG 4290</td>
<td>Geographies of Health and Health Care (Department Head Approval)</td>
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<tr>
<td>ENVR 3400</td>
<td>Introduction to Environment and Health (60 credit hours of university credit)</td>
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<tr>
<td>ENVR 3890</td>
<td>Geography of Wellness (ENVR 1000 or GEOG 1280 or GEOG 1700)</td>
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<tr>
<td>ENVR 4400</td>
<td>Advanced Issues in Environmental Health (ENVR 3400)</td>
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<tr>
<td>ENVR 4650</td>
<td>Advanced Issues in Environmental Law and Policy (ENVR 3160)</td>
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<tr>
<td>BIOL 3600</td>
<td>Biological Diversity and Sustainability (BIOL 2300* or BIOL 1030 and BIOL 2390)</td>
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<tr>
<td>CHEM 2100</td>
<td>Organic Chemistry 1: Foundations of Organic Chemistry [{CHEM 1110} and (one of CHEM 1120, or CHEM 1126)] or (the former CHEM 1310).</td>
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<tr>
<td>CHEM 2110</td>
<td>Organic Chemistry 2: Foundations of Organic Synthesis (one of CHEM 2100 or the former CHEM 2210)</td>
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<tr>
<td>CHEM 2700</td>
<td>Biochemistry 1: Biomolecules and an Introduction to Metabolic Energy [{CHEM 1110} and (one of CHEM 1120 or CHEM 1126)] or (the former CHEM 1310)] and [BIOL 1030]</td>
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<tr>
<td>CHEM 2710</td>
<td>Biochemistry 2: Catabolism, Synthesis, and Information Pathways [one of CHEM 2700, the former CHEM 2360, the former CHEM 2860, MBIO 2700, the former MBIO 2360] and [one of CHEM 2100, the former CHEM 2210].</td>
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<tr>
<td>CHEM 2510</td>
<td>Introduction to Analytical Chemistry [{CHEM 1110} and (one of CHEM 1120or CHEM 1126)] or (the former CHEM 1310).</td>
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<tr>
<td>BIOL 2410</td>
<td>Human Physiology 1 (BIOL 1030 or BIOL 1412; or a “C+” or better in both BIOL 1000 and BIOL 1010)</td>
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<tr>
<td>BIOL 2420</td>
<td>Human Physiology 2 (BIOL 2410 (D), or BIOL 3460 (D))</td>
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<tr>
<td>EVLU 4006(T)</td>
<td>Topics Course: Health and Community Design (Permission from the Faculty of Architecture)</td>
</tr>
<tr>
<td>M BIO 3010</td>
<td>Mechanisms of Microbial Disease (M BIO 2020)</td>
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<tr>
<td>ANTH 2560</td>
<td>Anthropology of Illness (ANTH 1220 or ANTH 1520)</td>
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<tr>
<td>IN DG 3240</td>
<td>Indigenous Medicine and Health</td>
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<tr>
<td>EN TM 4250</td>
<td>Pesticide Toxicology (A course in biochemistry)</td>
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<tr>
<td>FOOD 4150</td>
<td>Food Microbiology 1</td>
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<tr>
<td>FOOD 4260</td>
<td>Water Management in Food Processing</td>
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<tr>
<td>LABR 3060</td>
<td>Workplace Health and Safety (LABR 1260 and LABR 1290 or both HRIR 3450 and 6 credit hours of other HRIR courses or written consent of the Labour Studies coordinator</td>
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<tr>
<td>WOMN 3130</td>
<td>Gender, Race and Environmental Justice (three credit hours of Women’s and Gender Studies courses or consent of instructor)</td>
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* or AGEC 2370

**Faculty members with expertise include:** Drs. Bonnie Hallman and Eric Collins
Land Systems

The properties and processes responsible for land systems are controlled by geological material, soil and land features found on Earth. This focus area examines the processes and techniques that are applicable to land systems. This is accomplished through an investigation from micro (mineralogy/soil ecology) through to macro scale (land use/geomorphology).

