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MEMORANDUM

ATTENTION: Senate | TEL

FROM: Peter Keller, Vice-President, Academic and Provost, and Chair, SCUP

RE: Establishment of the School of Environmental Science (SCUP 18-24)

DATE: May 18, 2018 | TIME

At its May 16, 2018 meeting, SCUP reviewed and approved the proposal to establish the School of Environmental Science within the Faculty of Environment.

Motion:

That Senate approve and recommend to the Board of Governors the establishment of the School of Environmental Science within the Faculty of Environment.

c: J. Venditti
I. Leman Stefanovic

SFU

INGRID LEMAN STEFANOVIC, DEAN
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MEMORANDUM

TO: Peter Keller, Chair, SCUP
DATE: May 4, 2018
FROM: Ingrid Leman Stefanovic, Dean
RE: School of Environmental Science Proposal

Please find enclosed the proposal to create a School of Environmental Science within the Faculty of Environment. The School will house both the current, highly-successful undergraduate program as well as the Professional Masters of Ecological Restoration, currently offered as a collaborative program between FENV SFU and BCIT.

We ask that the proposal be submitted for consideration at the next SCUP meeting.

Please let me know if you have any questions.

Sincerely,

I Stefanovic

Ingrid Leman Stefanovic
Dean

Cc: Dr. Jeremy Venditti, Director, Environmental Science Program
Dr. Alex Clapp, Associate Dean, Undergraduate, Faculty of Environment
Dr. Dongya Yang, Associate Dean, Graduate and Research, Faculty of Environment
Ms. Rebecca Ho, Academic Program Coordinator, Faculty of Environment
Ms. Michele Black, Director of Administration, Faculty of Environment
Dr. Jon Driver, Special Advisor to the Dean, Faculty of Environment

Proposal for a

School of Environmental Science

Simon Fraser University

May 4, 2018

Jeremy Venditti
Director of Environmental Science
Correspondence: EVSC_Director@sfu.ca

Ingrid Leman Stefanovic
Dean, Faculty of Environment
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Executive Summary

The Faculty of Environment (FENV) proposes the creation of a new School of Environmental Science, to house the Environmental Science (EVSC) Undergraduate Program as well as the joint SFU/BCIT Graduate Master of Science in Ecological Restoration (MER).

The Environmental Science (EVSC) Undergraduate Program at SFU has been a part of the Faculty of Environment since it was created in 2009. A 2015 external review, as well as an earlier one in 2006 when the program was in the Faculty of Science, have recommended the creation of a new unit structure (either a "department" or a "School") to house the growing program.

The MSc of Ecological Restoration was launched in 2015. Like the EVSC undergraduate program, it is administered through the Dean's Office at present.

The Faculty of Environment currently functions as a hybrid Faculty, hosting both departments as well as non-departmentalized programs. To facilitate a consistent governance structure, the Dean has expressed the desire to move to a fully departmentalized Faculty. Some changes in this direction have already occurred. Two Bachelor of Environment (BEnv) offerings, previously administered in the Dean's office, have moved to the Department of Geography and the School of Resource and Environmental Management.

Deans of the Faculty of Environment, Faculty of Science, and Faculty of Health Sciences have begun to meet to discuss harmonizing life sciences programming on campus and those discussions will continue.

Building on the spirit of these conversations, the current proposal aims to provide a more legible, unit-level home for the EVSC and MER programs within a coherent structure that supports their further growth.

1. History and Context

The Environmental Science (EVSC) Undergraduate Program at SFU has provided interdisciplinary science education for more than 20 years. Located in the Faculty of Science since 1995, it remained a smaller undergraduate program with enrolments of approximately 60 students before it was relocated to the Faculty of Environment in 2009. In response to an earlier external review (2006), the program was redesigned and in 2011, the present set of concentrations was launched.

The program historically has operated as a collaboration amongst science departments in both the Faculty of Science and Faculty of Environment. Currently, it offers programming in Applied Biology, Environmental Earth Systems, Environmetrics and Water Science. In the academic year 2014/15, the program went through a second external review process. This statement from the External Reviewers' report summarizes the current state-of-affairs for the Environmental Science Program:

> *The EVSC Program is at a crossroads. It has 234 students currently enrolled[1], with considerable potential for more, but it needs a better administrative framework, more resources including dedicated space and faculty, and a strategy for growth, with metrics for measuring accomplishment in order for the unit to realize its potential. Programs such as this, which serve a particular need but operate outside a departmental framework, face a variety of challenges and resource limitations. For the EVSC Program to thrive, support needs to be in place at the highest levels of university administration. It is up to SFU and FENV to commit to providing the EVSC Program with the means to develop and grow. The recent appointments of a new Dean of FENV [Faculty of Environment] and a new Director of EVSC make this an opportune time for elevating environmental sciences at SFU to a higher level.*

The reviewers' recommendations were unambiguous in recommending the reorganization of the program's administrative and governance framework in the form of a School to house both the EVSC program, as well as other related non-departmentalized FENV programs. The reviewers argued that such a School would provide the students with a centralized home unit where dedicated faculty and staff could be appointed. They also argued that a School would form an interdisciplinary hub to which discipline-based units could continue to contribute course offerings and benefit from course enrollments.

