

# 2012-2013 Undergraduate Calendar

The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2012-2013 academic year, including the Summer Semester 2012, the Fall Semester 2012 and the Winter Semester 2013.

For your convenience the Undergraduate Calendar is available in PDF format.

If you wish to link to the Undergraduate Calendar please refer to the [Linking Guidelines](#).

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The logo for the University of Guelph, featuring the text "UNIVERSITY of GUELPH" in a stylized font.The tagline "CHANGING LIVES IMPROVING LIFE" in a bold, sans-serif font, set against a yellow background.

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February 1, 2012	Initial Publication
March 29, 2012	Second Publication
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# Disclaimer

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## University of Guelph 2012

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The information published in this Undergraduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2012-2013 academic year, including the Summer Semester 2012, the Fall Semester 2012 and the Winter Semester 2013.

The University reserves the right to change without notice any information contained in this calendar, including fees, any rule or regulation pertaining to the standards for admission to, the requirements for the continuation of study in, and the requirements for the granting of degrees or diplomas in any or all of its programs. The publication of information in this calendar does not bind the University to the provision of courses, programs, schedules of studies, or facilities as listed herein.

The University will not be liable for any interruption in, or cancellation of, any academic activities as set forth in this calendar and related information where such interruption is caused by fire, strike, lock-out, inability to procure materials or trades, restrictive laws or governmental regulations, actions taken by faculty, staff or students of the University or by others, civil unrest or disobedience, public health emergencies, or any other cause of any kind beyond the reasonable control of the University.

In the event of a discrepancy between a print version (downloaded) and the Web version, the Web version will apply.

Published by: Enrolment Services

## **Introduction**

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### **Collection, Use and Disclosure of Personal Information**

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Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes. Certain personal information is disclosed to external agencies, including the Ontario Universities Application Centre, the Ministry of Training, Colleges and Universities, and Statistics Canada, for statistical and planning purposes, and is disclosed to other individuals or organizations in accordance with the Office of Registrarial Services Departmental Policy on the Release of Student Information. For details on the use and disclosure of this information call the Office of Registrarial Services at the University at (519) 824-4120 or see <http://www.uoguelph.ca/registrar/registrar/index.cfm?index>.

### **Statistics Canada - Notification of Disclosure**

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For further information, please see Statistics Canada's web site at <http://www.statcan.ca> and Section XIV Statistics Canada.

### **Address for University Communication**

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Depending on the nature and timing of the communication, the University may use one of these addresses to communicate with students. Students are, therefore, responsible for checking all of the following on a regular basis:

#### **Email Address**

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The University issued email address is considered an official means of communication with the student and will be used for correspondence from the University. Students are responsible for monitoring their University-issued email account regularly. See Section I--Statement of Students' Academic Responsibilities for more information.

#### **Home Address**

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Students are responsible for maintaining a current mailing address with the University. Address changes can be made, in writing, through Enrolment Services.

#### **Name Changes**

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The University of Guelph is committed to the integrity of its student records, therefore, each student is required to provide either on application for admission or on personal data forms required for registration, his/her complete, legal name. Any requests to change a name, by means of alteration, deletion, substitution or addition, must be accompanied by appropriate supporting documentation.

### **Student Confidentiality and Release of Student Information Policy Excerpt**

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The University undertakes to protect the privacy of each student and the confidentiality of his or her record. To this end the University shall refuse to disclose personal information to any person other than the individual to whom the information relates where disclosure would constitute an unjustified invasion of the personal privacy of that person or of any other individual. All members of the University community must respect the confidential nature of the student information which they acquire in the course of their work.

Complete policy at <http://www.uoguelph.ca/policies/pdf/ORSInfoReleasePolicy060610.pdf>.



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## Bachelor of Science in Environmental Sciences [B.Sc.(Env.)]

### Program Information

#### Objectives of the Program

The Environmental Sciences program is designed to provide a strong interdisciplinary grounding in specific environmental sciences including the socioeconomic context in which environmental issues are resolved.

There is an emphasis on management and decision-making skills for the application of scientific knowledge to environmental problems, and the evaluation of appropriate environmental policies. A practical perspective based on defining and resolving problems is central to the program, and this is often done in the context of group work.

Substantial emphasis is placed on communication skills, including the development of competence in both written and oral presentations. These skills will be progressively developed in core courses from the first to the fourth year. Students in the final year of their program will be expected to take part in more intensive communication skill development. Graduates will seek employment in a range of fields, from government agencies to private industry and research.

#### Academic Counselling

General information on the degree program is available from the Program Counsellor. Advising for each major is available through the assigned faculty advisor responsible for the major. Students are encouraged to seek the advice of the faculty advisors when choosing restricted electives and planning course selections.

#### Degree

The degree granted for the successful completion of this honours program will be the Bachelor of Science in Environmental Sciences--B.Sc.(Env.).

#### Continuation of Study

Students are advised to consult the regulations for Continuation of Study in Section VIII--Undergraduate Degree Regulations and Procedures of this Calendar.

#### Conditions for Graduation

In order to graduate from the B.Sc.(Env.) program, students must successfully complete a minimum of 20.00 credits including all the stated course requirements for the program. As well, students must achieve a cumulative average of 60% or higher over all course attempts.

#### Environmental Sciences (Co-op)

A 5-year Honours Program in Environmental Sciences is offered as a Co-operative Education Program. This option is offered within the B.Sc. (Env.) degree and is available to all majors. The course requirements are the same as those listed for the regular B.Sc. (Env.) program, by the Co-operative Education Program and as outlined in the Continuation of Study policy (Section VIII--Undergraduate Degree Regulations & Procedures).

3 co-op work terms (COOP\*1000, COOP\*2000, COOP\*3000) are required. An optional 4th co-op work term (COOP\*4000) is available. COOP\*1100 must be completed during semester 2.

Year	Fall	Winter	Spring
1	Academic Term 1	Academic Term 2	Off
2	Academic Term 3	COOP*1000	Academic Term 4
3	COOP*2000	Academic Term 5	COOP*3000
4	Academic Term 6	Academic Term 7	COOP*4000 (Optional)
5	Academic Term 8		

Since some of the course requirements in the degree program (core or major) are not offered each semester, careful planning and program consultation with the Faculty Co-op Advisor is essential. In particular, students are encouraged to seek advice when choosing for their Summer academic semester.