Selection of Relevant Courses:

- **ENVR 2010(T) MEIA Soil Sampling (1.5)** (Department Head Approval)
- **GEOG 2200** Introduction to Thematic Cartography (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 2272** Natural Hazards (one of GEOG 1290, GEOL 1340, or GEOL 1410)
- **GEOG 2550** Geomorphology (GEOG 1290)
- **GEOG 4200** Advanced Methods in Remote Sensing (GEOG 3200)
- **GEOG 4350** Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- **GEOL 2390** Environmental Geology (University Geology or GEOG 1290)
- **GEOL 2440** Structural Geology (GEOL 1340 (C+) and one of MATH 1300, MATH 1500, MATH 1510 or MATH 1520)
- **GEOL 2500** Introductory Mineralogy with Essential of Mineral Optics (GEOL 1340 (C+) and [one of Chemistry 40S (50%), CKSL 0100 (P) or the former CHEM 0900 (Pass)]. (CHEM 1100) and (one of CHEM 1120, or CHEM 1126) are highly recommended.
- **GEOL 2570** Energy and Mineral Resources (Any university-level Geology course)
- **GEOL 2770** Principles of Inorganic Geochemistry ([GEOL 2500 or the former GEOL 2540] and [one of MATH 1300, MATH 1210, MATH 1230, MATH 1500, MATH 1510, or MATH 1520]. Pre or Corequisite: [(CHEM 1100) and (one of CHEM 1120 or CHEM 1126)] or the former CHEM 1300.
- **SOIL 3600** Soils and Landscapes in our Environment
- **SOIL 3520** Pesticides: Environment, Economics and Ethics
- **SOIL 3610** Field Methods in Land Resource Science (SOIL 3600)
- **SOIL 4060** Physical Properties of Soils (SOIL 3600 or BIOE 2110)
- **SOIL 4130** Soil Chemistry and Mineralogy (SOIL 3600)
- **SOIL 4400** Soil Ecology (AGEC 2370 or BIOL 2300 or SOIL 3600)
- **SOIL 4500** Remediation of Contaminated Land (SOIL 3600)
- **SOIL 4510** Soil and Water Management (SOIL 3600)
- **SOIL 4520** Soil Fertility (SOIL 3600)

Faculty members with expertise include: Drs. David Walker, John Iacozza, Dustin Isleifson and Karen Alley
Natural Resource Management

Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on the reasonable and sustainable use of natural resources, balanced with conservation, to ensure quality of life for future generations. Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources.

Selection of Relevant Courses:

- **ENVR 3000 (T)** Contemporary Environmental Issues in the Arctic (Department Head Approval)
- **ENVR 3020 (T)** Environmental Science Field Investigations (Department Head Approval)
- **ENVR 4020 (T)** Environmental Science Field Investigations (Department Head Approval)
- **ENVR 3850** Sustainable Manitoba (60 credit hours)
- **ENVR 4850** Wildlife Management (Department Head Approval)
- **ENVR 4000 (T)** Understanding Environmental Effects Monitoring (Department Head Approval and 60 credit hours of university credit)
- **ENVR 4000 (T)** Winnipeg's Urban Nature (Department Head Approval)
- **ENVR 4000 (T)** Climate and Society (Department Head Approval)
- **ENVR 4050** Ecosystem Management (Department Head Approval)
- **ENVR 4060** Biogeography (Department Head Approval)
- **ENVR 4650** Advanced Issues in Environmental Law and Policy (ENVR 3160)

- **GEOG 2520** Geography of Natural Resources (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 3770 (T)** Environment and Tourism (Department Head Approval)
- **GEOG 4350** Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- **GEOG 4670** Human Dimensions of Wildlife (Department Head Approval)
- **GEOG 4750** Understanding Contemporary Environmentalism (Permission of the Instructor)

- **INDG 2030** Working with Indigenous Elders [INDG 1200 or the former NATV 1200] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **INDG 2110** Introduction to Indigenous Community Development [INDG 1200 or the former NATV 1200] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)] (formerly offered as NATV 2000 when entitled Introduction to Indigenous Community Development)

- **BIOL 2200** The Invertebrates (BIOL 1030)
- **BIOL 2210** The Chordates (BIOL 1030)
- **BIOL 3242** Vascular Flora of Manitoba (BIOL 2240 or BIOL 2242)
- **BIOL 3318** Boreal Ecology (BIOL 2300* and one of STAT 1150, STAT 1000)
- **BIOL 3350** Methods of Data Collection and Analysis in Ecology (BIOL 2300* and STAT 2000 (D))
- **BIOL 3360** Animal Behavior (BIOL 2300*; and BIOL 2210)
- **BIOL 3372** Wetland Ecology (BIOL 2300*)
- **BIOL 3600** Biological Diversity and Sustainability (BIOL 2300* or BIOL 1030 and BIOL 2390)
- **BIOL 4210** Biology of Fishes (BIOL 2210)
- **BIOL 4214** Biology of Amphibians and Reptiles (BIOL 2210)
- **BIOL 4216** Biology of Birds (BIOL 2210 and BIOL 3360)
- **BIOL 4218** Biology of Mammals (BIOL 2210 and BIOL 2300*)

- **ENTM 3160** Veterinary and Wildlife Entomology

* or AGEC 2370

**Faculty members with expertise include:** Drs. Jonathan Peyton and David Walker
Northern Studies

The Northern Studies stream provides students with an opportunity to explore individual interests in any combination of human, physical, and natural relationships in the North. Courses range from the physical aspects of climate change to cultural diversity across the Canadian and the Circumpolar Arctic, Boreal and Antarctic regions. Field trips, discussions, and internationally renowned researchers provide students with a wide range of perspectives and once-in-a-lifetime experiences.