The MSc in Ecological Restoration (MER) is the first graduate programming partnership between SFU and the BC Institute of Technology (BCIT). Launched in 2015, the program accepted 18 graduate students in its first year, an additional 24 in its second year and 25 in the Fall of 2017. The first cohort graduated in 2017. At present, the program is administered through the Dean's Office with the occasional assistance of the Faculty of Graduate Studies.

Through a formal survey as well as through meetings and informal discussions, students in both programs have expressed a desire for a clearer identity and focus on their field of study at SFU. With the growth of teaching needs within both programs, there is a need to also define a unit that can support

[1] Note the number of majors has risen to 296 in 2016/17.

direct faculty hires. In response to student feedback, as well as to the fact that both programs boast enrolments that exceed that of most FENV departments – there is a need to develop a more meaningful administrative structure for future growth and stability.

2. Interdisciplinary Environmental Governance Models

In Canada, housing interdisciplinary Environmental Science programs within their own administrative units is far from unusual. At present, there are 15 Environmental Science units at Canadian Universities (Table 1; based on an inventory developed by the FENV Dean as part of a SSHRC Insight grant that investigates interdisciplinary environmental programming across the country).

Table 1: Environmental Science units across Canada

University	Unit	Year Founded
University of Guelph	School of Environmental Sciences	2009
McGill University	McGill School of Environment	1988
Acadia University	Department of Environmental Sciences	2006
Dalhousie University,	Department of Environmental Sciences	Not reported
Mount Royal University	Department of Environmental Sciences	Not reported
University of Northern British Columbia	Department of Environmental Sciences	1990s
Saint Mary's University	Department of Environmental Sciences	Not reported
Saint Francis Xavier University	Department of Environmental Sciences	Not reported
University of Toronto Scarborough	Department of Physical and Environmental Sciences	1980s
Université de Québec à Trois-Rivières	Sciences de l'Environnement	Not reported
University of Waterloo	Department of Earth and Environmental Sciences	1969
University of Windsor	Department of Earth and Environmental Sciences	Not reported
Carleton University	Institute of Environmental Science	1998
Universite de Quèbec à Montréal	Institute des sciences de l'environnement	1990s
Wilfrid Laurier University	Institute for Water Science	2008

These units were created at various stages from 1965 onward. The oldest department that houses environmental science programming was developed at the University of Waterloo. The most recent unit, created in 2009, is the School of Environmental Sciences at the University of Guelph.

The chart above shows that "Departments" are clearly a preferred designation in a cross-Canadian survey of Environmental Science units. However, the Faculty of Environment prefers to opt for creation of a "School" for a variety of reasons.

The principal explanation is that, in our view, "departments" are most often historically understood to be disciplinary units. As Rustom Roy (1990) points out in his discussion of disciplinary boundaries, "for all intents and purposes on any one campus, discipline = department."[2] While interpretations may be changing, a search of dictionary definitions confirms that a department is generally understood to be "a part of an organization...that deals with a *particular* area of study of work. E.g. Department of Chemistry." (Cambridge Dictionary).

Such an understanding of the meaning of "department" does not square with the interdisciplinary nature of Environmental Science programming, nor with the challenges of cross-institutional teaching that occurs in the MER graduate program.

The concept of a "School," on the other hand, is open to broader interpretation than a "department", particularly at SFU where there is a faculty, disciplinary units and several interdisciplinary units that are called "schools." SFU hosts the Beedie "School" of Business that operates on the level of a Faculty. The Faculty of Applied Sciences supports the Schools of Computing Science, Engineering Science and Mechatronic Systems Engineering and the Faculty of Communication, Art and Technology supports Schools of Communication, Contemporary Arts and Interactive Arts and Technology, all of which operate as independent units. The Faculty of Arts and Social Sciences hosts several schools that support distinctively interdisciplinary undergraduate and graduate programming including the School of Criminology and School for International Studies. In FENV, we support the School of Resource and Environmental Management (REM that functions as an interdisciplinary unit, integrating social and natural sciences.

The reality is that a "School" can, in principle, point to broader, more flexible, cross-disciplinary academic opportunities in a way that the notion of a department typically cannot. Moreover, a "School" allows for the possibility of a different governance model than a traditional department. While a department often functions as a discrete, independent unit with robust disciplinary boundaries, a School offers the option of a different organizational structure that better accommodates interdisciplinary programming as evidenced by the Schools of Criminology, International Studies and the School of Resource and Environmental Management.

In fact, instead of supporting a circumscribed, departmental structure, the new School of Environmental Science will be differently organized (Figure 1). The Undergraduate Environmental Science program

[2] Rustom Roy, "Interdisciplinary Science on Campus", in Joseph J. Kockelmans, Ed., *Interdisciplinarity and Higher Education*, (University Park and London: Pennsylvania State University Press, 1979, p. 168. The history of disciplines is discussed elsewhere in classical works, such as Julie Thompson Klein's *Interdisciplinarity: History, Theory and Practice*, (Detroit: Wayne State University Press, 1990).

already functions in the manner of a "hub-and-spoke" model: an integrative, interdisciplinary core (hub) of EVSC offerings connects to discipline-based, science courses (spokes), ensuring that the collaboration is more than simply a multi-disciplinary assemblage of courses. Such a structure will continue in the new School because we feel that it is the optimal pedagogical model for delivery of environmental science programs that support the individual scientific disciplines (both in terms of enrolments but also in terms of academic content) while providing an opportunity for interdisciplinary integration within the context of complex environmental concerns. Given that the graduate MSc in Ecological Restoration is itself an innovative, cross-institutional experiment, once again, a School is a more appropriate home for such a program that crosses disciplinary boundaries in interdisciplinary environmental teaching and research.

