

# 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 Requirements (Honours)

This is a major within the degree: Bachelor of Science in Environmental Sciences.

Code	Title	Credits
<b>Semester 1</b>		
BIOL*1070	Discovering Biodiversity	0.50
CHEM*1040	General Chemistry I	0.50
ENVS*1030	Introduction to Environmental Sciences	1.00
MATH*1080	Elements of Calculus I	0.50
<b>Semester 2</b>		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1050	General Chemistry II	0.50
FARE*1040	Introduction to Environmental Economics, Law and Policy	1.00
GEOG*1300	Introduction to the Biophysical Environment	0.50
<b>Semester 3</b>		
BIOL*2060	Ecology	0.50
PHYS*1080	Physics for Life Sciences <sup>1</sup>	0.50
or PHYS*1300	Fundamentals of Physics	
ECON*2100	Economic Growth and Environmental Quality <sup>2</sup>	0.50
or FARE*2700	Survey of Natural Resource Economics	
1.00 electives or restricted electives		1.00
<b>Semester 4</b>		
BIOC*2580	Introduction to Biochemistry	0.50
BIOL*2400	Evolution	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
STAT*2230	Biostatistics for Integrative Biology	0.50
0.50 electives or restricted electives		0.50
<b>Semester 5</b>		
BIOL*3010	Laboratory and Field Work in Ecology	0.50
2.00 electives or restricted electives		2.00
<b>Semester 6</b>		
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*3130	Conservation Biology	0.50

1.50 electives or restricted electives	1.50
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### Semester 7

ENVS*4001	Project in Environmental Sciences	0.50
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2.00 electives or restricted electives	2.00
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### Semester 8

ENVS*4002	Project in Environmental Sciences	0.50
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2.00 electives or restricted electives	2.00
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- <sup>1</sup> Students lacking 4U physics or equivalent must take PHYS\*1300 Fundamentals of Physics. Students with 4U physics or equivalent must take PHYS\*1080 Physics for Life Sciences. PHYS\*1130 Physics with Applications may be substituted for PHYS\*1080 Physics for Life Sciences.
- <sup>2</sup> GEOG\*2210 Environment and Resources may be substituted for ECON\*2100 Economic Growth and Environmental Quality or FARE\*2700 Survey of Natural Resource Economics and would be taken in semester 4.

## Restricted Electives

Students are required to take 6.50 restricted credits as noted below. Of these, at least 1.00 credits must be at the 4000 level.

1. One from:

Code	Title	Credits
BOT*2100	Life Strategies of Plants	0.50
or ZOO*3600	Comparative Animal Physiology I	

2. A minimum of 0.50 credits from:

Code	Title	Credits
BOT*3410	Plant Anatomy	0.50
ZOO*2090	Vertebrate Structure and Function	0.50
ZOO*2700	Invertebrate Morphology & Evolution	0.50

3. A minimum of 0.50 credits from:

Code	Title	Credits
BIOL*4150	Wildlife Conservation and Management	0.50
CIS*1500	Introduction to Programming	0.50
GEOG*2420	The Earth From Space	0.50
GEOG*2480	Mapping and GIS	0.50
GEOG*3420	Remote Sensing of the Environment <sup>4</sup>	0.50
GEOG*3480	GIS and Spatial Analysis <sup>4</sup>	0.50
GEOG*4480	Applied Geomatics <sup>4</sup>	1.00

- <sup>4</sup> Additional prerequisites are required.

4. Students in the Ecology Major are required to take an additional 5.00 restricted elective credits from the following lists. Some courses may require other courses from the list as prerequisites. No course may be counted as both a required course and a restricted elective.

