

Statement of Intent for a New Program

Proponent's Contact Information	
New Program Name (degree and discipline):	B.Sc. (Hon) in Applied Ecology
Academic Unit Proposing the Program:	Department of Biological Sciences and Department of Geography & Tourism Studies
Proposed Start Date:	September 2022
Submitted by:	Jeff Stuart (Biology Chair) & Katharine Yagi
Email:	jstuart@brocku.ca , kyagi2@brocku.ca
Date of Submission:	January 12, 2022

The Statement of Intent will reference the evaluation criteria for new programs (IQAP Section 3.5) as appropriate and shall include:

Description of the Proposed Program
<p>Provide a description of the program, clearly stating the purpose, structure and pedagogical rationale, including an explanation of the proposed degree nomenclature.</p> <p>The purpose of this new undergraduate program is to provide an interdepartmental curriculum structure for students pursuing a B.Sc. focusing on applied ecology, and to advance students knowledge of ecological theories, concepts, and applications, allowing them to prepare for highly competitive graduate programs or applied ecology-related careers. This program will be a collaboration between the Department of Biological Sciences and Department of Geography & Tourism Studies, due to the interdisciplinary nature of Applied Ecology. Indigenous knowledge and ways of knowing will be incorporated as well.</p> <p>The proposed honors program will have experiential learning scaffolded into the curriculum, allowing students to gain the much-needed hands-on experience and assisting in professional networking opportunities. This new program will be designed to expose students to the understanding of how ecosystems function in such a way that they can apply these concepts to solve challenges that can be found in managed and natural systems such as fisheries, agriculture, urban settings, and conservation. The program will help students develop a skillset required for working in the industry, government, or non-governmental organizations. While some faculty will have study sites in various locations across the globe, some of the experiential learning will occur within the local ecosystems of Niagara, allowing for engagement with the local community, including the public (e.g. naturalist groups), public sectors, e.g. Ontario government – Ministry of Environmental, Conservation and Parks (MECP) & the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNR), private sectors (e.g. NGOs, consulting businesses), and local elementary and high school initiatives (e.g. Envirothon).</p> <p>Structure: The Applied Ecology B.Sc. (Hon) degree will be a 4-year program. Students not meeting the >70% average cut off will be able to transition into the existing Biological Sciences & Geography cross major (requires >60% average), and/or transition to the associated Pass/Fail option. However, only the Honors degree will come with accreditation with Eco-Canada, and Society for Ecological Restoration (SER).</p> <p>Pedagogical Rationale: With the increased need of graduates who have acquired applied skills and the need for urgent action related to environmental protection, conservation and restoration, some universities have realized that it is time to develop programs that can respond to this urgent call. With the launch of the UN Decade on Ecosystem Restoration, over 7.6 trillion USD will be spent over the decade to try to restore many degraded</p>

ecosystems worldwide. This will require the hiring of highly qualified personnel not currently available. Indeed, ecosystem restoration, conservation, and nature-based Solutions, require applied professionals with a strong fundamental understanding in ecological systems. Brock is strategically well positioned to contribute to this professional need, and needs to move forward and evolve in adding disciplines like applied ecology to increase its capacity to respond to these challenges for the sustainability of the region and beyond.

This new program will give learners:

- Opportunities to develop knowledge and understanding of the foundational concepts that are required for the application of ecological concepts
- Confidence in asking good, logical questions and analyse issues through a system thinking approach for field application
- Opportunities to develop skills in experimental and managerial design using applied ecological concepts
- The ability to gain experience and confidence in scientific writing for purposes that include research, management, project proposals, policy making and community action.
- Experience in public speaking, and science communication
- Opportunities to network and build good working relationships with peers, employers, government, and non-governmental organizations (NGOs).

Proposed Degree Nomenclature: Bachelor of Science (B.Sc., Honors), in Applied Ecology.

Explain how the proposed program fits with the University's strategic plan.

I. Brock University's Strategic Plan 2018-2025:

- i. Offer a transformational and accessible academic and university experience*
The new Applied Ecology program (B.Sc.) aims to be a high-quality program that can offer globally oriented learning and experience opportunities. It will meet the interests and needs of the student community, and as such expand Brock's list of lifelong learning opportunities geared towards students and members of the community. It will allow Brock to embrace a new generation of applied thinkers who will be able to work in transforming the current ecological and environmental challenges into positive outcomes, that they are in restoration, conservation, sustainable agriculture, ecosystem management, or stewardship of the land.
- ii. Build Research Capacity across the university*
The new Applied Ecology program will help foster the research culture at Brock and enhance creative excellence of the students. Such a program will promote the engagement of students in the field of applied ecology by having leading faculty members incorporate their current research into the course curriculum, building student interest in research and providing the opportunity to work with Faculty in their research labs. The program will require collaborations across disciplines/departments at Brock, which will also support more collaborative teaching and research, and further enhance Brock's representation as a center of research excellence. For instance, the program will be able to support greater engagement on topics such as the use of Indigenous knowledge in environmental assessment, monitoring and conservation. It will allow students to build an understanding of what is ethical space, ways of knowing, and social concerns regarding any type of applied ecological interventions. Research in the field of sustainable agriculture, restoration, urban planning and management, and conservation at Brock is increasing and this will allow for increase in number of research students being capable to participate in such initiatives, not only at Brock but with the communities, NGOs, and industries currently interacting with faculty of the department.
- iii. Enhance the life and vitality of our local region and beyond*
The new Applied Ecology program will have new courses that focus on the issues that are relevant to the Niagara region, making it a unique addition to a list of Ecology-related programs throughout the province and the country (e.g. being unique to have a course in sustainable agro-ecosystems). Students learning and discovering the region through a scientific lens will bring further interest to the regions social and cultural vitality. Naturally, this will lead

to students engaging in the community in various ways. Additionally, this new program is also meant to incorporate Indigenous knowledge as under the TRC Call for Action. It is important for new applied ecologists to understand and acknowledge the importance of Indigenous ways of knowing for the management and stewardship of the land.