To be sure, a "School" can, in principle, also function like any other department. The School of Resource and Environmental Management does not have well-defined disciplinary boundaries, but it does operate very much like a department. In the case of the current proposal, there will be some similarities between the School of Environmental Science and other departmental units. For instance, it will support a tenure and promotions committee (TPC) and it will allow for tenured faculty and lecturer appointments to be housed within the unit.

That being said, the new School aims to be an essentially *collaborative* unit, drawing from other departments across other Faculties and even across other institutions such as BCIT, to ensure delivery of an academically sound, interdisciplinary set of programs to address a complexity of scientific issues arising from a variety of environmental concerns.

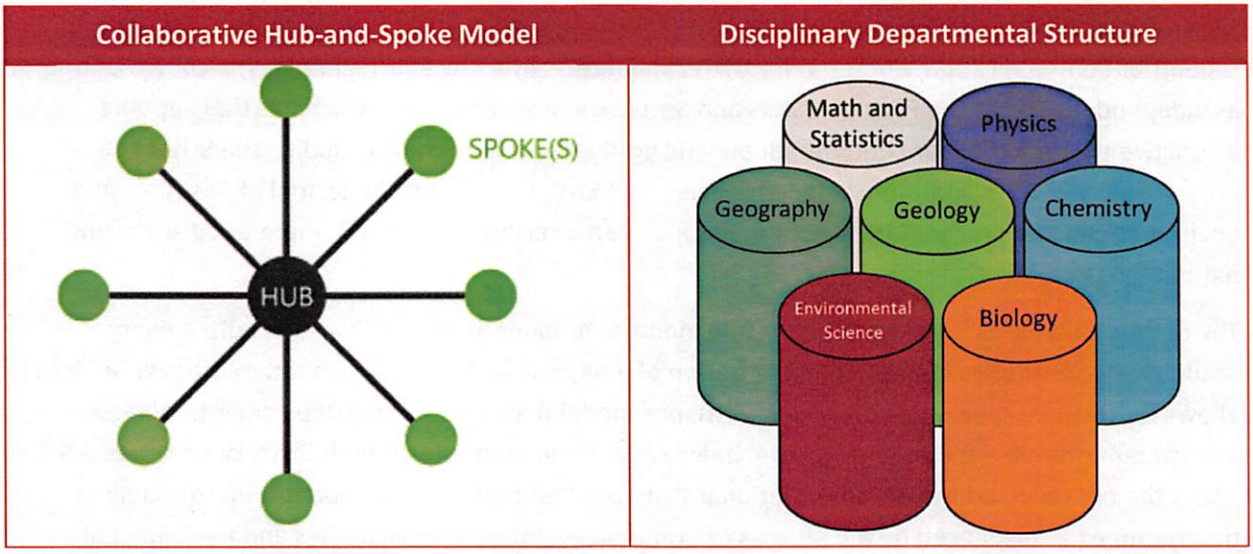


Figure 1: Contrasting models of unit organization.

Other sorts of models are possible and have been considered by the FENV Dean, her executive committee and by the EVSC steering committee prior to the decision to pursue a School of Environmental Science. These alternate options included:

1. Distributing the EVSC concentrations to other units in FENV and the Faculty of Science while continuing to administer the graduate MER program within the Dean's office.

2. Merging the EVSC and MER programs with other FENV units (Geography or REM).

Option #1 above would effectively dismantle the EVSC program – an unwise move, given that the program has strong student interest, is growing and continues to provide enrollments to the disciplinary units within FENV and the Faculty of Science. Dismantling the program would eliminate the central branding of Environmental Science that is attracting students and, ultimately, can legitimately be expected to do damage to those enrollment numbers. The MER program would have to continue to be administered through the Dean's office because it does not fit into any single FENV unit's scope, nor has there been expressed interest in adopting the program. A more legible home base for the MER program can be provided by a school without disrupting the current structure of FENV units.

Option #2 was carefully considered in light of expressions of interest by the Chair of the Department of Geography to merge with the EVSC program. Discussions within the EVSC steering committee revealed a number of concerns with this path forward. Primary among the concerns was that merging EVSC with any single, disciplinary unit would damage the collaboration between units that has been the hallmark of the program at SFU since its inception. There is a sense of communal 'ownership' of the program by participating (partner) units, which include the Departments of Geography and Resource and Environmental Management (REM) in FENV and the Departments of Biological Sciences, Earth Sciences and Statistics and Actuarial Sciences in the Faculty of Science. Many of the steering committee members felt that all units with representation on the steering committee have an equal say in the direction and future of the EVSC program. Members from the Faculty of Science in particular felt that placing the program into an existing unit in FENV would distance them from the program. The Faculty of Science offers over half the EVSC program (by enrolments), so any dilution of the collaborative structure currently in place, was of major concern to steering committee members and is a major concern to the Director and Dean of the Faculty of Environment.