Code	Title	Credits
<b>Ecology</b>		
ANSC*3180	Wildlife Nutrition	0.50
BIOL*3450	Introduction to Aquatic Environments	0.50
BIOL*3670	Introduction to Wildlife Rehabilitation	0.50

BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BOT*3050	Plant Functional Ecology	0.50
ENVS*2030	Meteorology and Climatology	0.50
ENVS*3010	Climate Change Biology	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3290	Waterborne Disease Ecology	0.50
ENVS*3370	Terrestrial Ecosystem Ecology	0.50
ENVS*4350	Forest Ecology	0.50
GEOG*2000	Geomorphology	0.50
GEOG*2110	Climate and the Biophysical Environment	0.50
GEOG*3000	Fluvial Processes	0.50
GEOG*3610	Environmental Hydrology	0.50
NUTR*3210	Fundamentals of Nutrition	0.50
ZOO*2090	Vertebrate Structure and Function	0.50
ZOO*2700	Invertebrate Morphology & Evolution	0.50
ZOO*4570	Marine Ecological Processes	0.50
<b>Conservation</b>		
BIOL*4120	Evolutionary Ecology	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4350	Limnology of Natural and Polluted Waters	0.50
ENVS*2040	Plant Health and the Environment	0.50
ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
ENVS*3000	Nature Interpretation	0.50
ENVS*3010	Climate Change Biology	0.50
GEOG*2480	Mapping and GIS	0.50
GEOG*3020	Global Environmental Change	0.50
GEOG*3110	Biogeography	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3480	GIS and Spatial Analysis	0.50
GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4230	Environmental Impact Assessment	0.50
GEOG*4480	Applied Geomatics	1.00
<b>Policy, Law and Management</b>		
BIOL*4500	Natural Resource Policy Analysis	0.50
ECON*2100	Economic Growth and Environmental Quality	0.50
FARE*2700	Survey of Natural Resource Economics	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*4210	Environmental Governance	0.50
GEOG*4220	Local Environmental Management	0.50
PHIL*2070	Philosophy of the Environment	0.50
POLS*3370	Environmental Politics and Governance	0.50
<b>Independent Research, Experiential Learning, and Field Courses</b>		
BIOL*3660	Internship In Biological Science	0.50
BIOL*4410	Field Ecology	0.75
BIOL*4700	Field Biology	0.50
BIOL*4710	Field Biology	0.25
BIOL*4800	Field Biology	0.50
BIOL*4810	Field Biology	0.25

ENVS*4410	Introduction to Advanced Independent Research	0.50
ENVS*4420	Advanced Independent Research	0.50
ENVS*4430	Advanced Independent Research	1.00
IAEF*3500	Experiential Education	0.50
IAEF*3510	Interdisciplinary Flexible Internship	0.50
IBIO*4500	Research in Integrative Biology I	1.00
IBIO*4510	Research in Integrative Biology II	1.00
IBIO*4521	Thesis in Integrative Biology	1.00
IBIO*4522	Thesis in Integrative Biology	1.00
ZOO*4300	Marine Biology and Oceanography	0.75

## Credit Summary

(20.00 Total Credits)

Code	Title	Credits
Environmental Sciences core		7.00
Required courses		4.00
Restricted electives		6.50
Free electives		2.50
<b>Total Credits</b>		<b>20</b>

Students are reminded that 6.00 credits of their B.Sc. (Env.) degree must be at the 3000-4000 level, and no program may include more than 7.00 credits at the 1000 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.

## Co-op Requirements (Honours)

**This is a major within the degree: Bachelor of Science in Environmental Sciences.**

The Co-op program in Ecology is a five year program including four work terms. Students must complete a Fall, Winter and Summer work term, and must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recrutguelp.ca/cecs/>). Please refer to the Co-operative Education program policy with respect to adjusting this schedule.

## Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2; COOP*1100	Off
2	Academic Semester 3	COOP*1000 Work Term I	COOP*2000 Work Term II
3	Academic Semester 4	Academic Semester 5	COOP*3000 Work Term III
4	COOP*4000 Work Term IV	Academic Semester 6	Off
5	Academic Semester 7	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Co-ordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

## Credit Summary

(22.00 Total Credits)

Code	Title	Credits
	Environmental Sciences Core	7.00
	Required Courses	4.00
	Restricted Electives	6.50
	Free Electives	2.50
	Co-op Work Terms	2.00
<b>Total Credits</b>		<b>22</b>

Students are reminded that 6.00 credits of their B.Sc. (Env.) degree must be at the 3000-4000 level, and no program may include more than 7.00 credits at the 1000 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.