#### The Environmental Sciences Program

The degree in Environmental Sciences consists of a minimum of 20.00 credits, as follows:

- 5.00 First Year Curriculum
- 2.00 Environmental Sciences Core
- 8.00 - 11.00 Environmental Sciences prescribed and restricted electives according to major.
- free electives\*

Within these courses, students must include at least 6.00 credits at the 3000 or 4000 level, and no program may include more than 7.00 credits at the 1000 level.

\* There are not specific subject requirements for the elective courses, however, you may NOT select the following: BIOL\*1500, BOT\*1200, CHEM\*1100, CIS\*1000, ENVS\*1060, GEOL\*1100, MICR\*1020, MBG\*1000, PHYS\*1600.

Please note that not all courses in the "One of:" options are available each semester (F, W, S). Students are encouraged to seek advice from the appropriate advisor when selecting and scheduling courses.

#### First Year Curriculum

The first year courses have been selected to provide students with sufficient background and knowledge to enter any one of the Environmental Sciences majors.

##### Semester 1

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

##### Semester 2

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

**Note:** Co-op students must select COOP\*1100 Introduction to Co-operative Education

#### Environmental Sciences Core

In addition to the common first year curriculum, students are required to take the following core Environmental Sciences courses in the semesters recommended in the schedule of studies:

ENVS*4001	[0.50]	Project in Environmental Sciences
ENVS*4002	[0.50]	Project in Environmental Sciences

One of:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics
GEOG*3210	[0.50]	Management of the Biophysical Environment

A required statistics course is prescribed by the student's choice of major.

#### Environmental Sciences Majors

Ecology

Environment and Resource Management

Environmental Economics and Policy

Environmental Sciences

Requirements for each of these majors are described in the detailed schedules of studies below.

#### Ecology (ECOL)

##### Department of Integrative Biology, College of Biological Science

This program provides a solid foundation in the principles of ecology, training in both pure and applied aspects of ecology and an introduction to economic, legal and policy issues related to the management of the environment. From the 2nd year on, students increasingly augment the core in ecology and policy with extensive restricted electives choices that allow the student to tailor the program to their interests. The major provides a sound science background for careers in conservation, resource management, ecological consulting, or nature interpretation used in teaching, government, non-government or the private sector; or for further post-graduate training in fundamental ecology, environmental biology and environmental management or policy.

#### Major

##### Semester 1

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

##### Semester 2

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

##### Semester 3

BIOL*2060	[0.50]	Ecology
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

One of:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics

0.50 electives or restricted electives

**Note:** PHYS\*1130 may be substituted for PHYS\*1080 and would be taken in a Winter semester.

**Note:** GEOG\*3210 may be substituted for ECON\*2100 or FARE\*2700 and would be taken in semester 5.

##### Semester 4

BIOC*2580	[0.50]	Introduction to Biochemistry
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BIOL*2400	[0.50]	Evolution
BIOL*3110	[0.50]	Population Ecology
MBG*2040	[0.50]	Foundations in Molecular Biology and Genetics
STAT*2050	[0.50]	Statistics II

**Semester 5**

BIOL*3010	[0.50]	Laboratory and Field Work in Ecology
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One of:

BOT*2100	[0.50]	Life Strategies of Plants
ZOO*3200	[0.50]	Comparative Animal Physiology I

One of:

BOT*3410	[0.50]	Plant Anatomy
ZOO*2090	[0.50]	Vertebrate Structure and Function

1.00 electives or restricted electives

**Note:** ZOO\*2700 may be substituted for BOT\*3410 or ZOO\*2090 and would be taken in semester 6.

**Semester 6**

BIOL*3120	[0.50]	Community Ecology
BIOL*3130	[0.50]	Conservation Biology

1.50 electives or restricted electives

**Semester 7**

ENVS*4001	[0.50]	Project in Environmental Sciences
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2.00 electives or restricted electives

**Note:** For students considering graduate research programs in Ecology, ENVS\*4001/2 may be substituted by an independent research course (1.00 credits minimum) with approval from the Ecology Faculty Advisor. Course options include: (ENVS\*3410 and ENVS\*3420) ENVS\*3430, (IBIO\*4500 and IBIO\*4510), IBIO\*4521/2.

**Semester 8**

ENVS*4002	[0.50]	Project in Environmental Sciences
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2.00 electives or restricted electives

**Note:** See note in semester 7.

**Restricted Electives**

Students are required to take 5.00 restricted credits in Ecology as noted below. Of these, at least 1.00 credits must be at the 4000 level.

1. A minimum of 0.50 credits from:

BIOL*4150	[0.50]	Wildlife Conservation and Management
CIS*1500	[0.50]	Introduction to Programming
GEOG*2420	[0.50]	The Earth From Space
GEOG*2480	[0.50]	Mapping and GIS
GEOG*3420	[0.50]	Remote Sensing of the Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis *
GEOG*4480	[1.00]	Applied Geographic Information Systems *

\* Additional prerequisites are required.

2. Students in the Ecology Major are required to take an additional 4.50 restricted elective credits from the following lists. Some courses may require other courses from the list as prerequisites.

**Ecology**

ANSC*3180	[0.50]	Wildlife Nutrition
BIOL*3450	[0.50]	Introduction to Aquatic Environments
BOT*3050	[0.50]	Plant Functional Ecology
ENVS*2030	[0.50]	Meteorology and Climatology
ENVS*2150	[0.50]	Terrestrial Systems
ENVS*3010	[0.50]	Climate Change Biology
ENVS*3270	[0.50]	Forest Biodiversity
ENVS*3290	[0.50]	Waterborne Disease Ecology
ENVS*4350	[0.50]	Forest Ecology
GEOG*2000	[0.50]	Geomorphology
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*3000	[0.50]	Fluvial Processes
GEOG*3610	[0.50]	Environmental Hydrology
NUTR*3210	[0.50]	Fundamentals of Nutrition
ZOO*4570	[0.50]	Marine Ecological Processes

**Conservation**

BIOL*4120	[0.50]	Evolutionary Ecology
BIOL*4150	[0.50]	Wildlife Conservation and Management
BIOL*4350	[0.50]	Biology of Polluted Waters
ENVS*2040	[0.50]	Plant Health and the Environment
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity
ENVS*3000	[0.50]	Nature Interpretation
ENVS*3010	[0.50]	Climate Change Biology
GEOG*2480	[0.50]	Mapping and GIS
GEOG*3020	[0.50]	Global Environmental Change
GEOG*3110	[0.50]	Biotic and Natural Resources
GEOG*3210	[0.50]	Management of the Biophysical Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis

GEOG*4110	[1.00]	Environmental Systems Analysis
GEOG*4230	[0.50]	Environmental Impact Assessment
GEOG*4480	[1.00]	Applied Geographic Information Systems

**Policy, Law and Management**

BIOL*4500	[0.50]	Natural Resource Policy Analysis
ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics
GEOG*2210	[0.50]	Environment and Resources
GEOG*4210	[0.50]	Environmental Governance
GEOG*4220	[0.50]	Local Environmental Management
PHIL*2070	[0.50]	Philosophy of the Environment
POLS*3370	[0.50]	Environmental Politics and Governance

**Independent Research and Field Courses**

BIOL*4410	[0.75]	Field Ecology
BIOL*4700	[0.50]	Field Biology
BIOL*4710	[0.25]	Field Biology
BIOL*4800	[0.50]	Field Biology
BIOL*4810	[0.25]	Field Biology
ENVS*3410	[0.50]	Independent Research I
ENVS*3420	[0.50]	Independent Research II
ENVS*3430	[1.00]	Independent Research
IBIO*4500	[0.75]	Research in Integrative Biology I
IBIO*4510	[0.75]	Research in Integrative Biology II
IBIO*4521	[1.00]	Thesis in Integrative Biology
IBIO*4522	[1.00]	Thesis in Integrative Biology
ZOO*4300	[0.75]	Marine Biology and Oceanography

**Credit Summary (20.00 Total Credits)**

7.00 credits - Environmental Sciences core

6.00 credits - Ecology Required courses

5.00 credits - Ecology Restricted electives

2.00 credits - Free electives

Students are reminded that 6.00 credits of their B.Sc. (Env.) degree must be at the 3000-4000 level.

Students are encouraged to seek advice on their choices from their faculty advisor. With prior approval, students may be able to use courses not on these lists towards their Ecology restrictive electives.

**Ecology (ECOL:C)****Department of Integrative Biology, College of Biological Science**

This program provides a solid foundation in the principles of ecology, training in both pure and applied aspects of ecology and an introduction to economic, legal and policy issues related to the management of the environment. From the 2nd year on, students increasingly augment the core in ecology and policy with extensive restricted electives choices that allow the student to tailor the program to their interests. The major provides a sound science background for careers in conservation, resource management, ecological consulting, or nature interpretation used in teaching, government, non-government or the private sector; or for further post-graduate training in fundamental ecology, environmental biology and environmental management or policy.

**Major****Semester 1 - Fall**

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

**Semester 2 - Winter**

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

**Semester 3 - Fall**

BIOL*2060	[0.50]	Ecology
PHYS*1080	[0.50]	Physics for Life Sciences
STAT*2040	[0.50]	Statistics I

One of:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics

0.50 electives or restricted electives

**Note:** PHYS\*1130 may be substituted for PHYS\*1080 and would be taken in a Winter semester.

**Note:** GEOG\*3210 may be substituted for ECON\*2100 or FARE\*2700 and would be taken in semester 5.

**Winter Semester**

COOP*1000	[0.00]	Co-op Work Term I
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**Semester 4 - Summer**

BIOC\*2580 [0.50] Introduction to Biochemistry

STAT\*2050 [0.50] Statistics II

1.50 electives or restricted electives

**Fall Semester**

COOP\*2000 [0.00] Co-op Work Term II

**Semester 5 - Winter**

BIOL\*2400 [0.50] Evolution

BIOL\*3110 [0.50] Population Ecology

MBG\*2040 [0.50] Foundations in Molecular Biology and Genetics

1.00 electives or restricted electives

**Summer Semester**

COOP\*3000 [0.00] Co-op Work Term III

**Semester 6 - Fall**

BIOL\*3010 [0.50] Laboratory and Field Work in Ecology

ENVS\*4001 [0.50] Project in Environmental Sciences

One of:

BOT\*2100 [0.50] Life Strategies of Plants

ZOO\*3200 [0.50] Comparative Animal Physiology I

One of:

BOT\*3410 [0.50] Plant Anatomy

ZOO\*2090 [0.50] Vertebrate Structure and Function

0.50 electives or restricted electives

**Note:** ZOO\*2700 may be substituted for BOT\*3410 or ZOO\*2090 and would be taken in semester 7.**Note:** For students considering graduate research programs in Ecology, ENVS\*4001/2 may be substituted by an independent research course (1.00 credits minimum) with approval from the Ecology Faculty Advisor. Course options include: (ENVS\*3410 and ENVS\*3420) ENVS\*3430, (IBIO\*4500 and IBIO\*4510), IBIO\*4521/2.**Semester 7 - Winter**

BIOL\*3120 [0.50] Community Ecology

BIOL\*3130 [0.50] Conservation Biology

ENVS\*4002 [0.50] Project in Environmental Sciences

1.00 electives or restricted electives

**Note:** See note in semester 6.**Summer Semester (Optional)**

COOP\*4000 [0.00] Co-op Work Term IV

**Semester 8- Fall**

2.50 electives or restricted electives

**Restricted Electives**

Students are required to take 5.00 restricted credits in Ecology as noted below. Of these, at least 1.00 credits must be at the 4000 level.

1. A minimum of 0.50 credits from:

BIOL\*4150 [0.50] Wildlife Conservation and Management

CIS\*1500 [0.50] Introduction to Programming

GEOG\*2420 [0.50] The Earth From Space

GEOG\*2480 [0.50] Mapping and GIS

GEOG\*3420 [0.50] Remote Sensing of the Environment

GEOG\*3480 [0.50] GIS and Spatial Analysis \*

GEOG\*4480 [1.00] Applied Geographic Information Systems

\* Additional prerequisites are required.

2. Students in the Ecology Major are required to take an additional 4.50 restricted elective credits from the following lists. Some courses may require other courses from the list as prerequisites.