Furthermore, there has been expressed interest from some units (Archaeology, Chemistry and Statistics and Actuarial Sciences) for greater participation in the program. Given the number of FENV and Science departments which have interest in collaborating in interdisciplinary Environmental Science offerings, placing programs within a single Department would signal the predominance of a single discipline over interdisciplinary collaboration.

Scientific understanding of environmental problems is advanced in significant ways through discipline-based learning at SFU. Nevertheless, complex environmental problems require collaboration amongst the sciences and this needs to be reflected in the education of our students. A School of Environmental Science will serve as an interdisciplinary hub for education that integrates disciplinary expertise from other units, while not replacing disciplinary teaching. This will reinforce the various units by adding course enrolments to the disciplinary units, while allowing EVSC to grow and prosper from the collegial interactions of the various units with some expertise in Environmental Science.

Finally, formation of a School of Environmental Science will provide a unit unlike others in FENV. There exist hybrid units within FENV that combine the humanities, social science and science traditions in teaching and research (Archaeology and Geography), and we support an interdisciplinary unit

integrating social and natural sciences that focuses on management issues (REM). In the Faculty of Science, there are several disciplinary units that house environmental scientists (Biological Sciences, Earth Sciences, Statistics and Actuarial Sciences). There is no unit within the FENV that has the traditions and culture of an interdisciplinary science unit. A School of Environmental Science – supporting undergraduate programs in Environmental Science and a Professional Masters Program in Ecological Restoration – provides an opportunity for a unit that focuses on interdisciplinary science and will form a strong and coherent hub for both teaching and research. Importantly, the formation of a new school provides a unit that can support appointments and the opportunity to develop a faculty cohort to enhance rapidly expanding interdisciplinary science programs at the undergraduate and graduate levels.

3. The Student Experience

Students are the principal driving force behind this proposal. Repeatedly, they have voiced their interest in strengthening the cohort model for the undergraduate program. At the graduate level, they are seeking a more legible sense of belonging to SFU as, occasionally, BCIT has been seen to be their current, exclusive home base – something that we would like to change.

EVSC students are typically passionate about environmental issues, engaged in the community and remarkably proactive about their education. This engagement leads to high quality students. Several of the top scholarships in the university have gone to entering EVSC students in the past few years. Most of the students are attracted to the EVSC program, because it allows them to take a broader range of science courses than available through departmentalized science programs at SFU. They are also adamant that they want a science-based program with the integration of some social sciences to help them better understand the societal context of environmental problems.

On their own initiative, the EVSC Student Union undertook an online survey, designed by them to assess the quality of the program and the student experience. (The Student Union has been in existence since 2001 and is particularly active to this day. Please see http://www.sfu.ca/~evscsu/.) Appendix A presents unedited results, as provided by the steering committee student representative. Students are generally satisfied with the program, but not "extremely satisfied". They appear to want a greater sense of community within the EVSC program, more courses offered directly by the program to foster a more coherent cohort and to improve scheduling problems across departments and faculties, and opportunities to learn field and laboratory methods that will lead to job opportunities in environmental fields. Their responses leave some room for improvement of the program – improvements that are intended to be addressed through the formation of a School with a more legible cohort program, improved space and dedicated classroom and lab instructors. It is not currently possible to appoint faculty, lecturers, lab instructors and staff to a program, reiterating the need for a school.

While the MSc in Ecological Restoration is still new, the Dean has met with students informally to discuss their experiences within the program. Shortly after that meeting, the Ecological Restoration MSc cohort ratified a constitution for the new Ecological Restoration Student Association (ERSA). For more

information, please see https://erstudentassociation.wordpress.com/. Students have expressed the need for a clearer pathway to SFU advisory services and, like their undergraduate colleagues, voiced their desire for a gathering place in the form of a student lounge. They remain confused as to whom to turn to at SFU for guidance and, consequently, appear to draw principally from BCIT for assistance. This is problematic, given that the program is billed as an SFU/BCIT (in that order) joint graduate program.

Recently, and in response to student requests, student lounges have now been put into place and furnished by the Dean's office within TASC2. All EVSC offices for teaching and advisory staff are also now in one location in TASC 2. We expect that by developing a School, graduate students will similarly find it easier to navigate in locating advisory and administrative support services for the MER program as well.

4. Undergraduate Programming and Enrolments

4.1 Educational Goals and Program

Educational goals for the EVSC program were developed by the EVSC Steering Committee in 2014 and revised in 2016 (See Appendix B). These goals are partly aspirational and currently guide program development. They recognize the need to develop environmental scientists who have a solid grounding in the natural and mathematical sciences as well as core competencies in scientific communication, critical thinking and an understanding of social science perspectives on environmental issues. At the upper division, core competencies and skills are developed thematically through disciplinary course work.

There are three versions of the EVSC program that include the EVSC Major, EVSC Honours and EVSC Cooperative Education. In all three versions, students take a common first year, including courses from Biological Sciences, Geography, Mathematics, Chemistry, Physics and Statistics and Actuarial Science. Students choose from four areas of concentration, for which they complete a series of required lower and upper division courses (see Appendix C for complete program details). The four concentrations are:

1) Applied Biology: Designed to develop a firm background in various aspects of ecology, whole-organism biology, and applied conservation biology.