Selection of Relevant Courses:

- **ENVR 3000 (T)** Contemporary Environmental Issues in the Arctic (Department Head Approval)
- **ENVR 3000(T)** What is North? Environmental and Geographical Concepts (Department Head Approval and 60 credit hours of university credit.)
- **GEOG 2640** Geography of Culture and Inequality (GEOG 1200 or GEOG 1280)
- **GEOG 3760(T)** Canadian Natural Environments & Landscapes (6) (Department Head Approval)
- **GEOG 3770(T)** International Development Issues/Global Issues (Department Head Approval)
- **GEOG 4260** Sacred Lands (Department Head Approval)
- **INDG 2012** Indigenous History in Canada (6)
- **INDG 2080** Inuit Society and Culture [INDG 1200 or the former NATV 1200] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **INDG 2110** Introduction to Indigenous Community Development [INDG 1200 or the former NATV 1200] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **INDG 3240** Indigenous Medicine and Health
- **INDG 3330** Indigenous People, Science and the Environment (INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240))
- **INDG 4220** Environment, Economy and Indigenous Peoples (Department Head Approval)
- **INDG 4240** Arctic Lifestyles (Department Head Approval)
- **INDG 4320** Indigenous Economic Leadership [INDG 1200 (or the former NATV 1200)] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **ANTH 3500** Peoples of the Arctic (ANTH 1220 or ANTH 1520)
- **SWRK 4220** Aboriginal People and Social Work Practice (6) (SWRK 1310, SWRK 2080, SWRK 2090, and SWRK 3140)
- **POLS 3872** Indigenous Governance (Department Head Approval)
- **ECON 2350** Community Economic Development
- **BIOL 3318** Boreal Ecology (one of BIOL 2300 or AGEC 2370 and one of STAT 1150, STAT 1000)
- **BIOL 4890 (T)** Special Topics in Arctic Ecology (BIOL 2300 and Department Head Approval)

Faculty members with expertise include: Drs. Stephane McLachlan, Jill Oakes, Lisa Loseto, Jonathan Peyton, Eric Collins, Jens Ehn and Juliana Marson
Policy and Law is the foundation for understanding how environmental problems are addressed systematically. From international agreements on climate change, to fostering local green businesses, to developing clean energy technologies - understanding, implementing and improving environmental policy and law is key.

**Selection of Relevant Courses:**

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<tr>
<th>Course Code</th>
<th>Course Title / Requirements</th>
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<tr>
<td>ENVR 3250</td>
<td>Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)</td>
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<tr>
<td>ENVR 4000(T)</td>
<td>Decision-Making for Sustainability (Department Head Approval and 60 credit hours of university credit)</td>
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<tr>
<td>ENVR 4000 (T)</td>
<td>Climate and Society (Department Head Approval)</td>
</tr>
<tr>
<td>ENVR 4650</td>
<td>Advanced Issues in Environmental Law and Policy (ENVR 3160)</td>
</tr>
<tr>
<td>GEOG 2640</td>
<td>Geography of Culture and Inequality (GEOG 1200 or GEOG 1280)</td>
</tr>
<tr>
<td>GEOG 4750</td>
<td>Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)</td>
</tr>
<tr>
<td>ECON 3710</td>
<td>Sustainable Development: Issues and Policy (six credit hours of 1000 level Economics)</td>
</tr>
<tr>
<td>PHIL 2750</td>
<td>Ethics and the Environment</td>
</tr>
<tr>
<td>INDG 3280</td>
<td>Indigenous Peoples and the Canadian Justice System [INDG 1200 (or the former NATV 1200)] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]</td>
</tr>
<tr>
<td>INDG 4220</td>
<td>Environment, Economy and Indigenous Peoples (Department Head Approval)</td>
</tr>
<tr>
<td>INDG 4240</td>
<td>Arctic Lifestyles (Department Head Approval)</td>
</tr>
<tr>
<td>POLS 2502</td>
<td>Introduction to World Affairs</td>
</tr>
<tr>
<td>POLS 2504</td>
<td>Introduction to International Relations (POLS 2502)</td>
</tr>
<tr>
<td>POLS 3872</td>
<td>Indigenous Governance (Department Head Approval)</td>
</tr>
<tr>
<td>SOC 3380</td>
<td>Power, Politics and the Welfare State (SOC 1000 or the former SOC 1200)</td>
</tr>
<tr>
<td>SOC 3838</td>
<td>Ecology and Society (SOC 1000 or the former SOC 1200)</td>
</tr>
<tr>
<td>ANTH 2000</td>
<td>Culture, Society, and Power (ANTH 1220 or ANTH 1520)</td>
</tr>
<tr>
<td>ANTH 2430</td>
<td>Ecology, Technology and Society</td>
</tr>
<tr>
<td>ANTH 2500</td>
<td>Culture, Environment, and Technology (ANTH 1220 or ANTH 1520)</td>
</tr>
<tr>
<td>LABR 3010</td>
<td>Labour Law (LABR 1260 and LABR 1290 or HRIR 3450 and 6 credit hours of other HRIR courses)</td>
</tr>
<tr>
<td>WOMN 3130</td>
<td>Gender, Race and Environmental Justice (three credit hours of Women's and Gender Studies courses or consent of instructor)</td>
</tr>
</tbody>
</table>