**Ecology**

ANSC\*3180 [0.50] Wildlife Nutrition

BIOL\*3450 [0.50] Introduction to Aquatic Environments

BOT\*3050 [0.50] Plant Functional Ecology

ENVS\*2030 [0.50] Meteorology and Climatology

ENVS\*2150 [0.50] Terrestrial Systems

ENVS\*3010 [0.50] Climate Change Biology

ENVS\*3270 [0.50] Forest Biodiversity

ENVS\*3290 [0.50] Waterborne Disease Ecology

ENVS\*4350 [0.50] Forest Ecology

GEOG\*2000 [0.50] Geomorphology

GEOG\*2110 [0.50] Climate and the Biophysical Environment

GEOG\*3000 [0.50] Fluvial Processes

GEOG\*3610 [0.50] Environmental Hydrology

NUTR\*3210 [0.50] Fundamentals of Nutrition

ZOO\*4570 [0.50] Marine Ecological Processes

**Conservation**

BIOL\*4120 [0.50] Evolutionary Ecology

BIOL\*4150 [0.50] Wildlife Conservation and Management

BIOL\*4350 [0.50] Biology of Polluted Waters

ENVS\*2040 [0.50] Plant Health and the Environment

ENVS\*2330 [0.50] Current Issues in Ecosystem Science and Biodiversity

ENVS\*3000 [0.50] Nature Interpretation

ENVS\*3010 [0.50] Climate Change Biology

GEOG\*2480 [0.50] Mapping and GIS

GEOG\*3020 [0.50] Global Environmental Change

GEOG\*3110 [0.50] Biotic and Natural Resources

GEOG\*3210 [0.50] Management of the Biophysical Environment

GEOG\*3480 [0.50] GIS and Spatial Analysis

GEOG\*4110 [1.00] Environmental Systems Analysis

GEOG\*4230 [0.50] Environmental Impact Assessment

GEOG\*4480 [1.00] Applied Geographic Information Systems

**Policy, Law and Management**

BIOL\*4500 [0.50] Natural Resource Policy Analysis

ECON\*2100 [0.50] Economic Growth and Environmental Quality

FARE\*2700 [0.50] Survey of Natural Resource Economics

GEOG\*2210 [0.50] Environment and Resources

GEOG\*4210 [0.50] Environmental Governance

GEOG\*4220 [0.50] Local Environmental Management

PHIL\*2070 [0.50] Philosophy of the Environment

POLS\*3370 [0.50] Environmental Politics and Governance

**Independent Research and Field Courses**

BIOL\*4410 [0.75] Field Ecology

BIOL\*4700 [0.50] Field Biology

BIOL\*4710 [0.25] Field Biology

BIOL\*4800 [0.50] Field Biology

BIOL\*4810 [0.25] Field Biology

ENVS\*3410 [0.50] Independent Research I

ENVS\*3420 [0.50] Independent Research II

ENVS\*3430 [1.00] Independent Research

IBIO\*4500 [0.75] Research in Integrative Biology I

IBIO\*4510 [0.75] Research in Integrative Biology II

IBIO\*4521 [1.00] Thesis in Integrative Biology

IBIO\*4522 [1.00] Thesis in Integrative Biology

ZOO\*4300 [0.75] Marine Biology and Oceanography

**Credit Summary (20.00 Total Credits)**

7.00 credits - Environmental Sciences core

6.00 credits - Ecology Required courses

5.00 credits - Ecology Restricted electives

2.00 credits - Free electives

Students are reminded that 6.00 credits of their B.Sc. (Env.) degree must be at the 3000-4000 level.

Students are encouraged to seek advice on their choices from their faculty advisor. With prior approval, students may be able to use courses not on these lists towards their Ecology restrictive electives.

**Environmental Sciences (ENVS)****School of Environmental Sciences, Ontario Agricultural College****Major****Semester 1**

BIOL\*1070 [0.50] Discovering Biodiversity

CHEM\*1040 [0.50] General Chemistry I

ENVS\*1030 [1.00] Introduction to Environmental Sciences

MATH\*1080 [0.50] Elements of Calculus I

**Semester 2**

BIOL\*1090 [0.50] Introduction to Molecular and Cellular Biology

CHEM\*1050 [0.50] General Chemistry II

FARE\*1040 [1.00] Intro to Environmental Economics, Law &amp; Policy

GEOG\*1300 [0.50] Introduction to the Biophysical Environment

**Semester 3**

ENVS\*2230 [0.50] Communications in Environmental Science

ENVS\*2310 [0.50] Current Issues in Earth Surface Processes

ENVS\*2330 [0.50] Current Issues in Ecosystem Science and Biodiversity

One of:

ECON\*2100 [0.50] Economic Growth and Environmental Quality

FARE\*2700 [0.50] Survey of Natural Resource Economics

0.50 electives or restricted electives from List A

**Note:** ENVS\*2230 may be taken in either Semester 3 or 4.**Note:** 1.00 credits from: (ENVS\*2310, ENVS\*2320, ENVS\*2330, ENVS\*2340) must be taken by the end of Semester 4. ENVS\*2310 and/or ENVS\*2330 may be substituted for ENVS\*2320 and/or ENVS\*2340, which would be taken in Semester 4.**Note:** GEOG\*3210 may be substituted for ECON\*2100 or FARE\*2700 and would be taken in Semester 5.

**Semester 4**

ENVS*2230	[0.50]	Communications in Environmental Science
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt
STAT*2040	[0.50]	Statistics I

0.50 electives or electives from List A

**Note:** ENVS\*2230 is taken in Semester 4 if not already taken in Semester 3.

**Note:** 1.00 credits from: (ENVS\*2310, ENVS\*2320, ENVS\*2330, ENVS\*2340) must be taken by the end of Semester 4. ENVS\*2320 and/or ENVS\*2340 may be substituted for ENVS\*2310 and/or ENVS\*2330, which would be taken in Semester 3.

**Semester 5**

2.50 electives or restricted electives from List A

**Semester 6**

2.50 electives or restricted electives from List A

**Semester 7**

ENVS*4001	[0.50]	Project in Environmental Sciences *
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2.00 electives or restricted electives from List A

**Semester 8**

ENVS*4002	[0.50]	Project in Environmental Sciences *
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2.00 electives or restricted electives from List A

\* An Independent Research course may be substituted for ENVS\*4001/2.

**Restricted Electives**

Students are required to choose a minimum of 8.00 credits from the following list, including at least 1.00 credit at the 4000-level. The list has been divided into sections however students may choose courses from any of the sections provided that they have the necessary prerequisites for the upper level courses they plan to take. Students are encouraged to seek advice on their choices from their faculty advisor and are reminded that 6.00 credits of the B.Sc.(Env.) degree must be at the 3000-4000 level.

**Note:** Students should note that many restricted electives require other restricted electives as prerequisites. Students should consult the most recent Undergraduate Calendar for specific requirements.

