

BACHELOR OF INDIGENOUS ENVIRONMENTAL SCIENCE AND PRACTICE (BIESP)

Territorial and Land Acknowledgement

We give thanks for this place where we are gathered and for all those beings, both human and non-human, with whom we share this space: the rocks, the waters, the plants, the finned, the furred, the feathered, the four-legged, two-legged, many-legged and no-legged, those who creep and walk and swim and fly, all our relations, and acknowledge that our existence is intertwined and interdependent.

The University of Guelph resides on the ancestral lands of the Attawandaron people and the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land, and offer our respect to our Anishinaabe, Haudenosaunee, and Métis neighbours. Today, this gathering place is home to many First Nations, Métis, and Inuit peoples and acknowledging them reminds us of our important connection to this land where we learn and work.

Program Information

The Bachelor of Indigenous Environmental Science and Practice (BIESP) is an interdisciplinary science degree that focuses on the development of leaders in areas of environmental science, land-use and policy development who are grounded in Indigenous ways of knowing and being. This science degree emphasizes the respectful and consensual braiding of Indigenous and Western knowledge systems to address complex environmental issues and challenges. It focuses on the responsible use and protection of the natural environment through practices based on Indigenous ways of knowing and doing and the practice of Indigenous land ethics grounded in Indigenous epistemologies, ontologies, traditions and aspirations. By explicitly recognizing the inherent validity and value of Indigenous ways of knowing and doing, this interdisciplinary program offers a critical, yet constructive, view of environmental science, grounded in Indigenous knowledge systems, methodologies, priorities and values and oriented towards concrete action. In addition to their studies of natural and applied science, students will examine the historical and contemporary relationships between Indigenous and non-Indigenous peoples in Canada and the legal, political and economic context of environmental science and practice.

Experiential learning is incorporated into each year of study through opportunities to interact and work directly with Indigenous communities and organizations supporting cross-cultural learning and practice. In the final year, students will conduct a group project that focuses on a current environmental issue and provides the opportunity to obtain realistic experiences within the interdisciplinary context of practicing environmental science with Indigenous communities. The BIESP is also offered as a co-op option.

Learning Outcomes

Graduates of the BIESP degree will have demonstrated they can:

1. Build awareness of Indigenous cultural frameworks of environmental science including the role of traditional knowledge keepers, right relations, multi-generational environmental stewardship, and inclusion of non-human beings.
2. Consider the implications of historical and contemporary relationships between Indigenous and non-Indigenous communities in influencing governance, practices, policies, interactions and decision making in environmental science and practice.
3. Apply a critical and decolonial lens to the existing approach to environmental science and practice in Canada through the exploration of Indigenous principles, aspirations and practices while cognizant of the historical and ongoing legacy of colonization, land dispossession, and intergenerational trauma.
4. Apply the evolving legal frameworks of Indigenous and non-Indigenous environmental science, which include Indigenous People's inherent, treaty and constitutionally-protected rights, historic and contemporary lands, the minimal standard of free, prior, and informed consent, duty to consult and Indigenous-led practices of protection and restoration of special places and community well-being, to environmental stewardship.
5. Bridge and braid Indigenous and Western knowledge systems to propose and evaluate answers and solutions to environmental questions.
6. Formulate relevant and testable research questions, develop and implement an effective method of inquiry and perform appropriate quantitative and qualitative analyses for use in evidence-based environmental planning, policy development and implementation across different knowledge systems from Indigenous and Western research paradigms and methodologies.
7. Utilize techniques and skills including mapping and GIS, data classification, spatial analysis, map design, Indigenous research methodologies and environmental risk assessment practices to analyze environmental management issues across different knowledge systems.
8. Demonstrate project management skills (leadership, negotiation, communication, problem-solving, decision-making, time and task management, and budgeting) to effectively work within a team to complete multifaceted projects related to environmental management, research, and community engagement.
9. Communicate ideas, arguments and analyses to Indigenous and non-Indigenous audiences accurately and effectively, recognizing the role of language, personal values, strengths and limitations, and respecting diverse perspectives.
10. Demonstrate moral maturity and intercultural competency by considering diverse perspectives on environmental issues and Indigenous world views when acting as a professional and community member in decision making processes related to topics of land use, conservation, sustainability and environmental remediation and restoration.
11. Critically reflect on their personal values, academic and professional goals and determine how they can continue to respectfully engage and sustain relationships with Indigenous and non-Indigenous communities to address environmental challenges utilizing both Indigenous and Western scientific knowledge systems and ethical protocols.
12. Appreciate and support the needs and priorities of Indigenous communities to promote respect, protect and sustain Indigenous knowledge and practice in Indigenous communities.