* or AGEC 2370

**Faculty members with expertise include:** Dr. Nicole Wilson
Stewardship

Stewardship is maintaining natural resources for future generations. Stewardship means, as humans we are responsible for our actions on earth. Future generations are dependant upon the continuity of the natural environment. We must respect life and integrate our uses of the natural environment. We must respect life and integrate our uses of the natural resources in a manner compatible with the continuity on earth. It requires a lot of education, research, work and dedication to successfully change the current systems to create and/or enhance sustainability of our actions.

Selection of Relevant Courses:

- **GEOG 2520**  Geography of Natural Resources (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 3640**  Social Geography of the Environment (GEOG 1200 or GEOG 1280)
- **GEOG 4350**  Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- **GEOG 4750**  Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)
- **ENVR 3110**  Environmental Conservation and Restoration (BIOL 2390 or 2300 or AGEC 2370)
- **ENVR 3250**  Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 3750**  Green Building and Planning (ENVR 2000 and 57 credit hours)
- **ENVR 3850**  Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)
- **ENVR 4000(T)**  Applied Qualitative Research: Making a Difference (Department Head Approval)
- **ENVR 4050**  Ecosystem Management (Department Head Approval)
- **ENVR 4060**  Biogeography (Department Head Approval)
- **ENVR 4650**  Advanced Issues in Environmental Law and Policy (ENVR 3160)
- **ENVR 4850**  Wildlife Management (Department Head Approval)
- **GEOL 4370**  Global Change (GEOL 3900 and GEOL 3490)
- **ECON 2400**  Introduction to Energy Economics (six credit hours of 1000 level Economics)
- **ECON 3710**  Sustainable Development: Issues and Policies (six credit hours of 1000 level Economics)
- **ANTH 2000**  Culture, Society, and Power (ANTH 1220 or ANTH 1520)
- **ANTH 2430**  Ecology, Technology and Society
- **ANTH 2500**  Culture, Environment, and Technology (ANTH 1220 or ANTH 1520)
- **INDG 3280**  Indigenous Peoples and the Canadian Justice System [INDG 1200 (or the former NATV 1200)] or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **INDG 4220**  Environment, Economy and Indigenous Peoples (Department Head Approval)
- **PHIL 2750**  Ethics and the Environment
- **WOMN 3130**  Gender, Race and Environmental Justice (three credit hours of Women’s and Gender Studies courses or consent of instructor)
- **BIOL 3318**  Boreal Ecology (BIOL 2300* and one of STAT 1150, STAT 1000)
- **BIOL 3600**  Biological Diversity and Sustainability (BIOL 2300*; or BIOL 1030 and BIOL 2390)

* or AGEC 2370

Faculty members with expertise include: Drs. Stephane McLachlan and Eric Collins
Sustainable Building, or Green Building describes projects that are sited to promote livable communities; protect sensitive lands and preserve natural resources; are energy efficient and/or use renewable energy; incorporate environmentally-friendly building materials and practices; and promote occupant health and well-being. As with all issues of sustainability the solutions are particular to the place and people.