## Recommended Program Sequence

Code	Title	Credits
<b>Semester 1 - Fall</b>		
BIOL*1070	Discovering Biodiversity	0.50
CHEM*1040	General Chemistry I	0.50
ENVS*1030	Introduction to Environmental Sciences	1.00
MATH*1080	Elements of Calculus I	0.50
<b>Semester 2 - Winter</b>		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1050	General Chemistry II	0.50
COOP*1100	Introduction to Co-operative Education	0.00
FARE*1040	Introduction to Environmental Economics, Law and Policy	1.00
GEOG*1300	Introduction to the Biophysical Environment	0.50
<b>Summer Semester</b>		
No academic semester or work term		
<b>Semester 3 - Fall</b>		
BIOL*2060	Ecology	0.50
PHYS*1080	Physics for Life Sciences <sup>2</sup>	0.50
or PHYS*1300	Fundamentals of Physics	
ECON*2100	Economic Growth and Environmental Quality <sup>3</sup>	0.50
or FARE*2700	Survey of Natural Resource Economics	
1.00 electives or restricted electives		1.00
<b>Winter Semester</b>		
COOP*1000	Co-op Work Term I	0.50
<b>Summer Semester</b>		
COOP*2000	Co-op Work Term II	0.50
<b>Semester 4 - Fall</b>		
BIOC*2580	Introduction to Biochemistry	0.50
2.00 electives or restricted electives		2.00

<b>Semester 5 - Winter <sup>4</sup></b>		
BIOL*2400	Evolution	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
STAT*2230	Biostatistics for Integrative Biology	0.50
1.00 electives or restricted electives		1.00
<b>Summer Semester</b>		
COOP*3000	Co-op Work Term III	0.50
<b>Fall Semester</b>		
COOP*4000	Co-op Work Term IV	0.50
<b>Semester 6 - Winter</b>		
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*3130	Conservation Biology	0.50
1.50 electives or restricted electives		1.50
<b>Summer Semester</b>		
No academic semester or work term		
<b>Semester 7 - Fall</b>		
BIOL*3010	Laboratory and Field Work in Ecology	0.50
ENVS*4001	Project in Environmental Sciences	0.50
1.50 electives or restricted electives		1.50
<b>Semester 8 - Winter</b>		
ENVS*4002	Project in Environmental Sciences	0.50
2.00 electives or restricted electives		2.00

- <sup>2</sup> Students lacking 4U physics or equivalent must take PHYS\*1300 Fundamentals of Physics. Students with 4U physics or equivalent must take PHYS\*1080 Physics for Life Sciences. PHYS\*1130 Physics with Applications may be substituted for PHYS\*1080 Physics for Life Sciences.
- <sup>3</sup> GEOG\*2210 Environment and Resources may be substituted for ECON\*2100 Economic Growth and Environmental Quality or FARE\*2700 Survey of Natural Resource Economics and would be taken in semester 5.

## Restricted Electives

Students are required to take 6.50 restricted elective credits in Ecology as noted below. Of these, at least 1.00 credits must be at the 4000 level.

1. One from:

Code	Title	Credits
BOT*2100	Life Strategies of Plants	0.50
or ZOO*3600	Comparative Animal Physiology I	

2. A minimum of 0.50 credits from:

Code	Title	Credits
BOT*3410	Plant Anatomy	0.50
ZOO*2090	Vertebrate Structure and Function	0.50
ZOO*2700	Invertebrate Morphology & Evolution	0.50

3. A minimum of 0.50 credits from:

Code	Title	Credits
BIOL*4150	Wildlife Conservation and Management	0.50
CIS*1500	Introduction to Programming	0.50
GEOG*2420	The Earth From Space	0.50

GEOG*2480	Mapping and GIS	0.50
GEOG*3420	Remote Sensing of the Environment <sup>5</sup>	0.50
GEOG*3480	GIS and Spatial Analysis <sup>5</sup>	0.50
GEOG*4480	Applied Geomatics	1.00

<sup>5</sup> Additional prerequisites are required.