**List A**

The following courses have as prerequisites courses from the first-year curriculum and/or courses within the list. Students are responsible for ensuring that they have the necessary pre-requisites for courses they wish to take.

**Aquatic Science:**

BIOL*3450	[0.50]	Introduction to Aquatic Environments
BIOL*4350	[0.50]	Biology of Polluted Waters
ENVS*3150	[0.50]	Aquatic Systems
ENVS*3190	[0.50]	Environmental Water Chemistry
ENVS*3290	[0.50]	Waterborne Disease Ecology

**Atmospheric Science:**

ENVS*2020	[0.50]	Agrometeorology
ENVS*2030	[0.50]	Meteorology and Climatology
ENVS*3050	[0.50]	Microclimatology
ENVS*4110	[0.50]	Physical Meteorology
ENVS*4210	[0.50]	Atmospheric Experimentation and Instrumentation
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

**Ecological and Environmental Toxicology:**

BIOC*2580	[0.50]	Introduction to Biochemistry
CHEM*3360	[0.50]	Environmental Chemistry and Toxicology
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*3020	[0.50]	Pesticides and the Environment
ENVS*3040	[0.50]	Natural Chemicals in the Environment
ENVS*4130	[0.50]	Chemical Ecology: Principles & Practice
MICR*3220	[0.50]	Plant Microbiology
MICR*4180	[0.50]	Microbial Processes in Environmental Management
TOX*2000	[0.50]	Principles of Toxicology

**Ecosystem Sciences and Biodiversity:**

BIOL*2060	[0.50]	Ecology
ENVS*2210	[0.50]	Introductory Apiculture
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity
ENVS*3000	[0.50]	Nature Interpretation
ENVS*3010	[0.50]	Climate Change Biology
ENVS*3090	[0.50]	Insect Diversity and Biology
ENVS*3230	[0.50]	Agroforestry Systems
ENVS*3250	[0.50]	Forest Health and Disease
ENVS*3270	[0.50]	Forest Biodiversity
ENVS*4040	[0.50]	Behaviour of Insects
ENVS*4230	[0.50]	Biology of Aquatic Insects
ENVS*4260	[0.50]	Field Entomology
ENVS*4270	[0.50]	Insect Biosystematics
ENVS*4350	[0.50]	Forest Ecology

**Geoscience:**

Last Revision: April 30, 2012

ENVS*1050	[0.50]	Geology and the Environment
ENVS*2110	[0.50]	Earth Material Science
ENVS*2150	[0.50]	Terrestrial Systems
ENVS*2200	[0.50]	Glacial Geology
ENVS*2400	[0.50]	Sedimentary Environments
ENVS*3060	[0.50]	Groundwater
ENVS*3260	[0.50]	Field Methods in Geosciences
ENVS*4280	[0.50]	Geomicrobiology
GEOG*3420	[0.50]	Remote Sensing of the Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis
GEOG*3610	[0.50]	Environmental Hydrology
GEOG*4150	[0.50]	Sedimentary Processes
<b>Plant Health and Pathology:</b>		
ENVB*4070	[0.50]	Biological and Cultural Control of Plant Diseases
ENVS*2040	[0.50]	Plant Health and the Environment
ENVS*3210	[0.50]	Plant Pathology
ENVS*4100	[0.50]	Integrated Management of Invasive Insect Pests
ENVS*4240	[0.50]	Biological Activity of Pesticides
MICR*3220	[0.50]	Plant Microbiology
PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant-Microbe Interactions
<b>Soil Science:</b>		
ENVS*2060	[0.50]	Soil Science
ENVS*3070	[0.50]	Environmental Soil Chemistry
ENVS*3080	[0.50]	Soil and Water Conservation
ENVS*3120	[0.50]	Land Utilization
ENVS*3130	[0.50]	Lab and Field Methods in Groundwater
ENVS*3200	[0.50]	Environmental Soil Biology
ENVS*4090	[0.50]	Soil Management
ENVS*4160	[0.50]	Soil and Nutrient Management
ENVS*4250	[0.50]	Soils in the Landscape
MICR*4140	[0.50]	Soil Microbiology and Biotechnology
PBIO*4100	[0.50]	Soil Plant Relationships
<b>Stewardship:</b>		
BIOL*3130	[0.50]	Conservation Biology
BIOL*4150	[0.50]	Wildlife Conservation and Management
ENVS*2120	[0.50]	Introduction to Environmental Stewardship
ENVS*3030	[0.50]	Conservation Field Course
ENVS*3110	[0.50]	Resource Planning Techniques
ENVS*3140	[0.50]	Management of Turfgrass Diseases
ENVS*4150	[0.50]	Natural Resources Management Field Camp

The following courses are guided independent study courses. The semester prior to enrolling in one of these courses the student must arrange for a faculty supervisor and develop a course proposal in consultation with that supervisor.

ENVS*3100	[0.50]	Internship/Externship in Environmental Sciences
ENVS*3410	[0.50]	Independent Research I
ENVS*3420	[0.50]	Independent Research II
ENVS*3430	[1.00]	Independent Research
ENVS*4410	[1.00]	Advanced Independent Research I
ENVS*4420	[1.00]	Advanced Independent Research II
ENVS*4430	[2.00]	Advanced Independent Research

**Credit Summary (20.00 Total Credits)**

7.00 credits - Environmental Sciences core

1.50 credits - Required Courses for the Major

8.00 credits - Restricted Electives (List A)

3.50 credits - Free electives

Students are encouraged to seek advice from their faculty advisor and are reminded that 6.00 credits of their B.Sc.(Env.) degree must be at the 3000-4000 level. With prior approval, students may be able to use courses not on List A toward their restricted electives

**Environmental Sciences (ENVS:C)****School of Environmental Sciences, Ontario Agricultural College****Major****Semester 1 - Fall**

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

**Semester 2 - Winter**

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

**Semester 3 - Fall**

ENVS*2230	[0.50]	Communications in Environmental Science
ENVS*2310	[0.50]	Current Issues in Earth Surface Processes
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity

One of:

ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics

0.50 electives or restricted electives from List A

**Note:** ENVS\*2230 may be taken in either Semester 3 or 5.

**Note:** 1.00 credits from: (ENVS\*2310, ENVS\*2320, ENVS\*2330, ENVS\*2340) must be taken by the end of Semester 5. ENVS\*2310 and/or ENVS\*2330 may be substituted for ENVS\*2320 and/or ENVS\*2340, which would be taken in Semester 5.