**Selection of Relevant Courses:**

- **ENVR 3250** Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 3750** Green Building and Planning (ENVR 2000 and 57 credit hours)
- **ENVR 3850** Sustainable Manitoba (60 credit hours of course work)
- **GEOG 2272** Natural Hazards (one of GEOG 1290, GEOL 1340, or GEOL 1410, GEOG 1200, GEOL 1360)
- **GEOG 2630** Geography of Culture and the Environment (GEOG 1200 or GEOG 1280)
- **GEOG 3460** Urban Geography (6) (GEOG 1200 or GEOG 1280)
- **EVDS 2702** Natural and Human Systems (EVDS 1680 (C+))
- **EVDS 2200** Ecology and Design (EVDS 2702)
- **EVLU 3002** Site Planning (Permission by the Faculty of Architecture)
- **EVLU 3010** Landscape and Urbanism Theory (Permission by the Faculty of Architecture)
- **EVLU 3014** Placemaking Fundamentals (Permission by the Faculty of Architecture)
- **EVLU 4006(T)** Health and Community Design (Permission by the Faculty of Architecture)
- **EVLU 4006(T)** Child-Friendly Cities (Permission by the Faculty of Architecture)
- **EVLU 4008** Plants, Ecosystems and Designs (Permission by the Faculty of Architecture)
- **EVLU 4018** Principles of Urban Design (Permission by the Faculty of Architecture)
- **SOC 3838** Ecology and Society (SOC 1000 or the former SOC 1200)
- **SOC 3840** Community and Social Reconstruction (SOC 1000 or the former SOC 1200)
- **PHIL 2750** Ethics and the Environment

* or AGEC 2370

Faculty members with expertise include:
TBA
**Sustainable Development**

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for future generations. The achievement of sustainable development requires the integration of its economic, environmental and social components at all levels.

**Selection of Relevant Courses:**

- **GEOG 2330** Place, Populations and Mobility: Geographic Perspectives (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 2520** Geography of Natural Resources (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 2630** Geography of Culture and the Environment (GEOG 1200 or GEOG 1280)
- **GEOG 2640** Geography of Culture and Inequality (GEOG 1200 or GEOG 1280)
- **GEOG 3272** Social Vulnerability to Natural Hazards (a minimum of three credit hours from Geography courses numbered at the 1000 level, or GPE 1700 or GEOL 1340 or GEOL 1410)
- **GEOG 3460** Urban Geography (6) (GEOG 1200 or GEOG 1280)
- **GEOG 3640** Social Geography of the Environment (GEOG 1200 or GEOG 1280)
- **GEOG 3770 (T)** Environment and Tourism (Department Head Approval)
- **GEOG 3870** Food Geographies (GEOG 1280 or HNSC 1200)
- **GEOG 4280** Gender and the Human Environment (a grade of C or better in a minimum of six credit hours in Geography)
- **GEOG 4350** Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- **GEOG 4750** Understanding Contemporary Environmentalism: Power and Discourse (Permission of the Instructor)
- **GEOG 4670 (T)** Human Dimensions of Wildlife (Department Head Approval)
- **ENVR 3000 (T)** Contemporary Environmental Issues in the Arctic (Department Head Approval)
- **ENVR 3250** Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 3400** Introduction to Environment and Health (60 credit hours of university credit)
- **ENVR 3750** Green Building and Planning (ENVR 2000 and 57 credit hours)
- **ENVR 3850** Sustainable Manitoba (60 credit hours of course work)
- **ENVR 4000 (T)** Climate and Society (Department Head Approval)
- **ENVR 4000 (T)** Winnipeg’s Urban Nature (Department Head Approval)
- **ENVR 4050** Ecosystem Management (Department Head Approval)
- **ENVR 4650** Advanced Issues in Environmental Law and Policy (ENVR 3160)
- **ECON 3710** Sustainable Development: Issues and Policy (six credit hours of 1000 level Economics)
- **EVLU 4006 (T)** Child-Friendly Cities (Permission by the Faculty of Architecture)
- **ANTH 2000** Culture, Society, and Power (ANTH 1220 or ANTH 1520)
- **ANTH 2430** Ecology, Technology and Society
- **ANTH 2500** Culture, Environment, and Technology (ANTH 1220 or ANTH 1520)
- **INDG 2110** Introduction to Indigenous Community Development (INDG 1200 or the former NATV 1200) or [INDG 1220 (or the former NATV 1220) and INDG 1240 (or the former NATV 1240)]
- **INDG 4220** Environment, Economy and Indigenous Peoples (Department Head Approval)
- **INDG 4230** Traditional Knowledge and Indigenous Studies Research (Department Head Approval)
- **INDG 4240** Arctic Lifestyles (Department Head Approval)
- **MKT 3246** Sustainability Marketing (MKT 2210 (D) or MKT 2211 (D))
- **POLS 2502** Introduction to World Affairs
- **POLS 2504** Introduction to International Relations (POLS 2502 or POLS 2403)
- **POLS 3250** International Political Economy (POLS 2502, or (POLS 2043 and POLS 2045), or the former POLS 2040)
- **SOC 2390** Social Organization (SOC 1000 or the former SOC 1200)
- **SOC 2480** Population Problems (SOC 1000 or the former SOC 1200)
- **SOC 3460 (T)** Building a Community Commons (SOC 1000 or the former SOC 1200)
- **SOC 3460 (T)** Sociology of Consumption (SOC 1000 or the former SOC 1200)
- **SOC 3838** Ecology and Society (SOC 1000 or the former SOC 1200)
- **SOC 3840** Community and Social Reconstruction (SOC 1000 or the former SOC 1200)
- **WOMN 3130** Gender, Race and Environmental Justice (three credit hours of Women’s and Gender Studies courses or consent of instructor)