2) Environmental Earth Systems: Provides students with an integrative coverage of environmental processes and systems, as well as the opportunity to develop technical skills in quantitative methods, geographic information systems and remote sensing.

3) Environmetrics: Designed to provide training in the design and analysis of sampling schemes for environmental monitoring and related experiments.

4) Water Science: Provides a focused interdisciplinary science-based training in hydrologic, climate, and aquatic science, complemented by courses in social sciences and law (governance).

4.2 Enrollments

The EVSC program is the 4th largest science program on campus (Table 2). The size of the EVSC program is now larger than many of the departmentalized BSc programs in the Faculty of Science (e.g. Earth Science, Chemistry, Mathematics, Physics and Statistics). In the Faculty of Science, EVSC program enrolments were ~60 students, but began increasing in 2006 (Table 3). Since establishment of FENV in 2009, enrolments have almost tripled and continue to grow every semester. This can be attributed to marketing in the high schools by SFU Recruitment Services and FENV's Manager of Recruitment & Community Liaison, and the higher profile the program maintains in FENV than it did in the Faculty of Science.

Table 2: Majors in BSc programs at SFU. Includes Majors only.

Program	Faculty	Headcount*
Biomedical Physiology & Kinesiology	Science	877
Department of Molecular Biology and Biochemistry	Science	593
Department of Biological Sciences	Science	546
Environmental Sciences Program	Environment	296
Department of Chemistry	Science	292
Department of Statistics and Actuarial Science	Science	247
Department of Mathematics	Science	214
Department of Physics	Science	194
Department of Earth Sciences	Science	100
Department of Geography (BSc Physical Geography)	Environment	34

* Includes majors for the most recent year available from IRP departmental profiles (2016/17), but excludes minors because there is no comparable minor in EVSC.

Most of the increase in enrolments comes from new students entering the program from high schools and the BC college system, where they can undertake two years of studies and then transfer to Bachelor's degree programs at SFU. Internal transfers within SFU are a significantly smaller proportion of new students. The Director or the EVSC limited-term lecturer attends the British Columbia Environmental Articulation Committee meetings to ensure that college credit transferability is maintained. Continued growth is expected as the brand of the new program becomes better established, but at what rate is not currently clear. Our expectation is for modest growth over the next few years. Prior to its move to the FENV in 2009 and a program redesign completed in 2011, students enrolled in one of 6 different concentrations (Figure 2). The most popular concentration prior was Biology, followed by Physical Geography and Chemistry. The other concentrations were not well

subscribed throughout most of the program's history. There is substantial increase in enrolments since 2006, which coincides with an increase in majors without a declared concentration, suggesting students were attracted to the environmental science brand, but uncertain about what specific area defined their interests.

Table 3: EVSC program headcounts

Year	Honors	Majors	Total	Faculty
1995/96	0	17	17	Science
1996/97	2	47	49	
1997/98	6	64	70	
1998/99	6	95	101	
1999/00	3	95	98	
2000/01	4	79	83	
2001/02	2	59	61	
2002/03	4	56	60	
2003/04	3	50	53	
2004/05	2	41	43	
2005/06	1	52	53	
2006/07	1	81	82	
2007/08	0	98	98	
2008/09	0	96	96	
2009/10	0	105	105	Environment
2010/11	4	134	138	
2011/12	4	166	170	
2012/13	7	179	186	
2013/14	7	194	201	
2014/15	6	248	254	
2015/16	7	282	289	
2016/17	8	288	296	

The program was redesigned in 2011 and students can now choose from concentrations in Applied Biology, Environmental Earth Systems, Environmetrics (statistics for environmental scientists) and Water

Science. Figure 2 shows enrollments in all the concentrations have grown. Applied Biology remains the most popular. The Environmental Earth Systems concentration is a close second. Water Science is experiencing rapid growth. It is expected that declarations in the Environmetrics concentration will continue to be low, based on its historical levels of popularity. The popularity of biology-centered concentrations may be partly related to the content of the EVSC 100. For some years, the course content consisted essentially of applied ecology. The current director and EVSC limited-term lecturer have made attempts to broaden the course content to better represent the breadth of the program. Whether this broadens enrollments across the concentrations remains to be seen but the increasing popularity of Environmental Earth Systems and Water Science, both programs dominated by Geography and Earth Science courses at the upper division, suggest some success. The reorganization of the Introduction to Environmental Science course (EVSC 100) and recent appointment of a dedicated limited-term lecturer to teach EVSC courses seem to be having some effect. Many EVSC students have not declared a concentration and they form the largest cohort in the program. In fact, the number of undeclared students is nearly equivalent to the number of declared students. Growth patterns (Figure 3) suggest that these undeclared students will distribute primarily across Applied Biology, Environmental Earth Systems and Water Science.