Details of Resource Implications

Provide details of the existing and new resources (human, physical and budgetary) required to mount the program.

Most courses planned for this new program currently exist, however seven new courses (**three core courses, four optional courses**) will be developed for year-3 and year-4 of the program. Assuming any faculty retirees (with a background relevant to the Applied Ecology program) will be replaced, two new faculty hires, one Senior Lab Demonstrator and a Program Coordinator hire would be required in a phased-in approach by year-3 after program launch (see **Appendix A**).

Evidence of Consultation with Affected Academic Units

Include the results of any consultation with other units that will be impacted by the proposed program. Include evidence indicating the extent to which any participating Department(s)/Centre(s) is prepared to contribute to the proposed program.

There have been at least five departmental meetings in the Biology and Geography & Tourism Studies departments this year, where the progress of the AE program was discussed. In all cases feedback was positive and confirmed our direction. A draft outline of the program was circulated at the end of March 2021 and minor feedback, comments and suggestions were received and addressed in a revision (see Appendix A). Additional discussions among Jeff Stuart (Chair, Department of Biology), Liette Vasseur (Professor, Department of Biology), Glenn Tattersall (Professor, Department of Biology), Kiyoko Gotanda (Assistant Professor, Department of Biology), Heather VanVolkenburg (Research Assistant, Department of Biology), Michael Pisaric (Chair, Department of Geography & Tourism Studies), Jeffrey Boggs (Associate Professor, Department of Geography & Tourism Studies), and Katharine Yagi (Adjunct Faculty, Department of Biology) took place between January 2021 and May 2021 to help organize the proposed program outline. In August 2021, the updated draft program outline was circulated to Frank Fueten (Chair, Department of Earth Sciences), which was subsequently shared with the Earth Sciences Department faculty for further input and feedback. In September 2021, another a meeting with key Biology department faculty occurred where more details about the program outline were flushed out, and the Statement of Intent (SOI) form was discussed. Email correspondence between Frank Fueten and Michael Pisaric occurred in mid-September to check for more feedback. After some consultation with the registrar's office and Eco-Canada and SER accreditation staff, a few quality checks of the SOI among the Biology and Geography faculty were done in October 2021. Finally, the Dean of FMS and Dean of FSS were informed of the proposal development in September 2021 and sent a copy to review by October 25, 2021.

Evidence of Consultation Regarding Space Needs for the Proposed Program

Include the results of any consultation with the Advisory Committee on Space regarding the space needs for the proposed program.

Since the program will offer several new courses, it would require lecture and lab space to accommodate in-person student learning. Many new courses are planned be field-based or at least have field components, and so there may be little additional space required for the lab components. The major space requirement would be for the offices of the four additional hires proposed: two faculty hires, one senior lab demonstrator, and one program coordinator.

A record of consultation with the Space Advisory Committee (Roland Mech) is attached (**Appendix B**). In summary, this preliminary discussion on space requirements for the new program confirmed that four additional office spaces (for the 2 proposed faculty hires, 1 proposed Senior Lab Demonstrator, and 1 proposed program coordinator) will be required. Upon approval to proceed to the next step, consultation with the FMS space coordinator (Dr. Fereidoon Razavi) will be made to identify opportunities for the offices. To date, there is

some space available, and there may be potential costs for renovation. Confirmation depends on the program start date, number of retiring faculty and the number of simultaneous program changes within FMS.

Evidence of Student Demand, including projected enrollments

1. Students from second- and third-year ecology courses in 2019 and 2020 were surveyed on their impression of ecology in general, and interest in having more ecology-based courses.
 - a. In Fall 2019, students in BIOL 2Q04 (Principles of Ecology) were surveyed about their specific experience with this course and asked about their desire for more ecology courses at Brock. The most relevant question and its response is provided below.

QU. Would you like to see more upper year course offerings geared toward ecological studies?

Yes: 40/56 = 71%

- b. In Spring 2020, students in ERSC 3P85 (Ecology of a Changing Planet) were polled on a variety of aspects about the course and general interest in having more ecology at Brock. Student answers to the final, most relevant, question is below.

Qu 17. Would you like to see more upper year course offerings geared toward ecological studies? Why or why not?

- 25 out of 32 students surveyed responded positively to the survey questions (with 6 students not giving specific comments). Generally, students would like to see more ecology-focused courses available at Brock because there are currently very few and it is a topic that many have become passionate about. Students enjoyed the applied aspect of 3P85 and appreciated the chance to develop technical skills which are useful in the industry after graduation.

2. Consultation with the Office of Institutional Analysis and Planning (headcount reports):
The biology programs at Brock University currently make up about 25% of FMS student enrolment. The main ecology course (2Q04) also has relatively high enrolment (Table 1), having students mainly from biology, but also those in geography, earth sciences, the combined geography-biology major, and likely other departments outside FMS. The headcount reports were used to examine the 2Q04 course enrolment from the academic years 2017 to 2020 (Table 1). The average number of students enrolling in this course is about 90, ranging from 77 to 102. Additionally, Brock's Master's program in Sustainability Science and Society (SSAS) receives between 100 and 160 applications every year, with only 12-13 positions available.