Academic Advising and Counselling

The Bachelor of Indigenous Environmental Science and Practice Program Counsellor is available to assist in-course students who require information or advice about their program or other academic regulations and who seek information about resources available to students. For information about how to contact a program counsellor, and for more information about program counselling, visit the UAIC website and review Section VII – Academic Counselling.

The faculty advisor is a current faculty member associated with the program, is familiar with the academic requirements of the program, and is aware of experiential learning and career opportunities. Students are strongly encouraged to attend all meetings called by their advisor, and to set up individual meetings with them when they have questions or concerns about their performance or progress in the program.

Continuation of Study

Students are advised to consult the regulations for Continuation of Study which are outlined in detail in Section VIII – Undergraduate Degree Regulations & Procedures in the current calendar.

Conditions for Graduation

The BIESP degree requires the completion of 20.00 credits as follows:

- 10.50 required courses
- 7.50 restricted electives
- 2.00 free electives

Of these credits, a minimum of 6.00 credits are required to be at the 3000 level or higher, of which at least 2.00 credits must be at the 4000 level.

To qualify for co-op, 22.00 credits are required. The additional 2.00 credits are earned through the successful completion of four work-terms which are 0.50 credits each.

In addition, students must meet the continuation of study requirements at the time of graduation and have a minimum cumulative average of 60%.

Minors and Double Counting

Students may also take a minor in another subject area. A maximum of 2.50 credits required for the BIESP program may be applied to meet the requirements of a minor. Students should note that completion of a minor may require additional credits beyond the 20.00 required for the program. Students intending to acquire a minor should consult with their Program Counsellor.

Schedule of Studies

Courses specified in the Schedule of Studies (requirements) are required courses and must be successfully completed. A full time course load normally includes 2.50 credits.

Schedule of Studies

Code	Title	Credits
Semester 1		
CHEM*1040	General Chemistry I	0.50
ENVS*1040	Natural History of the Great Lakes Region	0.50

IES*1010	Introduction to Indigenous Environmental Science and Practice	0.50
INDG*1100	Indigenous Language and Culture	0.50
MATH*1080	Elements of Calculus I	0.50
Semester 2		
ACCT*1220	Introductory Financial Accounting	0.50
BIOL*1070	Discovering Biodiversity	0.50
IES*1020	Indigenous Knowledge for Environmental Science and Practice	0.50
1.00 electives or restricted electives		1.00
Semester 3		
BIOL*2060	Ecology	0.50
IES*2010	Land-Based Teachings for Environmental Science and Practice	0.50
1.00 electives or restricted electives		1.00
Semester 4		
GEOG*2210	Environment and Resources	0.50
GEOG*2480	Mapping and GIS	0.50
ANTH*2660	Contemporary Indigenous Peoples in Canada	0.50
or HIST*2090	Indigenous Peoples of the Americas	
1.00 electives or restricted electives		1.00
Semester 5		
ANTH*3650	The Anthropology of Indigenous Peoples Before Canada	0.50
IES*3020	Right Relations: Reconciliation, Decolonialization, & the Environment	0.50
1.50 electives or restricted electives		1.50
Semester 6		
POLS*3340	Indigenous Politics in Canada	0.50
2.00 electives or restricted electives		2.00
Semester 7		
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
IES*4000	Indigenous Environmental Science: Methodologies in Practice	0.50
1.50 electives or restricted electives		1.50
Semester 8		
IES*4010	Indigenous Environmental Science Project	0.50
IES*4020	Indigenous Environmental Science Reflective Capstone	0.50
1.50 electives or restricted electives		1.50

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Note: Students who are not native speakers of an Indigenous language must take INDG*1100. Students with alternate Indigenous language preparation may substitute an elective or restricted elective in place of INDG*1110, such as ANTH*1150 Introduction to Anthropology, ENGL*1030 Effective Writing, LING*1000 Introduction to Linguistics or SOC*1100 Sociology.