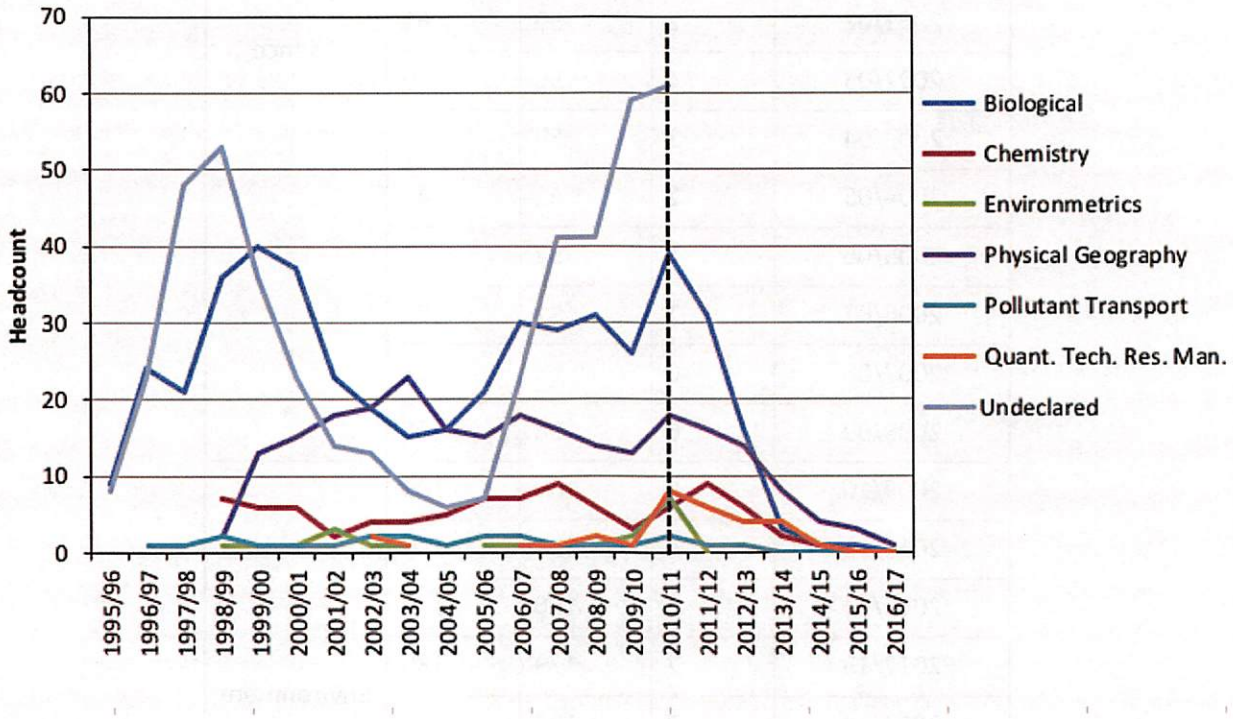


Figure 2: Students enrolled in the old EVSC concentrations (before fall 2011). The vertical dashed line indicates the year when the new concentrations were launched.

4.3 Graduates

A total of 409 degrees have been conferred in EVSC at SFU since 1995 at a rate of approximately 20 per year following the initial startup period (1995-1999) with a slight increase in the past two years (Table

4). Over 50 % of the degrees have been conferred to majors in the biology-related concentrations. The average time to completion since 1995 is 5.5 years for students entering from high school and has not significantly changed through time. The formation of a School would support a stronger cohort for the program, which would promote more timely completion because students' shared experiences will help them direct their own studies.

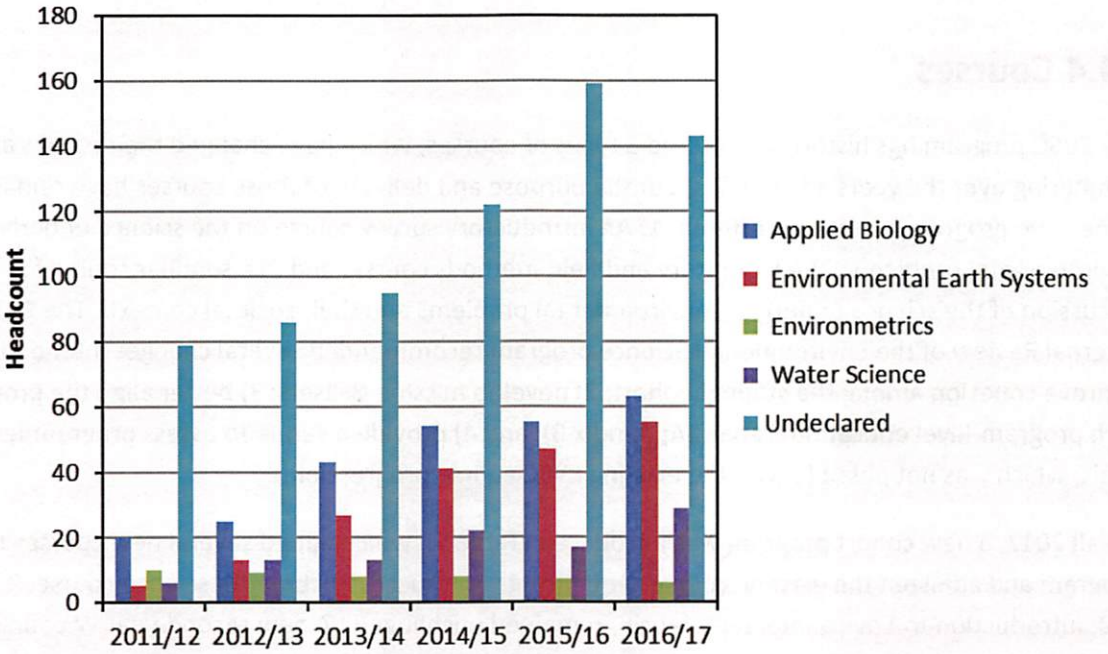


Figure 3: Students enrolled in the current EVSC program concentrations (since Fall 2011). Students who started the program prior to 2011 were able to declare their concentration in the current program, even though it did not exist when they first registered