* or AGEC 2370

**Faculty members with expertise include:** Drs. Bruce Erickson, Eric Collins and Dr. Michael Campbell
Toxicology

Environmental toxicology deals with the potential impacts of chemical and non-chemical stressors, both natural and synthetic, on ecosystem constituents. While significant emphasis is placed on understanding the response of individual organisms, the true focus is on characterizing the effects, both direct and indirect, and the risk they pose at the ecosystem-level.

Selection of Relevant Courses:

ENVR 2180  Introductory Toxicology (BIOL 1030 and CHEM 1310 or CHEM 1320)
ENVR 2550  Environmental Chemistry (CHEM 1310)
ENVR 3140  Aquatic Ecosystem Services (Permission of department head, and 60 credit hours of university credit.)
ENVR 3180  Methods in Ecotoxicology (ENVR 2180 or BIOL 2380 or AGRI 2180, and a second year course in the Faculty of Science or the Faculty of Agricultural and Food Sciences that has a laboratory component)
ENVR 3550  Environmental Analysis (ENVR 2550 (C), or CHEM 2550 (C), or CHEM 2470 (C))
ENVR 4000 (T) Understanding Environmental Effects Monitoring (Department Head Approval and 60 credit hours of university credit)
ENVR 4000 (T) Advanced Topics In Ecosystem Services (Department Head Approval)
ENVR 4180  Ecotoxicological Risk Characterization (ENVR 2180 or BIOL 2380 or AGRI 2180)
ENVR 4550  Aquatic Chemistry (ENVR 3550 or CHEM 3590)

GEOL 2390  Environmental Geology (University Geology or GEOG 1290)

ENTM 4250  Pesticide Toxicology (A course in biochemistry)

BIOL 2520  Cell Biology (BIOL 1030)
BIOL 2262  Biology of Algae (BIOL 1030)
BIOL 3310  Foundations of Population Ecology  (BIOL 2300*; and one of STAT 1150 or STAT 2000)
BIOL 3312  Community Ecology  (BIOL 2300*)
BIOL 3318  Boreal Ecology (BIOL 2300* and one of STAT 1150, STAT 1000)
BIOL 3370  Limnology (BIOL 2300*)
BIOL 3372  Wetland Ecology [one of BIOL 2300 or AGEC 2370] and [one of STAT 1150, STAT 1000]
BIOL 3470  Environmental Physiology of Animals I (BIOL 2200 or BIOL 2210)
BIOL 3472  Environmental Physiology of Animals II (BIOL 2200 or BIOL 2210)
BIOL 4380  Environmental Toxicology (one of CHEM 2370, Mbio 2370, CHEM 2780, or MBIO 2780 and one of BIOL 2300* and one of STAT 1150, STAT 1000 and one of BIOL 2410, BIOL 3470, BIOL 3472)

SOIL 3520  Pesticides: Environment, Economics and Ethics
SOIL 3600  Soils and Landscapes in our Environment
SOIL 4130  Soil Chemistry and Mineralogy (SOIL 3600)
SOIL 4400  Soil Ecology (AGEC 2370 or BIOL 2300 or SOIL 3600)
SOIL 4500  Remediation of Contaminated Land (SOIL 3600)