4. Students in the Ecology Major are required to take an additional 5.00 restricted elective credits from the following lists. Some courses may require other courses from the list as prerequisites. No course may be counted as both a required course and a restricted elective.

Code	Title	Credits
<b>Ecology</b>		
ANSC*3180	Wildlife Nutrition	0.50
BIOL*3450	Introduction to Aquatic Environments	0.50
BIOL*3670	Introduction to Wildlife Rehabilitation	0.50
BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BOT*3050	Plant Functional Ecology	0.50
ENVS*2030	Meteorology and Climatology	0.50
ENVS*3010	Climate Change Biology	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3290	Waterborne Disease Ecology	0.50
ENVS*3370	Terrestrial Ecosystem Ecology	0.50
ENVS*4350	Forest Ecology	0.50
GEOG*2000	Geomorphology	0.50
GEOG*2110	Climate and the Biophysical Environment	0.50
GEOG*3000	Fluvial Processes	0.50
GEOG*3610	Environmental Hydrology	0.50
NUTR*3210	Fundamentals of Nutrition	0.50
ZOO*2090	Vertebrate Structure and Function	0.50
ZOO*2700	Invertebrate Morphology & Evolution	0.50
ZOO*4570	Marine Ecological Processes	0.50
<b>Conservation</b>		
BIOL*4120	Evolutionary Ecology	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4350	Limnology of Natural and Polluted Waters	0.50
ENVS*2040	Plant Health and the Environment	0.50
ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
ENVS*3000	Nature Interpretation	0.50
ENVS*3010	Climate Change Biology	0.50
GEOG*2480	Mapping and GIS	0.50
GEOG*3020	Global Environmental Change	0.50
GEOG*3110	Biogeography	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3480	GIS and Spatial Analysis	0.50
GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4230	Environmental Impact Assessment	0.50
GEOG*4480	Applied Geomatics	1.00
<b>Policy, Law and Management</b>		
BIOL*4500	Natural Resource Policy Analysis	0.50

ECON*2100	Economic Growth and Environmental Quality	0.50
FARE*2700	Survey of Natural Resource Economics	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*4210	Environmental Governance	0.50
GEOG*4220	Local Environmental Management	0.50
PHIL*2070	Philosophy of the Environment	0.50
POLS*3370	Environmental Politics and Governance	0.50
<b>Independent Research and Field Courses</b>		
BIOL*4410	Field Ecology	0.75
BIOL*4700	Field Biology	0.50
BIOL*4710	Field Biology	0.25
BIOL*4800	Field Biology	0.50
BIOL*4810	Field Biology	0.25
ENVS*4410	Introduction to Advanced Independent Research	0.50
ENVS*4420	Advanced Independent Research	0.50
ENVS*4430	Advanced Independent Research	1.00
IBIO*4500	Research in Integrative Biology I	1.00
IBIO*4510	Research in Integrative Biology II	1.00
IBIO*4521	Thesis in Integrative Biology	1.00
IBIO*4522	Thesis in Integrative Biology	1.00
ZOO*4300	Marine Biology and Oceanography	0.75

## Minor Requirements (Honours)

This minor cannot be combined with a major in Ecology.

A minimum of 5.00 credits is required to complete the minor, which must include:

Code	Title	Credits
BIOL*2060	Ecology	0.50
BIOL*3010	Laboratory and Field Work in Ecology	0.50
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*4110	Ecological Methods	1.00
BIOL*4120	Evolutionary Ecology	0.50

*Of the remaining 2.00 required credits, students will select from the following:*

Select at least 0.50 credits from the following:

BIOL*2400	Evolution	0.50
BIOL*3020	Population Genetics	0.50

Select at least 0.50 credits from the following:

BOT*2100	Life Strategies of Plants	0.50
ZOO*2090	Vertebrate Structure and Function	0.50

Select 0.50 credits from the following:

GEOG*1220	Explaining Environmental Change	0.50
GEOG*1300	Introduction to the Biophysical Environment	0.50