Table 4: Graduates from each EVSC concentration as of Fall 2017

New concentrations	*Graduates*
Applied Biology	56
Environmental Earth Systems	43
Environmetrics	12
Water Science	9
Old concentrations	
Biological	164
Chemistry	31
Environmetrics	7
Physical Geography	77

Pollutant Transport	8
Quantitative Techniques for Resource Management	13
Total	**420**

4.4 Courses

The EVSC program has historically offered 3 types of courses, which have changed their names and numbering over the years a few times, but the purpose and delivery of those courses have remained the same. The program has always offered: 1) An introductory survey course on the science underlying environmental problems; 2) A laboratory and field methods course; and 3) a seminar course for discussion of the science underlying environmental problems and their societal context. The 2015 External Review of the Environmental Science program recommended several changes intended to: 1) improve cohesion among the student cohort; 2) develop missing skillsets; 3) better align the program with program-level educational goals (Appendix B); and 4) provide a venue to assess program-level goals, which was not possible with the existing EVSC course progression.

In Fall 2017, a new cohort program was introduced (Table 5), which added several new courses to the program and adjusted the existing course sequencing. The successful breadth science course, 'EVSC 100: Introduction to Environmental Science', remained unchanged. A new second-year W course entitled 'EVSC 201W: Environmental Science in Practice' was developed to help students develop science communications skills and expose students to what environmental scientists do. The course draws upon guest lectures from environmental scientists and practitioners across contributing disciplines and workplaces. The methods course was moved from the second year to the upper division where, it became 'EVSC 305: Methods in Environmental Science'. This change recognized that students needed more exposure to disciplinary courses before learning field and laboratory methods. The seminar courses which were being taught as single credit pass/fail courses (EVSC 399 and EVSC 499) were consolidated into a single 300-level seminar course called 'EVSC 300: Environmental Science Seminar', which is now 3-units and graded. The course provides Environmental Science students the opportunity to investigate an environmental science topic in depth, through lectures and bi-weekly guest speakers from diverse sectors (academia, government, industry and NGOs). In Fall 2017, EVSC 300 focused on Canada's Climate Adaptation Plan and in Spring 2018, the environmental impacts of the Site C dam on the Peace River in Northern British Columbia. A fourth year, project-based capstone course called 'EVSC 400: Environmental Science Capstone' has been created to allow EVSC students to integrate their disciplinary, science backgrounds to solve environmental problems. Project-based coursework will promote collaborative group work, emphasizing research skills, data analysis, scientific writing and communication, preparing students for employment as environmental scientists. The first offering of EVSC 400 was planned to coincide with the Fall 2017 cohort progression to 4th year (Fall 2020), but demand from exiting students switching into the new program necessitates teaching it Fall 2019. A new thesis course 'EVSC 490: Environmental Science Thesis' has also been created for the honours program. It is to be completed in the 4th year under the supervision of any SFU faculty member. The course is

designed for those who want to do the honours program, but cannot take the 15 unit Biology thesis courses (BISC 490, 491, 492W) or the Geography Honours Essay (GEOG 491) (see Appendix C).

The EVSC cohort model is further supported by social science courses offered in FENV, which provide a 'social science perspectives on environmental issues', a key program-level educational goal (Appendix B). These courses include: Environmental Law (ENV 319), Ethics and the Environment (ENV 320W), Ecological Economics (REM 321) and Institutional Arrangements for Sustainable Environmental Management (REM 356), of which two are required. The new set of required EVSC courses (100, 201W, 300, 305 and 400), and the core social science-perspective courses, provide a set of courses that EVSC students will take together. This provides an opportunity to apply some of the things they learn in their disciplinary Biology, Geography, Earth Science, REM and Statistics courses and a better context for the societal, legal and ethical issues they will deal with in their careers as environmental scientists.

Table 5: EVSC cohort program introduced in Fall 2017

Cohort courses in 2017/18	*Previously*
EVSC 100 Introduction to Environmental Science*	EVPL 200, EVSC 200
EVSC 201W: Environmental Science in Practice*	New in 2017
EVSC 300: Environmental Science Seminar*	EVSC 401, EVSC 399, EVSC 499
EVSC 305: Methods in Environmental Science*	EVSC 491W, EVSC 205
EVSC 400: Environmental Science Capstone	New in 2017; to be taught in 2019
EVSC 490: Environmental Science Thesis	New in 2017

*The most recent course outlines and syllabi are included in Appendix D.

The popularity of EVSC courses has increased over time. Figure 4 (top) shows the enrollment in EVSC 100 is dramatically larger than its predecessor EVSC 200, which was taught until 2011. EVSC 100 is a popular breadth science course and increasingly a service course for the university. The enrollments have been increasing because we have been adding sections of the course over the past 5 years. EVSC 100 is now taught in the Fall, Spring and Summer semesters at both the Surrey and Burnaby Campuses. It was also offered at the Vancouver Campus in 2016 as part of the continuing education program. The course routinely fills to capacity and the primary limitation on the number of students enrolled is physical class size. Larger classrooms would facilitate higher enrollments. These expanded offerings of EVSC 100 benefit the program by attracting students to the major who might not have otherwise considered EVSC. It also benefits FENV because it generates revenue under the current responsibility-based budgetary Faculty Allocation Model. There have also been increases in the Methods in Environmental Science class, which routinely has 40-50 students enrolled and the seminar courses that attract >60 students per year from EVSC and REM (Figure 4 bottom).