3. The Ecological Restoration program at Trent University, which is a 2+2 degree (first two years at Fleming College, last two years at Trent U), has 40 students enrol in the first year (at Fleming College), and 25-30 students enroll at Trent in the third year of the program. Retention rates for this program at Trent U is about 65%, although students who leave this program tend to move into other programs offered at Fleming College. Additionally, statistics from SER reveal that Niagara College produces 30-40 students from their Restoration Ecology diploma per year, who apply for their accreditation (CERPIT). Therefore, it would be reasonable to predict a **similar enrolment rate to the Trent University program, in the range of 30-40 students per year**. Our best guess at a steady-state annual intake is 30-40 students, with about 20-30 students graduating annually. Based on our experience, we expect the remaining 10-20 students to switch to other existing biology or geography programs offered at Brock (see Table 2).

Table 1. Summary of the annual headcount for students in Year 2 in the Department of Biological Sciences, and course Enrolment Reports for BIOL 2Q04, Principles of Ecology. While it appears that a high proportion of Biology students take 2Q04 from this table, it is acknowledged that the 2Q04 headcount may not all be represented by Biology students in Year 2 of their program.

Year	Year 2 headcount in Department of Biological Sciences	BIOL 2Q04 Enrolment	Source
2017	129	77	Institutional Analysis & Planning. March 2017. Full-time Equivalent (FTE) Enrolment Report. Pp. 185
2018	125	102	Office of Institutional Analysis & Planning. Academic Year 2018. Course Enrolment Report. Pp. 79
2019	124	99	Office of Institutional Analysis & Planning. Academic Year 2019. Course Enrolment Report. Pp. 82
2020	126	83	Office of Institutional Analysis & Planning. Academic Year 2020. Course Enrolment Report. Pp. 82

Table 2. Estimated enrolment for the Applied Ecology program, showing student head counts in each year of the program from 2022 (potential program launch) to 2028. We assume a loss of 5 students when transitioning to next program year. Years 2027 and 2028 reflect potential steady-state enrolment and program headcount.

	2022	2023	2024	2025	2026	2027	2028
Year 1	10	15	20	25	30	35	35
Year 2	--	10	15	20	25	30	30
Year 3	--	--	10	15	20	25	25
Year 4	--	--	--	10	15	20	20
Total enrolment in program	10	25	45	70	90	110	110

Evidence of Societal Need

The 2021-2030 have been declared the UN Decade on Ecosystem Restoration, under the purview of FAO and UNEP. Additionally, the United Nations Educational, Scientific and Cultural Organization (UNESCO) is leading the UN Decade on Ocean Science for Sustainable Development. We also are currently in the 2019-2028 UN Decade for Family Farming where agroecosystems and sustainable agriculture are essential for small sustainable family industries. Solutions need to be developed to reduce land and ocean degradation and thus secure a sustainable future. The Society for Ecological Restoration suggests that over \$6-7 trillion USD will be spent over the decade to restore global ecosystems. The Ontario Federation of Aggregates estimated that over 2000-3000 abandoned sites require rehabilitation. The UN Decade on Ocean Science also impacts us directly, as the Department of Fisheries and Oceans has included the Great Lakes and St Lawrence as an integrated component of the Blue Economy Strategy implementation. Research, solutions, and personnel will be needed to respond to these initiatives, and we can play a role here.

The Canadian Occupational Projection System (COPS) offers some insight into the demand for employment in various sectors including the those representing the environmental industry. For example, the projected demand for occupations in the “Consulting and Professional Services” sector increases by 17% from 2021 to 2025 and increases by 67% in the “Scientific Research & Design Services” sector for the same time frame. These projected increases suggest there will be a need for educated and skilled professionals in the workforce in these related fields as early as 4 years from now. Eco-Canada has also provided summary statistics on a surge in “green jobs” in Canada. Their online job posting data indicates the 4th consecutive quarter of increased job advertisements. There were 67,230 green jobs posted out of the 1 million unique jobs advertised online from April to June 2021. Even though the total online job postings have decreased by 8% since the beginning of the year, environmental job postings (enviro ads) have increased by approximately 20%. As a result, Canada’s proportion of enviro ads to total job ads increased from 5.1% to 6.7% (+1.6 percentage points), indicating higher labour demand growth in the environmental sector relative to other sectors across the country.

(https://eco.ca/research-and-resources/environmental-job-market-trends/?utm_term=See%20the%20latest%20job%20trends%20for%20the%20sector&utm_campaign=October%20newsletter&utm_content=email&utm_source=Act-On+Software&utm_medium=email&cm_mmc=Act-On%20Software-_-email-_-ECO%20Monthly%3A%20Hiring%20Support%20for%20Organizations%20%2526%20Individuals-_-See%20the%20latest%20job%20trends%20for%20the%20sector)

Finally, Consultation with local industry representatives show that a new program in Applied Ecology at Brock University would benefit the environmental planning process by having more skilled people in both governmental and consulting positions in the region (Appendix C). The Honours and the internships will help link professionals with students for research and acquisition of professional experience.