Restricted Electives

A minimum of 7.50 credits of restricted electives are required, of which at least 1.00 credits must be at the 4000-level. Students must select restricted elective courses from each of groups 1, 2 and 3. Restricted

electives may require other prerequisites. Students should consult with program counselling and plan accordingly.

Group 1

Minimum of 2.00 credits must be from lists A and/or B. Of these, at least 0.50 credits must be at the 4000-level.

List A. Environmental Economics and Policy

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
ECON*2100	Economic Growth and Environmental Quality	0.50
FARE*2700	Survey of Natural Resource Economics	0.50
FARE*3170	Cost-Benefit Analysis	0.50
FARE*4290	Land Economics	0.50
FARE*4310	Resource Economics	0.50
GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4220	Local Environmental Management	0.50
GEOG*4230	Environmental Impact Assessment	0.50
POLS*3370	Environmental Politics and Governance	0.50

List B. Quantitative Methods and Geomatics

Code	Title	Credits
GEOG*2420	The Earth From Space	0.50
GEOG*3420	Remote Sensing of the Environment	0.50
GEOG*3480	GIS and Spatial Analysis	0.50
GEOG*4480	Applied Geomatics	1.00
STAT*2050	Statistics II	0.50
STAT*3510	Environmental Risk Assessment	0.50

Group 2

Minimum of 3.00 credits must be from lists C, D, E, F, G, or H. Of these, at least 0.50 credits must be at the 4000-level. Students are encouraged to select courses from more than one list.

List C. Wildlife Stewardship and Conservation

Code	Title	Credits
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*3130	Conservation Biology	0.50
BIOL*3670	Introduction to Wildlife Rehabilitation	0.50
BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4500	Natural Resource Policy Analysis	0.50
ENVS*4070	Pollinator Conservation	0.50

List D. Environmental Microbiology

Code	Title	Credits
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
ENVS*2080	Introduction to Environmental Microbiology	0.50
ENVS*3290	Waterborne Disease Ecology	0.50
ENVS*3310	Soil Biodiversity and Ecosystem Function	0.50

ENVS*4320	Laboratory and Field Methods in Soil Biodiversity	1.00
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List E. Ecotoxicology and Environmental Chemistry

Code	Title	Credits
BIOL*3450	Introduction to Aquatic Environments	0.50
BIOL*4350	Limnology of Natural and Polluted Waters	0.50
CHEM*1050	General Chemistry II	0.50
CHEM*3360	Environmental Chemistry and Toxicology	0.50
ENVS*3020	Pesticides and the Environment	0.50
ENVS*3150	Aquatic Systems	0.50
ENVS*3220	Terrestrial Chemistry	0.50
ENVS*4000	Toxicological Risk Assessment	0.50
ENVS*4180	Insecticide Biological Activity and Resistance	0.50
ENVS*4230	Biology of Aquatic Insects	0.50
ENVS*4370	Natural and Anthropogenic Compounds in the Environment	0.50
TOX*2000	Principles of Toxicology	0.50

List F. Forest Ecosystems

Code	Title	Credits
BOT*2100	Life Strategies of Plants	0.50
BOT*3050	Plant Functional Ecology	0.50
BOT*3710	Plant Diversity and Evolution	0.50
ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
ENVS*3090	Insect Diversity and Biology	0.50
ENVS*3230	Agroforestry Systems	0.50
ENVS*3250	Forest Health and Disease	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3370	Terrestrial Ecosystem Ecology	0.50
ENVS*4260	Field Entomology	0.50
ENVS*4350	Forest Ecology	0.50

List G. Soil and Water Stewardship

Code	Title	Credits
ENVS*2060	Soil Science	0.50
ENVS*2240	Fundamentals of Environmental Geology	0.50
ENVS*3060	Groundwater	0.50
ENVS*3080	Soil and Water Conservation	0.50
ENVS*3180	Sedimentary Environments	0.50
ENVS*4030	Ecohydrology	0.50
ENVS*4090	Soil Management	0.50
ENVS*4160	Soil and Nutrient Management	0.50
ENVS*4360	Glacial Environments	0.50
ENVS*4390	Soil Variability and Land Evaluation	1.00
GEOG*4150	Catchment Processes	0.50