**Note:** GEOG\*3210 may be substituted for ECON\*2100 or FARE\*2700 and would be taken in Semester 6.

**Winter Semester**

COOP*1000	[0.00]	Co-op Work Term I
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**Semester 4 - Summer**

STAT*2040	[0.50]	Statistics I
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2.00 electives or restricted electives from List A

**Fall Semester**

COOP*2000	[0.00]	Co-op Work Term II
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**Semester 5 - Winter**

ENVS*2230	[0.50]	Communications in Environmental Science
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt

1.00 electives or restricted electives from List A

**Note:** ENVS\*2230 is taken in Semester 4 if not already taken in Semester 3.

**Note:** 1.00 credits from: (ENVS\*2310, ENVS\*2320, ENVS\*2330, ENVS\*2340) must be taken by the end of Semester 5. ENVS\*2320 and/or ENVS\*2340 may be substituted for ENVS\*2310 and/or ENVS\*2330, which would be taken in Semester 3.

**Summer Semester**

COOP*3000	[0.00]	Co-op Work Term III
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**Semester 6 - Fall**

ENVS*4001	[0.50]	Project in Environmental Sciences *
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2.00 electives or restricted electives from List A

**Semester 7 - Winter**

ENVS*4002	[0.50]	Project in Environmental Sciences *
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2.00 electives or restricted electives from List A

**Summer Semester - (Optional)**

COOP*4000	[0.00]	Co-op Work Term IV
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**Semester 8 - Fall**

2.50 electives or restricted electives from List A

\* An Independent Research course may be substituted for ENVS\*4001/2.

**Restricted Electives**

Students are required to choose a minimum of 8.00 credits from the following list, including at least 1.00 credit at the 4000-level. The list has been divided into sections however students may choose courses from any of the sections provided that they have the necessary prerequisites for the upper level courses they plan to take. Students are encouraged to seek advice on their choices from their faculty advisor and are reminded that 6.00 credits of the B.Sc.(Env.) degree must be at the 3000-4000 level.

**Note:** Students should note that many restricted electives require other restricted electives as prerequisites. Students should consult the most recent Undergraduate Calendar for specific requirements.

**List A**

The following courses have as prerequisites courses from the first-year curriculum and/or courses within the list. Students are responsible for ensuring that they have the necessary pre-requisites for courses they wish to take.

**Aquatic Science:**

BIOL*3450	[0.50]	Introduction to Aquatic Environments
BIOL*4350	[0.50]	Biology of Polluted Waters
ENVS*3150	[0.50]	Aquatic Systems
ENVS*3190	[0.50]	Environmental Water Chemistry
ENVS*3290	[0.50]	Waterborne Disease Ecology

**Atmospheric Science:**

ENVS*2020	[0.50]	Agrometeorology
ENVS*2030	[0.50]	Meteorology and Climatology
ENVS*3050	[0.50]	Microclimatology
ENVS*4110	[0.50]	Physical Meteorology
ENVS*4210	[0.50]	Atmospheric Experimentation and Instrumentation
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

**Ecological and Environmental Toxicology:**

BIOC*2580	[0.50]	Introduction to Biochemistry
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CHEM*3360	[0.50]	Environmental Chemistry and Toxicology
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*3020	[0.50]	Pesticides and the Environment
ENVS*3040	[0.50]	Natural Chemicals in the Environment
ENVS*4130	[0.50]	Chemical Ecology: Principles & Practice
MICR*3220	[0.50]	Plant Microbiology
MICR*4180	[0.50]	Microbial Processes in Environmental Management
TOX*2000	[0.50]	Principles of Toxicology

**Ecosystem Sciences and Biodiversity:**

BIOL*2060	[0.50]	Ecology
ENVS*2210	[0.50]	Introductory Apiculture
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity
ENVS*3000	[0.50]	Nature Interpretation
ENVS*3010	[0.50]	Climate Change Biology
ENVS*3090	[0.50]	Insect Diversity and Biology
ENVS*3230	[0.50]	Agroforestry Systems
ENVS*3250	[0.50]	Forest Health and Disease
ENVS*3270	[0.50]	Forest Biodiversity
ENVS*4040	[0.50]	Behaviour of Insects
ENVS*4230	[0.50]	Biology of Aquatic Insects
ENVS*4260	[0.50]	Field Entomology
ENVS*4270	[0.50]	Insect Biosystematics
ENVS*4350	[0.50]	Forest Ecology

**Geoscience:**

ENVS*1050	[0.50]	Geology and the Environment
ENVS*2110	[0.50]	Earth Material Science
ENVS*2150	[0.50]	Terrestrial Systems
ENVS*2200	[0.50]	Glacial Geology
ENVS*2400	[0.50]	Sedimentary Environments
ENVS*3060	[0.50]	Groundwater
ENVS*3260	[0.50]	Field Methods in Geosciences
ENVS*4280	[0.50]	Geomicrobiology
GEOG*3420	[0.50]	Remote Sensing of the Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis
GEOG*3610	[0.50]	Environmental Hydrology
GEOG*4150	[0.50]	Sedimentary Processes

**Plant Health and Pathology:**

ENVB*4070	[0.50]	Biological and Cultural Control of Plant Diseases
ENVS*2040	[0.50]	Plant Health and the Environment
ENVS*3210	[0.50]	Plant Pathology
ENVS*4100	[0.50]	Integrated Management of Invasive Insect Pests
ENVS*4240	[0.50]	Biological Activity of Pesticides
MICR*3220	[0.50]	Plant Microbiology
PBIO*4000	[0.50]	Molecular and Cellular Aspects of Plant-Microbe Interactions

**Soil Science:**

ENVS*2060	[0.50]	Soil Science
ENVS*3070	[0.50]	Environmental Soil Chemistry
ENVS*3080	[0.50]	Soil and Water Conservation
ENVS*3120	[0.50]	Land Utilization
ENVS*3130	[0.50]	Lab and Field Methods in Groundwater
ENVS*3200	[0.50]	Environmental Soil Biology
ENVS*4090	[0.50]	Soil Management
ENVS*4160	[0.50]	Soil and Nutrient Management
ENVS*4250	[0.50]	Soils in the Landscape
MICR*4140	[0.50]	Soil Microbiology and Biotechnology
PBIO*4100	[0.50]	Soil Plant Relationships

**Stewardship:**

BIOL*3130	[0.50]	Conservation Biology
BIOL*4150	[0.50]	Wildlife Conservation and Management
ENVS*2120	[0.50]	Introduction to Environmental Stewardship
ENVS*3030	[0.50]	Conservation Field Course
ENVS*3110	[0.50]	Resource Planning Techniques
ENVS*3140	[0.50]	Management of Turfgrass Diseases
ENVS*4150	[0.50]	Natural Resources Management Field Camp

The following courses are guided independent study courses. The semester prior to enrolling in one of these courses the student must arrange for a faculty supervisor and develop a course proposal in consultation with that supervisor.