Brock has been promoting itself as a sustainable campus and has worked to increase its profile in sustainable development. With this global push for more sustainable solutions, this is an opportune time for Brock University to offer a program in Applied Ecology. The University is ideally situated to take advantage of its unique position in the Niagara Escarpment Biosphere Region. The Niagara Region is growing substantially, resulting in urban development and population growth. With this comes the need for ecological information for environmental assessments across the landscape in order for agencies and governments to make the best planning decisions for our green spaces and biodiversity. Currently the entire region is quite data poor in this sector. This program is an opportunity for Brock University to provide regional, national, and international leadership in a critical area.

The Ministry should approve a new B.Sc. program in Applied Ecology for three main reasons:

1. Applied Ecological knowledge, skills and expertise are increasingly in demand due to the urgent need to restore the environment, conserve our resources and fight against climate change.
2. Brock is ideally located to take advantage of the local ecosystems and research, which can align with several other activities such as governmental, non-governmental and environmental consulting projects. All of these initiatives and programs require experts that can apply scientific concepts to deal with such ecological issues.
3. This new program is being built on existing courses, resources and expertise, and a new, thriving program would better enhance recruitment and retention of students in FMS. There is a vision that a Master’s in Applied Ecology will follow to enhance the capacity of Brock to continue to innovate in this field and in many aspects allow for collaboration with the new Engineering department.

Duplicative Similarities

Provide evidence that any duplicative similarities to existing programs, internally, provincially, or nationally, are justifiable for reasons of public funding.

Across Canada, 27 universities (out of 97) offer ecology-related undergraduate programs. University of British Columbia offers several ecology and forestry-based programs, University of Saskatoon offers an Applied Plant Ecology program, University of Manitoba offers an Agroecology program, and McGill University offers a

program in Biodiversity and Conservation, an Applied Ecology minor, an Agro-Environmental Science major, and an Ecological Agricultural minor. Interestingly, there is currently no “Applied Ecology” honors undergraduate program offered at a Canadian University.

In Ontario, a variety of Environmental Science programs are offered across all major universities, but not all of them integrate biological concepts, physical geography knowledge, ecological principles, and applied experiential learning opportunities. One of the main ecology undergraduate programs in Ontario is at Trent University, called “Ecological Restoration”, offered by the School of Environment. Students receive their B.Sc. degree from Trent, a diploma from Fleming College, and their in-training certification by the Society for Ecological Restoration (aka Certified Ecological Restoration Practitioner In-Training, or CERPIT) upon completion of this program. There is also an “ecosystem restoration” program offered by Niagara College, which is established with SER by running the SER Ontario Chapter. While this program does provide students the framework to apply for their CERPIT after graduating, the duration is quite short (only 1 year) with the requirement for students to already have a diploma in environmental technology, ecosystem management technology, or a B.Sc. in Biology, Ecology, Botany, Environmental Science, Zoology or Landscape Architecture. Another nearby university with a related program is at the University of Guelph, offering a B.Sc. in Environmental Science, with Ecology major, and a B.Sc. in Wildlife Biology and Conservation. Finally, the University of Toronto offers a variety of eco-evo related programs through the department of Ecology & Evolutionary Biology, such as the B.Sc. in Ecology & Evolutionary Biology specialist and major, Biodiversity & Conservation Biology major, and the B.Sc. Environmental Biology major and minor.

There is currently no similar program to Applied Ecology at Brock. The cross-major between Biology and Geography offers a resemblance to the first- and second-year requirements in the new program outline, but there is not a specific focus on ecological-based courses, relevant applied learning, nor excellent applications of faculty ecological research in course lectures. There is also no similar program at the nearest university, McMaster University, where there is major focus on Health Sciences. Although there is an Environmental & Earth Sciences program here, this does not cover any integrated biology or ecology concepts.

Our new program in Applied Ecology will be aligned with two accreditation programs, one for certifying ecological restoration practitioners in-training (CERPIT by SER), and the other for certifying Environmental Professionals in-training (EPT) by Eco-Canada. This program will focus on experiential learning by scaffolding those concepts into each year of the degree program and incorporate work-placement opportunities. The program will also offer new ecologically focused courses with seminars, and project-based labs in upper years. There will also be new courses offering field-based labs to educate students in relevant applied skills in data collection, taxonomic identification, field study design, and provide options for research in undergrad-thesis courses by Year 4 (or Year-5 if co-op) of the program.

In summary, this new program at Brock University will be strategic and unique in several ways:

1. As noted above, the university campus is uniquely situated within a UNESCO Biosphere reserve, and within a region of Canada with comparatively high levels of biodiversity, rare species, agricultural practice (including specialized crops like vineyards and orchards), high rates of urban development, and high tourism rates. There is substantial opportunity to utilize the local environment for experiential learning, helping students be taught in situ about the challenges our environment faces with different pressures created by humans, and how to discover best practices to protect and restore the remaining green spaces.
2. Brock faculty can utilize their own unique research labs to highlight the various aspects of the ongoing research on and off campus. Several faculty members conduct ecological research at sites within Canada, and around the globe, including the Galapagos Islands, China, and across the Canadian arctic. There will be enormous potential for students in the Applied Ecology program to get involved with these active research labs, potentially moving on to graduate studies, and building the research capacity at Brock University. An involved student community will likely lead to more engagement and growth.
3. There are currently no B.Sc. programs called “applied ecology” offered at a Canadian University. This means the example can be set by Brock University, creating an integrative learning experience that directly engages students in the fields required to develop competitive knowledge and skills in the ecology/environment industry.