CHEM 2100  Organic Chemistry 1: Foundations of Organic Chemistry [(CHEM 1110) and (one of CHEM 1120, or CHEM 1126)] or (the former CHEM 1310).
CHEM 2110  Organic Chemistry 2: Foundations of Organic Synthesis (one of CHEM 2100 or the former CHEM 2210)
CHEM 2700  Biochemistry 1: Biomolecules and an Introduction to Metabolic Energy [(CHEM 1110) and (one of CHEM 1120 or CHEM 1126) or (the former CHEM 1310)] and [BIOL 1030]
CHEM 2710  Biochemistry 2: Catabolism, Synthesis, and Information Pathways [one of CHEM 2700, the former CHEM 2360, the former CHEM 2860, Mbio 2700, the former MBIO 2360] and [one of CHEM 2100, the former CHEM 2210].
CHEM 2510  Introduction to Analytical Chemistry [(CHEM 1110) and (one of CHEM 1120 or CHEM 1126)] or (the former CHEM 1310).
CHEM 3500  Instrumental Analysis [(CHEM 2510) and (CHEM 2520)] or (the former CHEM 2470).

Faculty members with expertise include: Drs. Fei Wang and Mark Hanson
The study of water resources is gaining increasing attention as society recognizes the limitations that exist with this important renewable resource. Water resources are important to the environment generally in terms of being a critical factor in most biotic and abiotic processes. Ensuring a safe and healthy supply of water globally for human uses including household, agricultural, industrial, and recreational is the focus of this field of study.

Careers in this area can be further explored through the EcoCanada website (www.eco.ca).

**Selection of Relevant Courses:**

- **ENVR 2180** Introductory Toxicology (BIOL 1030 and CHEM 1310 or CHEM 1320)
- **ENVR 2550** Environmental Chemistry (CHEM 1310)
- **ENVR 3140** Aquatic Ecosystem Services (Permission of department head, and 60 credit hours of university credit.)
- **ENVR 3180** Methods in Ecotoxicology (ENVR 2180 or BIOL 2380 or AGRI 2180, and a second year course in the Faculty of Science or the Faculty of Agricultural and Food Sciences that has a laboratory component)
- **ENVR 3250** Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 4000 (T)** Advanced Topics in Ecosystem Services (Department Head Approval)
- **ENVR 4000 (T)** Water Resource Management (Department Head Approval and 60 credit hours of university credit)
- **ENVR 4000 (T)** Understanding Environmental Effects Monitoring (Department Head Approval and 60 credit hours of university credit)
- **ENVR 4000 (T)** Winnipeg's Urban Nature (Department Head Approval)
- **ENVR 4000 (T)** Oceanography: Chemical (Department Head Approval)
- **GEOG 2310** Introduction to Process Hydrology (GEOG 1290 and PHYS 1020 or PHYS 1050 or MATH 1500 or MATH 1510 or MATH 1520 or MATH 1530)
- **GEOG 2520** Geography of Natural Resources (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 2540** Weather and Climate (three credit hours from Geography courses numbered at the 1000 level)
- **GEOG 2930** Introduction to Oceanography (GEOG 1290 or ENVR 1000 or GEOL 1340)
- **GEOG 4050** Ecosystem Management (Department Head Approval)
- **GEOG 4060** Bioicity (Department Head Approval)
- **GEOG 4290** Biological Oceanography I: Lower Trophic Levels (GEOG 2930 and BIOL 1030)
- **GEOG 4930** Biological Oceanography II: Higher Trophic Levels (GEOG 3920 and a 2000- level BIOL course)
- **GEOG 2390** Environmental Geology (Minimum 3 credit hours of university-level geology or GEOG 1290)
- **BIOE 2110** The Chordates (BIOL 1030)
- **BIOE 2260** Biology of Fungi and Lichens (BIOL 1030)
- **BIOE 2262** Biology of Algae (BIOL 1030)
- **BIOE 3370** Limnology (BIOL 2300*)
- **BIOE 3372** Wetland Ecology (BIOL 2300*)
- **BIOE 4210** Biology of Fishes (BIOL 2210 or BIOL 2231)
- **BIOE 4220** Marine Biodiversity (BIOL 2300* and one of STAT 1150 or STAT 1000)
- **BIOE 4310** Application of Population Ecology in Fisheries and Wildlife (BIOE 3310)
- **BIOE 4312** Analysis of Biological Communities (BIOL 2300* and one of STAT 1150 or STAT 2000)
- **BIOE 4370** Aquatic Botany (BIOL 2300*)
- **CHEM 3500** Instrumental Analysis ([CHEM 2510] and [CHEM 2520]) or (the former CHEM 2470).
- **SOIL 3060** Introduction to Agrometeorology
- **SOIL 3520** Pesticides: Environment, Economics and Ethics
- **SOIL 4060** Physical Properties of Soils (SOIL 3600 or BIOE 2110)
- **SOIL 4500** Remediation of Contaminated Land (SOIL 3600)
- **SOIL 4510** Soil and Water Management (SOIL 3600)
- **SOIL 4520** Soil Fertility (SOIL 3600)