ENVS*3100	[0.50]	Internship/Externship in Environmental Sciences
ENVS*3410	[0.50]	Independent Research I
ENVS*3420	[0.50]	Independent Research II
ENVS*3430	[1.00]	Independent Research
ENVS*4410	[1.00]	Advanced Independent Research I
ENVS*4420	[1.00]	Advanced Independent Research II
ENVS*4430	[2.00]	Advanced Independent Research

**Credit Summary (20.00 Total Credits)**

7.00 credits - Environmental Sciences core

1.50 credits - Required Courses for the Major

8.00 credits - Restricted Electives (List A)

3.50 credits - Free electives

Students are encouraged to seek advice from their faculty advisor and are reminded that 6.00 credits of their B.Sc.(Env.) degree must be at the 3000-4000 level. With prior approval, students may be able to use courses not on List A toward their restricted electives

### Environmental Economics and Policy (EEP)

Department of Economics, College of Management and Economics

Department of Food, Agricultural and Resource Economics, Ontario Agricultural College

#### Major

##### Semester 1

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

##### Semester 2

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

##### Semester 3

ECON*1100	[0.50]	Introductory Macroeconomics
ECON*2100	[0.50]	Economic Growth and Environmental Quality
ENVS*2150	[0.50]	Terrestrial Systems
FARE*2700	[0.50]	Survey of Natural Resource Economics

One of:

BIOC*2580	[0.50]	Introduction to Biochemistry
BIOL*2060	[0.50]	Ecology
ENVS*1050	[0.50]	Geology and the Environment
ENVS*2110	[0.50]	Earth Material Science
ENVS*2310	[0.50]	Current Issues in Earth Surface Processes
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity
GEOG*2480	[0.50]	Mapping and GIS
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences
TOX*2000	[0.50]	Principles of Toxicology

##### Semester 4

ECON*2310	[0.50]	Intermediate Microeconomics
ECON*2740	[0.50]	Economic Statistics
ECON*2770	[0.50]	Introductory Mathematical Economics
FARE*3170	[0.50]	Cost-Benefit Analysis

One of:

BIOC*2580	[0.50]	Introduction to Biochemistry
BIOL*2060	[0.50]	Ecology
ENVS*2020	[0.50]	Agrometeorology
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt
ENVS*3150	[0.50]	Aquatic Systems
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*2480	[0.50]	Mapping and GIS
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

**Note:** STAT\*2040 may be substituted for ECON\*2740.

##### Semester 5

ECON*2410	[0.50]	Intermediate Macroeconomics
ECON*3710	[0.50]	Advanced Microeconomics
ECON*3740	[0.50]	Introduction to Econometrics
FARE*4290	[0.50]	Land Economics

0.50 electives or restricted electives

**Note:** FARE\*4290 is taught in even-numbered years.

**Note:** Students who wish to pursue graduate studies in Economics should take the following courses: ECON\*3810, ECON\*4710, ECON\*4810 and ECON\*4640.

##### Semester 6

2.50 electives or restricted electives

##### Semester 7

ENVS*4001	[0.50]	Project in Environmental Sciences
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2.00 electives or restricted electives

##### Semester 8

ECON*4930	[0.50]	Environmental Economics
ENVS*4002	[0.50]	Project in Environmental Sciences
FARE*4310	[0.50]	Resource Economics

1.00 restricted electives or electives

#### Restricted Electives

Students in the Environmental Economics and Policy major are required to choose 2.50 additional credits from Food, Agricultural and Resource Economics (FARE\*XXXX) or Economics (ECON\*XXXX) at the 3000 or 4000 level. Students must also take 5.00 additional credits in science courses. A list of acceptable science courses (which includes some ECON and FARE courses to simultaneously meet the additional FARE and ECON restricted electives), is available at [http://www.bsc.uoguelph.ca/Approved\\_electives.shtml](http://www.bsc.uoguelph.ca/Approved_electives.shtml).

### Environmental Economics and Policy (EEP:C)

Department of Economics, College of Management and Economics

Department of Food, Agricultural and Resource Economics, Ontario Agricultural College

#### Major

##### Semester 1 - Fall

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

##### Semester 2 - Winter

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

##### Semester 3 - Fall

ECON*1100	[0.50]	Introductory Macroeconomics
ECON*2100	[0.50]	Economic Growth and Environmental Quality
ENVS*2150	[0.50]	Terrestrial Systems
FARE*2700	[0.50]	Survey of Natural Resource Economics

One of:

BIOC*2580	[0.50]	Introduction to Biochemistry
BIOL*2060	[0.50]	Ecology
ENVS*1050	[0.50]	Geology and the Environment
ENVS*2110	[0.50]	Earth Material Science
ENVS*2310	[0.50]	Current Issues in Earth Surface Processes
ENVS*2330	[0.50]	Current Issues in Ecosystem Science and Biodiversity
GEOG*2480	[0.50]	Mapping and GIS
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences
TOX*2000	[0.50]	Principles of Toxicology

##### Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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##### Semester 4 - Summer

ECON*2310	[0.50]	Intermediate Microeconomics
ECON*2410	[0.50]	Intermediate Macroeconomics
ECON*2770	[0.50]	Introductory Mathematical Economics
STAT*2040	[0.50]	Statistics I

0.50 electives or restricted electives

**Note:** ECON\*2740 may be substituted for STAT\*2040.

##### Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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##### Semester 5 - Winter

ECON*3740	[0.50]	Introduction to Econometrics
FARE*3170	[0.50]	Cost-Benefit Analysis

One of:

BIOC*2580	[0.50]	Introduction to Biochemistry
BIOL*2060	[0.50]	Ecology
ENVS*2020	[0.50]	Agrometeorology
ENVS*2320	[0.50]	Current Issues in Microbial and Molecular Science
ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt
ENVS*3150	[0.50]	Aquatic Systems
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*2480	[0.50]	Mapping and GIS
PHYS*1070	[0.50]	Introductory Physics for Life Sciences
PHYS*1080	[0.50]	Physics for Life Sciences
PHYS*1130	[0.50]	Physics with Applications

1.00 electives or restricted electives

**Note:** Students who wish to pursue graduate studies in Economics should take the following courses: ECON\*3810, ECON\*4710, ECON\*4810 and ECON\*4640.

##### Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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##### Semester 6 - Fall

ECON*3710	[0.50]	Advanced Microeconomics
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ENVS*4001	[0.50]	Project in Environmental Sciences
FARE*4290	[0.50]	Land Economics

1.00 electives or restricted electives

**Note:** FARE\*4290 is taught in even-numbered years.

### Semester 7 - Winter

ECON*4930	[0.50]	Environmental Economics
ENVS*4002	[0.50]	Project in Environmental Sciences
FARE*4310	[0.50]	Resource Economics

1.00 electives or restricted electives

### Summer Semester (Optional)

COOP*4000	[0.00]	Co-op Work Term IV
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### Semester 8 - Fall

2.50 electives or restricted electives

### Restricted Electives

Students in the Environmental Economics and Policy major are required to choose 2.50 additional credits from Food, Agricultural and Resource Economics (FARE\*XXXX) or Economics (ECON\*XXXX) at the 3000 or 4000 level. Students must also take 5.00 additional credits in science courses. A list of acceptable science courses, which includes ECON and FARE courses to simultaneously meet the additional FARE and ECON restricted electives, is available at [http://www.bsc.uoguelph.ca/Approved\\_electives.shtml](http://www.bsc.uoguelph.ca/Approved_electives.shtml).

## Environment and Resource Management (ERM)

Department of Geography, College of Social and Applied Human Sciences

### Major

#### Semester 1

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

#### Semester 2

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

#### Semester 3

GEOG*2000	[0.50]	Geomorphology
GEOG*2460	[0.50]	Analysis in Geography
One of:		
ECON*2100	[0.50]	Economic Growth and Environmental Quality
FARE*2700	[0.50]	Survey of Natural Resource Economics

1.00 electives

#### Semester 4

ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*2210	[0.50]	Environment and Resources
GEOG*2480	[0.50]	Mapping and GIS

0.50 electives

**Note:** ENVS\*2120 may be substituted for ENVS\*2340 and could be taken in Semester 5.

#### Semester 5

ENVS*3120	[0.50]	Land Utilization
GEOG*3000	[0.50]	Fluvial Processes
GEOG*3110	[0.50]	Biotic and Natural Resources
GEOG*3210	[0.50]	Management of the Biophysical Environment

0.50 electives

**Note:** GEOG\*3610 may be substituted for ENVS\*3120 or GEOG\*3000 and would be taken in Semester 6.

#### Semester 6

GEOG*3480	[0.50]	GIS and Spatial Analysis
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2.00 electives

#### Semester 7

ENVS*4001	[0.50]	Project in Environmental Sciences
GEOG*4110	[1.00]	Environmental Systems Analysis

1.00 electives

#### Semester 8

ENVS*4002	[0.50]	Project in Environmental Sciences
GEOG*4210	[0.50]	Environmental Governance

At least 1.00 credits from:

ENVS*3110	[0.50]	Resource Planning Techniques
GEOG*4220	[0.50]	Local Environmental Management
GEOG*4230	[0.50]	Environmental Impact Assessment

0.50 electives

## Environment and Resource Management (ERM:C)

Department of Geography, College of Social and Applied Human Sciences

### Major

#### Semester 1 - Fall

BIOL*1070	[0.50]	Discovering Biodiversity
CHEM*1040	[0.50]	General Chemistry I
ENVS*1030	[1.00]	Introduction to Environmental Sciences
MATH*1080	[0.50]	Elements of Calculus I

#### Semester 2 - Winter

BIOL*1090	[0.50]	Introduction to Molecular and Cellular Biology
CHEM*1050	[0.50]	General Chemistry II
COOP*1100	[0.00]	Introduction to Co-operative Education
FARE*1040	[1.00]	Intro to Environmental Economics, Law & Policy
GEOG*1300	[0.50]	Introduction to the Biophysical Environment

**Note:** FARE\*2700 may be substituted for ECON\*2100 and may be taken in Semester 3 or 6. GEOG\*2460 may be substituted for STAT\*2040 and may be taken in Semester 3 or 6.

**Note:** ENVS\*2120 may be substituted for ENVS\*2340 and could be taken in Semester 3 or 6.

#### Semester 3 - Fall

GEOG*2000	[0.50]	Geomorphology
GEOG*2480	[0.50]	Mapping and GIS

1.50 electives

#### Winter Semester

COOP*1000	[0.00]	Co-op Work Term I
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#### Semester 4 - Summer

ECON*2100	[0.50]	Economic Growth and Environmental Quality
GEOG*2210	[0.50]	Environment and Resources
STAT*2040	[0.50]	Statistics I

1.00 electives

#### Fall Semester

COOP*2000	[0.00]	Co-op Work Term II
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#### Semester 5 - Winter

ENVS*2340	[0.50]	Current Issues in Agriculture and Landscape Mgmt
GEOG*2110	[0.50]	Climate and the Biophysical Environment
GEOG*3480	[0.50]	GIS and Spatial Analysis

1.00 electives

#### Summer Semester

COOP*3000	[0.00]	Co-op Work Term III
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#### Semester 6 - Fall

ENVS*3120	[0.50]	Land Utilization
ENVS*4001	[0.50]	Project in Environmental Sciences
GEOG*3000	[0.50]	Fluvial Processes
GEOG*3110	[0.50]	Biotic and Natural Resources
GEOG*3210	[0.50]	Management of the Biophysical Environment

**Note:** GEOG\*3610 may be substituted for ENVS\*3120 or GEOG\*3000 and would be taken in Semester 7.

#### Semester 7 - Winter

ENVS*4002	[0.50]	Project in Environmental Sciences
GEOG*4210	[0.50]	Environmental Governance

At least 1.00 credits from:

ENVS*3110	[0.50]	Resource Planning Techniques
GEOG*4220	[0.50]	Local Environmental Management
GEOG*4230	[0.50]	Environmental Impact Assessment

0.50 electives

#### Summer Semester (Optional)

COOP*4000	[0.00]	Co-op Work Term IV
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#### Semester 8 - Fall

GEOG*4110	[1.00]	Environmental Systems Analysis
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1.50 electives