4. Having the program aligned with two accreditation programs will be very attractive and desirable for many students living locally, nationally, and internationally. Eco-Canada's EPt credential is very prestigious to carry within Canada, and SERs CERPIT is recognized and respected on an international scale.

Decanal Comments

Include certification from the relevant Dean(s) that the new degree/major is an appropriate and desirable addition to the academic programs of the University and is in line with the strategic direction of the Faculty. As well a clear commitment that the new program will be appropriately resourced. For undergraduate programs, the relevant Dean(s) shall be the Dean(s) of the Faculty within which the program resides. For graduate programs, the appropriate Deans shall be both the Dean of Graduate Studies and the Dean(s) of the relevant Faculty or Faculties.

Letters of commitment and support for this new program have been provided by Dr. Ejaz Ahmed (Dean of the Faculty of Mathematics & Science), and Dr. Ingrid Makus (Dean of the Faculty of Social Sciences), are attached here.



November 2, 2021

To whom it May concern,

Ecology is a rapidly growing field and is vital to the understanding of the effects of human activity on our planet, including global warming.

I am glad that our Biology department is taking the initiative to start this timely program and I support it wholeheartedly.

Yours truly

A handwritten signature in black ink, appearing to read "S. Ejaz Ahmed".

Dr. S. Ejaz Ahmed, Ph.D.
Dean Faculty of Math & Science

*Professor, Department of Mathematics and Statistics
Fellow, American Statistical Association
ASEAN Chair Professorship (Thammasat University)
Technometrics Review Editor
Associate Editor: SPL, JSCS & other*

MEMORANDUM

brocku.ca

FROM: Ingrid Makus, Dean, Faculty of Social Sciences

TO: Brian Power, Vice-Provost and Associate Vice-President, and members of the Academic Review Committee (ARC)

cc: Michael Pisaric, Chair, Geography & Tourism Studies

DATE: November 12, 2021

RE: **B.Sc. (Honours) in Applied Ecology**

I am in support of this new program that collaborates across Faculties and departments. It promotes strategic priorities of providing students with a transformational academic experience that offers interdisciplinary courses in the Departments of Biological Sciences and Geography and Tourism Studies, enhances experiential opportunities for students that promote employment and graduate school success, and fosters research in a significant current area of inquiry.



IM/fn

Appendix A

Draft outline for the new Applied Ecology undergraduate program, * indicates a required course. New courses are highlighted in yellow:

Year 1

*BIOL 1P91	Introduction to Biology I
*BIOL 1P92	Introduction to Biology II
*BIOL 1P96	Fundamental Skills in Biological Sciences
*GEOG 1F91	Principles of Physical Geography
*GEOG 1F90	Introduction to Human Geography (Social Science context credit)
Total = 3.5 credits	

Choose 0.5 credits from:

ERSC 1P02	Planet Earth - Surface Processes
CHEM 1P92	Chemical Principles and Properties II
MATH 1P97	Calculus with Applications

Recommended context credit (1 credit):

INDG 1F90	Introduction to Indigenous Studies (Humanities context credit)
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Year 2

*BIOL 2Q04	Ecology
*BIOL 2P05	Evolution
*BIOL 2P92	Principles of Zoology
*BIOL 2P93	Introduction to Botany
*BIOL 2P98	Principles of Microbiology
*GEOG 2P07	Introduction to Geospatial Technologies
*GEOG 2P13	Resource and Environmental Geographies
Total = 3.5 credits	

Choose 1.5 credits from the following courses:

BIOL 2P94	Plant Biology: Growth and Development
BIOL 2P96	Biology of Fungi
GEOG 2P08	Climate Crisis
GEOG 2P94	Human-dominated Ecosystems
ERSC 2P05	Earth Surface Processes
ERSC 2P15	Introduction to Oceanography

Year 3

*BIOL 3P96	Biometrics
*BIOL 3P##	Ecosystem Ecology (new – in review – lectures & project-based labs)
*BIOL 3P##	Agro-ecosystems (new – lectures & field-based labs)
*GEOG 3P05	Geographic Information Systems
*GEOG 3P09	Principles of Biogeography
*GEOG 3P14	Soil Science
Total = 3 credits	

Choose 2 credits from the following courses:

BIOL 3P43	Applied Microbiology
BIOL 3P60	Animal Behaviour
BIOL 3P64	Introductory Insect Biology
BIOL 3P71	Ontario Universities Field Course
BIOL 3P72	Ontario Universities Field Course
BIOL 3P95	Comparative Animal Physiology
BIOL 3P97	Molecular Ecology
BIOL 3P##	Exploring Niagara's Ecosystems (new – lectures & field-based labs)
GEOG 3P40	The New Niagara
GEOG 3P56	Physical Geography Field Course
GEOG 3P50	Resource Management: Discourses, Policies and Ethics
GEOG 3P07	Remote Sensing
GEOG 3P95	Advanced Geographic Information Systems
GEOG 3P83	Geography of Water Resources
TOUR 3P33	Tourism in Parks and Protected Areas
ERSC 3P35	Biomonitoring and Environmental Stress Assessment
ERSC 3P85	Ecology of a Changing Planet

Year 4

*BIOL 4P##	Science Communications (new – seminars, collaborative projects)
*BIOL 4P##	Restoration Ecology (new- field-based learning, project-driven)
*BIOL 4P##	Environmental Impact Assessments (new – field-based learning, project-driven)

Total = 1.5 credits

Students focusing on research may choose 1-2 credits from:

BIOL 4F90/91	Undergraduate thesis (2 credits)
BIOL 4F92	Undergraduate literature review thesis (1 credit)
GEOG 4F90	Undergraduate thesis (1 credit)

AND/OR

Students focusing on developing skills for the industry may choose 1 credit from:

GEOG 4F99	Internship (1 credit)
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New total = 2.5-3.5 credits

Choose remaining credits from the following courses:

BIOL 4P05	Concepts of Biodiversity in a Biosphere Reserve
BIOL 4P25	Bioremediation
BIOL 4P64	Insect Behaviour
BIOL 4P##	Indigenous Worldview of Ecology (new – seminars & field-based labs)
GEOG 4P26	Stream Form and Function
GEOG 4P80	Dendrochronology
GEOG 4P07	Advanced Remote Sensing
GEOG 4P95	Directed Readings I (0.5 credit)
GEOG 4P96	Directed Readings II (0.5 credit)
GEOG 4P83	Research Themes in Water Resources
ERSC 4P13	Paleobotany and Palynology
ERSC 4P85	Ecosystems and Changing Disturbance Regimes
ERSC 4P46	Advanced Environmental Issues
ERSC 4P31	Watershed Study and Assessment

APPENDIX B - SPACE ADVISORY CONSULTATION

From: [Roland Mech](#)
To: [Katharine Yagi](#)
Cc: [Fiona Hunter](#); [Jeff Stuart](#)
Subject: RE: Applied Ecology program update - space consultation 2
Date: September 14, 2021 5:03:17 PM

Hi Katharine,

Yes, my previous feedback is sufficient as long as the SOI is updated to identify the two additional faculty offices.

Regards,

Roland Mech, Licensed Technologist OAA, ASCT, LEED AP
Associate Director, Space Management and Planning
Brock University | Facilities Management

From: Katharine Yagi <kyagi2@brocku.ca>
Sent: September 14, 2021 4:38 PM
To: Roland Mech <rmech@brocku.ca>
Cc: Fiona Hunter <fhunter@brocku.ca>; Jeff Stuart <jstuart@brocku.ca>
Subject: Applied Ecology program update - space consultation 2

Hi Roland,

I wanted to give you an update on the draft SOI I sent out last week. After meeting with some faculty today, it was decided that we must request for more new positions than we originally discussed. In summary, we are requesting up to 2 new faculty hires (one within Biology department, one cross-appointed between Geography and Biology), 1 senior lab demonstrator and 1 program coordinator. I understand that Jeff Stuart (currently on sabbatical) knows a little bit about the space situation within the Biology department, so he is CC'ed here if he wanted to add anything to this thread.

Would your previous feedback still suffice for this change? If not, we can meet again to discuss, or you can send me any comments/recommendations as needed.

Thank you!
-Katharine

Katharine Yagi (she/her), PhD, CERPIT
Research Associate | 8Trees Inc. | www.8trees.ca
Department of Biological Sciences | Brock University
Amphibian and Reptile Specialist Subcommittee | COSEWIC
E1: katharine.yagi@8trees.ca | E2: kyagi2@brocku.ca

From: [Roland Mech](#)
To: [Katharine Yagi](#)
Subject: RE: Draft SOI Applied Ecology - looking for comments
Date: September 7, 2021 11:17:11 AM

Thanks Katharine,

The space needs section looks good.

Roland Mech, Licensed Technologist OAA, ASCT, LEED AP
Associate Director, Space Management and Planning
Brock University | Facilities Management

From: Katharine Yagi <kyagi2@brocku.ca>
Sent: September 3, 2021 3:22 PM
To: Fiona Hunter <fhunter@brocku.ca>
Cc: Liette Vasseur <lvasseur@brocku.ca>; Kiyoko Gotanda <kgotanda@brocku.ca>; Glenn Tattersall <gtattersall@brocku.ca>; Roland Mech <rmech@brocku.ca>; Jeff Stuart <jstuart@brocku.ca>
Subject: Draft SOI Applied Ecology - looking for comments

Hi Fiona et al.

I have put together the Draft SOI form for the Applied Ecology program. I was hoping to get some feedback from some faculty before I review it with the Registrars office. Feel free to forward it on if you feel more faculty should take a look! And no pressure if some of you are too busy, I know it is a hectic time of year!

I am still waiting on a few letters for Appendix E (consultation with Industry – currently not labeled at the end of the document), and I will incorporate feedback from Roland Mech in Appendix C once he has this email file to look at. We already had a Teams meeting and discussed the potential for space needs for the new program.

Looking forward to discussing this with you all if and when you have the time!

Cheers,
Katharine

Katharine Yagi (she/her), PhD, CERPIT
Research Associate | 8Trees Inc. | www.8trees.ca
Department of Biological Sciences | Brock University
Amphibian and Reptile Specialist Subcommittee | COSEWIC
E1: katharine.yagi@8trees.ca | E2: kyagi2@brocku.ca



RE: Support request for a new Brock University program – B.Sc. in Applied Ecology

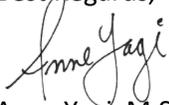
To Whom it May Concern,

I am writing to communicate my support for a new undergraduate program at Brock University in Applied Ecology. I have over 30 years experience working for the provincial government as a regional Biologist, and since my retirement in 2016, I've been working in private sector as an environmental consultant. In my opinion, there is a great need for experienced Ecologists, both in theoretical and practical applications, that have regulatory control of land use decisions in the Niagara Region. I have come across dozens of examples over the last few years, where I find myself needing to educate the agency Ecologists, in basic ecology and ecosystem restoration practice. Too often, I am met with restrictive answers that are driven by policy, and not ecology. Policies were designed based on ecological principles and should not be blindly applied to every planning decision.