*or AGEC 2370

**Faculty members with expertise include:** Drs. Mark Hanson, Feiyue Wang, Tim Papakyriakou, Gary Stern, Eric Collins and CJ Mundy
Wildlife Management

Wildlife and ecosystem management continue to be dynamic and emerging fields in environmental science and studies. Wildlife management is the science and art of changing characteristics and interactions between animal populations, habitats, and humans to achieve specific societal goals. Ecosystem management addresses societal objectives for the broader consideration of all biological and abiotic components and their interacting processes in a defined geographical area. Both areas of study focus on reducing the loss of biological diversity. The Wildlife Society website (www.wildlife.org) provides additional details on career prospects and course requirements for Certification in these fields.

Selection of Relevant Courses:

- **ENVR 3020/4020 (T)** Environmental Science Field Investigations (Department Head Approval)
- **ENVR 3250** Environmental Assessment (ABIZ 3550 or ENVR 3160 and BIOL 2300* or BIOL 2390)
- **ENVR 3850** Ecosystem Management (Department Head Approval)
- **ENVR 4850** Wildlife Management (Department Head Approval)
- **GEOG 3770 (T)** Environment and Tourism (Department Head Approval)
- **GEOG 3860** Animal Geographies (Department Head Approval)
- **GEOG 4060** Biogeography (Department Head Approval)
- **GEOG 4350** Parks and Protected Areas Planning and Management: Field Studies (Department Head Approval)
- **GEOG 4670** Human Dimensions of Wildlife (Department Head Approval)
- **BIOL 2200** The Invertebrates (BIOL 1030)
- **BIOL 2210** The Chordates (BIOL 1030)
- **BIOL 2242** The Flowering Plants (BIOL 1030)
- **BIOL 2260** Biology of Fungi and Lichens (BIOL 1030)
- **BIOL 2262** Biology of Algae (BIOL 1030)
- **BIOL 2500** Genetics 1 (BIOL 1030)
- **BIOL 3242** Vascular Flora of Manitoba (BIOL 2240 or BIOL 2242)
- **BIOL 3280** Forest Botany (BIOL 2242; and BIOL 2300*)
- **BIOL 3310** Foundations of Population Ecology (BIOL 2300*; and one of STAT 1150 or STAT 2000)
- **BIOL 3312** Community Ecology (BIOL 2300*)
- **BIOL 3314** Field Ecology (BIOL 2300*; and one of STAT 1150 or STAT 2000 (D))
- **BIOL 3318** Boreal Ecology (BIOL 2300* and one of STAT 1150, STAT 1000)
- **BIOL 3372** Wetland Ecology (BIOL 2300*)
- **BIOL 3350** Methods of Data Collection and Analysis in Ecology (BIOL 2300* and STAT 2000 (D))
- **BIOL 3360** Animal Behaviour (BIOL 2300* and [one of STAT 1150, STAT 1000] and [one of BIOL 2200, BIOL 2210])
- **BIOL 3600** Biological Diversity and Sustainability (BIOL 2300* or BIOL 1030 and BIOL 2390)
- **BIOL 4210** Biology of Fishes (BIOL 2210)
- **BIOL 4212** Systematics and Biogeography of Fishes (BIOL 2210 or BIOL 2231)
- **BIOL 4214** Biology of Amphibians and Reptiles (BIOL 2210)
- **BIOL 4216** Biology of Birds (BIOL 2210 and BIOL 3360)
- **BIOL 4218** Biology of Mammals (BIOL 2210 and BIOL 2300*)
- **BIOL 4220** Marine Biodiversity (BIOL 2300* and one of STAT 1150 or STAT 1000)
- **BIOL 4262** Wildlife and Fisheries Parasitology (BIOL 3270)
- **BIOL 4310** Application of Population Ecology in Fisheries and Wildlife (BIOL 3310)
- **SOIL 3600** Soils and Landscapes in our Environment
- **SOIL 4060** Physical Properties of Soils (SOIL 3600 or BIOE 2110)
- **SOIL 4500** Remediation of Contaminated Land (SOIL 3600)
- **SOIL 4510** Soil and Water Management (SOIL 3600)

* or AGEC 2370

Faculty members with expertise include:

Drs. David Walker, Michael Campbell, Mary Benbow and Lisa Loseto
For Further Information
Please Contact:

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Email. riddell.advisor@umanitoba.ca

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umanitoba.ca/environment

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