List H. Climate

Code	Title	Credits
ENVS*2030	Meteorology and Climatology	0.50
ENVS*3010	Climate Change Biology	0.50
ENVS*3050	Microclimatology	0.50
ENVS*3340	Environmental Data Analysis	0.50
ENVS*4050	Predicting Impacts of Environmental Change	0.50
ENVS*4210	Meteorological and Environmental Instrumentation	0.50

Group 3

Leadership, Business Management and Ethics

At least 1.00 credits must be taken from the following list:

Code	Title	Credits
ACCT*2230	Management Accounting	0.50
HROB*2010	Foundations of Leadership	0.50
HROB*2090	Individuals and Groups in Organizations	0.50
HROB*2290	Human Resources Management	0.50
MGMT*2150	Introduction to Canadian Business Management	0.50
MGMT*3020	Corporate Social Responsibility	0.50
PHIL*2600	Business and Professional Ethics	0.50

Students may also take the following as restricted electives:

Code	Title	Credits
ENVS*3330	Environmental Flexible Internship	0.50
ENVS*4410	Introduction to Advanced Independent Research	0.50
ENVS*4420	Advanced Independent Research	0.50
ENVS*4510	Topics in Environmental Sciences	0.50
IAEF*3500	Experiential Education	0.50
SOAN*4210	Indigenous-Settler Relations in Canadian Society	0.50

Program Requirements

The Co-op program in Indigenous Environmental Science and Practice is a five-year program including four work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recruitguelph.ca/cecs/>).

Indigenous Environmental Science and Practice Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3, COOP*1100	Academic Semester 4	COOP*1000 Work Term I
3	Academic Semester 5	Academic Semester 6	COOP*2000 Work Term II
4	COOP*3000 Work Term III	COOP*4000 Work Term IV	Off

5	Academic Semester 7	Academic Semester 8	N/A
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To be eligible to continue in the Co-op program, students must meet a minimum 70% cumulative average requirement after second semester, as well as meet all work term requirements. 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
Required courses		10.50
Restricted electives		7.50
Free electives		2.00
Co-op Work Terms		2.00
Total Credits		22

The recommended program sequence is outlined below.

Co-op Schedule of Study

Code	Title	Credits
Semester 1		
CHEM*1040	General Chemistry I	0.50
ENVS*1040	Natural History of the Great Lakes Region	0.50
IES*1010	Introduction to Indigenous Environmental Science and Practice	0.50
INDG*1100	Indigenous Language and Culture	0.50
MATH*1080	Elements of Calculus I	0.50
Semester 2		
ACCT*1220	Introductory Financial Accounting	0.50
BIOL*1070	Discovering Biodiversity	0.50
IES*1020	Indigenous Knowledge for Environmental Science and Practice	0.50
1.00 electives or restricted electives		1.00
Summer Semester		
Off		
Semester 3		
BIOL*2060	Ecology	0.50
COOP*1100	Introduction to Co-operative Education	0.00
IES*2010	Land-Based Teachings for Environmental Science and Practice	0.50
STAT*2040	Statistics I	0.50
1.00 electives or restricted electives		1.00
Semester 4		
GEOG*2210	Environment and Resources	0.50
GEOG*2480	Mapping and GIS	0.50
ANTH*2660	Contemporary Indigenous Peoples in Canada	0.50
or HIST*2090		Indigenous Peoples of the Americas
1.00 electives or restricted electives		1.00

Summer Semester

COOP*1000	Co-op Work Term I	0.50
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Semester 5

ANTH*3650	The Anthropology of Indigenous Peoples Before Canada	0.50
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IES*3020	Right Relations: Reconciliation, Decolonialization, & the Environment	0.50
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1.50 electives or restricted electives		1.50
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Semester 6

POLS*3340	Indigenous Politics in Canada	0.50
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2.00 electives or restricted electives		2.00
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Summer Semester

COOP*2000	Co-op Work Term II	0.50
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Fall Semester

COOP*3000	Co-op Work Term III	0.50
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Winter Semester

COOP*4000	Co-op Work Term IV	0.50
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Summer Semester

Off

Semester 7

GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
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IES*4000	Indigenous Environmental Science: Methodologies in Practice	0.50
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1.50 electives or restricted electives		1.50
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Semester 8

IES*4010	Indigenous Environmental Science Project	0.50
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IES*4020	Indigenous Environmental Science Reflective Capstone	0.50
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1.50 electives or restricted electives		1.50
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Group 1

Minimum of 2.00 credits must be from lists A and/or B. Of these, at least 0.50 credits must be at the 4000-level.