Brock University is ideally located to support such a need in this industry, and I truly hope the future generations can enter the industry with decent, up-to-date working knowledge in ecology, with some practical experience in ecological applications.

Education and mentorship are very important aspects of our mandate at 8Trees Inc. Thank you for consulting with me and various other members of the industry in this important matter.

Best Regards,



Anne Yagi, M.Sc., EP, CERP

President | 8Trees Inc.

From: [Katharine Yagi](#)
To: [Katharine Yagi](#)
Subject: FW: Looking for Feedback
Date: September 2, 2021 1:39:04 PM

From: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Sent: September 2, 2021 1:38 PM
To: Katharine Yagi <kyagi2@brocku.ca>
Subject: RE: Looking for Feedback

That is ok with me, keep up the good work.

From: Katharine Yagi <kyagi2@brocku.ca>
Sent: September 2, 2021 1:33 PM
To: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Subject: RE: Looking for Feedback

Thanks Lucas, this is perfect! I will be including this email exchange in my report as evidence for consultation with industry parties. Let me know if you are OK with this or if you have any other questions!

I am happy to hear your experience with Anne and 8Trees has been positive. We hope to continue mentoring students and early career professionals to help develop their knowledge and experiences so they can carry on a similar approach in future consulting work.

All the best,
Katharine

Katharine Yagi (she/her), PhD, CERPIT
Research Associate | 8Trees Inc. | www.8trees.ca
Department of Biological Sciences | Brock University
Amphibian and Reptile Specialist Subcommittee | COSEWIC
E1: katharine.yagi@8trees.ca | E2: kyagi2@brocku.ca | T: (905) 328-2450

From: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Sent: September 2, 2021 1:19 PM
To: Katharine Yagi <kyagi2@brocku.ca>
Subject: RE: Looking for Feedback

Hi Katharine,

I can say that my experience working with Anne has been nothing but positive! Her varied experience as a biologist is clear to see, for example when she is explaining complex ecological concepts and is able to simplify them. She also is able to see the balance between development and the protection of the environment, and offers innovative opinions and recommendations in order to solve issues. In regards to ecologists employed by governmental organizations, in my experience I have found them to be mostly rigid

and inflexible, as would be expected. That is why I believe that having more independent consultants such as Anne is important as they provide a bridge between parties and are able to offer an unbiased, professional opinion that balances stewardship with development. Given the current housing crisis that is being experienced in much of Ontario, ecologists will be ever more important as environmental considerations are faced when inevitable development occurs.

Hope this helps!
Lucas

From: Katharine Yagi <kyagi2@brocku.ca>
Sent: September 1, 2021 10:00 AM
To: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Subject: RE: Looking for Feedback

Hi Lucas,

That is fine, you can give positive feedback (if your experience was positive!) or negative if that is true as well. Just to be clear, there are Ecologists employed at Niagara Region, and NPCA, as well as consulting companies so maybe you have had more interaction with Ecologists than you think?

Thank you for your help with this!
-Katharine

From: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Sent: September 1, 2021 9:57 AM
To: Katharine Yagi <kyagi2@brocku.ca>
Subject: RE: Looking for Feedback

Hi Katherine,

I would be willing to help, but to be honest my experience working with ecologists is small and has only been with Anne. Let me know what I can do regardless.

Lucas

From: Katharine Yagi <kyagi2@brocku.ca>
Sent: September 1, 2021 9:47 AM
To: Lucchetta, Lucas <Lucas.Lucchetta@colliers.com>
Cc: Anne Yagi <anne.yagi@8trees.ca>
Subject: Looking for Feedback

Hello Mr. Lucchetta,

Anne Yagi recently forwarded an email from me about requesting feedback from people working in the planning and/or environmental industry regarding the need for more education in Ecology in the region.

I've decided to reach out to our contacts individually about this to help me stay organized.

Would you or anyone on your team be willing to send me a statement/email or letter explaining your experiences with Ecologists employed in the Niagara Region? And whether or not you would be supportive of a new program in Ecology at Brock University? It wouldn't need to be very long, just informative.

I am currently working with Brock University Faculty to develop a new undergraduate program in Applied Ecology, and having input by people working in the industry would be very helpful. I would be happy to answer any other questions you may have.

Looking forward to your reply,

Best Regards,
Katharine

Katharine Yagi (she/her), PhD, CERPIT
Research Associate | 8Trees Inc. | www.8trees.ca
Department of Biological Sciences | Brock University
Amphibian and Reptile Specialist Subcommittee | COSEWIC
E1: katharine.yagi@8trees.ca | E2: kyagi2@brocku.ca

September 20, 2021

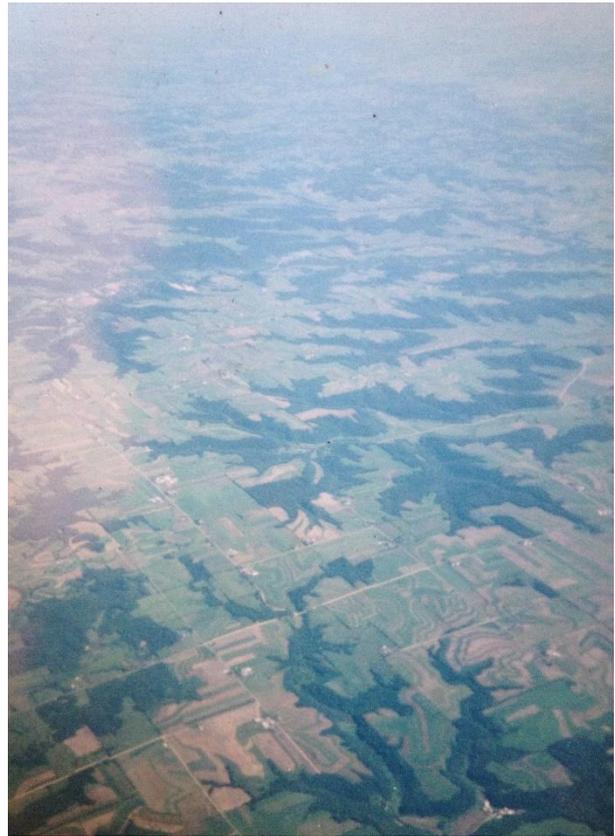
To Whom it Concerns

Re: Development of an Ecology Program at Brock University

I support the development of an ecology program at Brock University that teaches ecological principles and practices that will train and mentor students to 'see' what they are looking at.

Ontario will benefit from programs that train students to look at the landscape and see how the land lies, how does the surface and groundwater behave, how do the animals use it and travel through it, what is the history of the land, how does Municipal Drainage affect the area, what is the short and long term trend in the natural system.

Many areas are heavily impacted from a long history of manipulation and Ontario needs programs to mentor students to see and understand the implications of context, and often, to see what can be or needs to be done. This kind of mentoring is especially vital in today's political environment that uses a hands-off approach to ecological land management with the application of broad policies that have not been ground-truthed. And this kind of mentoring is also vital to prepare students to fight for or make the big decisions to allow the greatly needed changes that can reverse or alter the trajectories of Ontario's many endangered species.



Looking out airplane over Michigan, US, 1998.
Photo by B. Reilly

I was fortunate to have been mentored to look at the context of the land and the water, and it was this kind of teaching that allowed me to use the technical skills to the best of my ability, and that has allowed me to contribute to the progress of good environmental management and teaching in Ontario. I support and look forward to the future with an ecology program at Brock University that continues to pass on good teaching and mentoring. Consideration of a Co-operative Program would be ideal.

Sincerely,

A handwritten signature in black ink, appearing to read 'C Blott'.

Cathy Blott, Hon BSc.

November 23, 2021

To Whom it May Concern,

On behalf of Wildlife Preservation Canada, I would like to acknowledge our support for a new undergraduate program at Brock University called Applied Ecology. There is a great need for more training in this interdisciplinary field, particularly in terms of Indigenous knowledge systems and hands-on experience. It is becoming more and more difficult to find university graduates with hands-on applied experience in ecology in the work force. This new program offers a wonderful opportunity to integrate experiential learning and networking throughout each year of the program.

Wildlife Preservation Canada is a national charity with active conservation programs for Canada's most endangered species across the country, with our most established programs in Ontario and British Columbia. We at WPC would be more than happy to work with Brock University to take on and provide learning opportunities for student interns or co-op students and provide guest presentations and mentoring opportunities for students within such an applied program. We look forward to hearing more about this program as it gets developed. Please let us know how we can be of assistance.

Kind regards,

A handwritten signature in blue ink that reads "Lance Woolaver Jr". The signature is written in a cursive, flowing style.

Lance Woolaver, PhD, Executive Director, Wildlife Preservation Canada



December 8, 2021

[Category]

To Whom it May Concern,

RE: Development of an Applied Ecology Program at Brock University

On behalf of Natural Resource Solutions Inc. (NRSI), I am writing to provide support for the proposed Applied Ecology undergraduate program at Brock University.

NRSI is an environmental consulting firm comprised of over 50 permanent biologists specializing in aquatic, terrestrial, and wetland biology. NRSI provides professional environmental services to a range of clients across Canada, including Species at Risk (SAR) surveys and inventories, SAR status assessments and recovery strategy development, research, subwatershed studies, Environmental Impact Studies, Class Environmental Assessments, transportation and linear infrastructure studies, construction inspection, tree inventories, and permitting among others.

The environmental sector in Canada is expected to grow in by 8% by 2029 (Eco Canada 2020). This growth, combined with the job openings due to retirements (close to 30% of the current workforce will retire by 2029), will create an estimated 233,500 new jobs in the Canadian environmental sector (Eco Canada 2020). There will be a need for highly trained, experienced ecologists to join the workforce. A new Applied Ecology program at Brock University would be well-poised to provide this training for young professionals looking to join the environmental sector.

Every year NRSI employs 30-40 seasonal contract staff, including co-op students, to assist with terrestrial and aquatic surveys, environmental monitoring, data entry, reporting writing, and other aspects of our operations, as necessary. NRSI strives to ensure that these staff are provided valuable hands-on experience and mentorship in the field of environmental consulting. NRSI would be interested in supporting Brock University to provide its new Applied Ecology program students with work placements so they can get the valuable hands-on experience they need.

Sincerely,
Natural Resource Solutions Inc.

Jennifer McCarter, M.Sc.
Terrestrial and Wetland Biologist
jmccarter@nr.si.on.ca

Reference:

Eco Canada. 2020. From Recession to Recovery: Environmental Labour Demand Outlook.
<https://eco.ca/new-reports/environmental-labour-demand-outlook/>