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FARE*4290	Land Economics	0.50
FARE*4310	Resource Economics	0.50
GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4220	Local Environmental Management	0.50
GEOG*4230	Environmental Impact Assessment	0.50
POLS*3370	Environmental Politics and Governance	0.50

List B. Quantitative Methods and Geomatics

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GEOG*3480	GIS and Spatial Analysis	0.50
GEOG*4480	Applied Geomatics	1.00
STAT*2050	Statistics II	0.50
STAT*3510	Environmental Risk Assessment	0.50

Group 2

Minimum of 3.00 credits must be from lists C, D, E, F, G, or H. Of these, at least 0.50 credits must be at the 4000-level. Students are encouraged to select courses from more than one list.

List C. Wildlife Stewardship and Conservation

Code	Title	Credits
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*3130	Conservation Biology	0.50
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BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4500	Natural Resource Policy Analysis	0.50
ENVS*4070	Pollinator Conservation	0.50

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ENVS*3310	Soil Biodiversity and Ecosystem Function	0.50
ENVS*4320	Laboratory and Field Methods in Soil Biodiversity	1.00

List E. Ecotoxicology and Environmental Chemistry

Code	Title	Credits
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BIOL*4350	Limnology of Natural and Polluted Waters	0.50
CHEM*1050	General Chemistry II	0.50
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ENVS*3020	Pesticides and the Environment	0.50
ENVS*3150	Aquatic Systems	0.50
ENVS*3220	Terrestrial Chemistry	0.50
ENVS*4000	Toxicological Risk Assessment	0.50

ENVS*4180	Insecticide Biological Activity and Resistance	0.50
ENVS*4230	Biology of Aquatic Insects	0.50
ENVS*4370	Natural and Anthropogenic Compounds in the Environment	0.50
TOX*2000	Principles of Toxicology	0.50

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ENVS*3230	Agroforestry Systems	0.50
ENVS*3250	Forest Health and Disease	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3370	Terrestrial Ecosystem Ecology	0.50
ENVS*4260	Field Entomology	0.50
ENVS*4350	Forest Ecology	0.50

List G. Soil and Water Stewardship

Code	Title	Credits
ENVS*2060	Soil Science	0.50
ENVS*2240	Fundamentals of Environmental Geology	0.50
ENVS*3060	Groundwater	0.50
ENVS*3080	Soil and Water Conservation	0.50
ENVS*3180	Sedimentary Environments	0.50
ENVS*4030	Ecohydrology	0.50
ENVS*4090	Soil Management	0.50
ENVS*4160	Soil and Nutrient Management	0.50
ENVS*4360	Glacial Environments	0.50
ENVS*4390	Soil Variability and Land Evaluation	1.00
GEOG*4150	Catchment Processes	0.50

List H. Climate

Code	Title	Credits
ENVS*2030	Meteorology and Climatology	0.50
ENVS*3010	Climate Change Biology	0.50
ENVS*3050	Microclimatology	0.50
ENVS*3340	Environmental Data Analysis	0.50
ENVS*4050	Predicting Impacts of Environmental Change	0.50
ENVS*4210	Meteorological and Environmental Instrumentation	0.50

Group 3**Leadership, Business Management and Ethics**

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ACCT*2230	Management Accounting	0.50
HROB*2010	Foundations of Leadership	0.50
HROB*2090	Individuals and Groups in Organizations	0.50
HROB*2290	Human Resources Management	0.50
MGMT*2150	Introduction to Canadian Business Management	0.50
MGMT*3020	Corporate Social Responsibility	0.50
PHIL*2600	Business and Professional Ethics	0.50

Students may also take the following as restricted electives:

Code	Title	Credits
ENVS*3330	Environmental Flexible Internship	0.50
ENVS*4410	Introduction to Advanced Independent Research	0.50
ENVS*4420	Advanced Independent Research	0.50
ENVS*4510	Topics in Environmental Sciences	0.50
IAEF*3500	Experiential Education	0.50
SOAN*4210	Indigenous-Settler Relations in Canadian Society	0.50