Co-operative Education (co-op) is a popular option at SFU and the EVSC program is no exception. Participating students alternate semesters on campus and study-related employment. The program includes pre-employment orientation and four full-time, paid work semesters. A major and honors co-

operative education program leading to a B.Sc. degree in Environmental Science is available to qualified students. To enroll in the co-op program, students attend information meetings held in the first two weeks of the semester prior to the semester in which they wish to work. Students seek advice from the FENV coordinator as early as possible in their university careers to facilitate optimal scheduling. There has been a small but noticeable increase in the number of co-op placements as the program has grown (Figure 4 bottom).

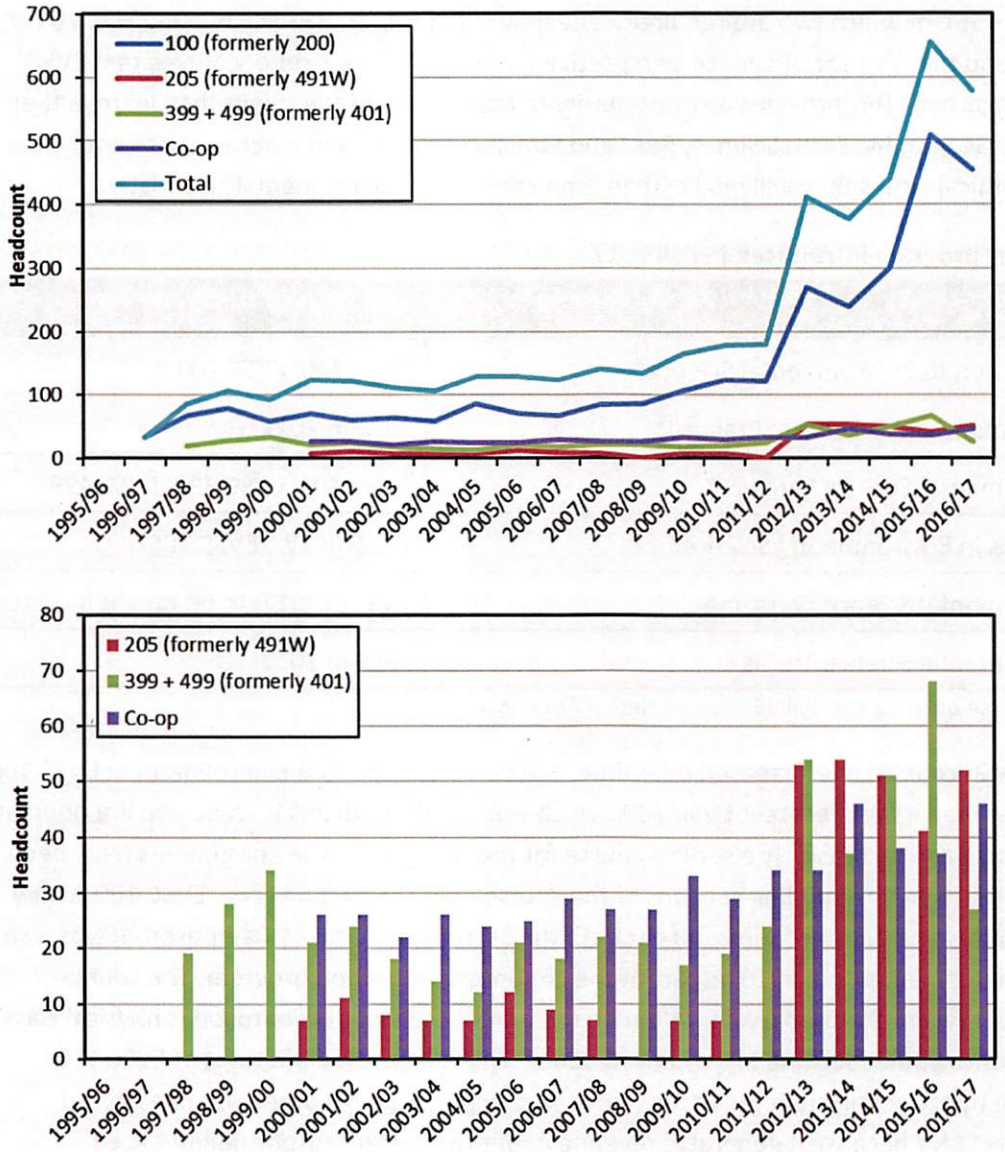


Figure 4: Enrollments in EVSC courses. Course codes explained in Table 5. The decline in enrollment in EVSC 100 in 2016/17 was because we reduced the number of sections from 7 to 6 that year. Enrollments in EVSC 399/499 were purposely limited in Spring 2017.

4.5 Overlap and Similar Programming at Simon Fraser University

There are several undergraduate programs that are closely aligned – but also quite distinctive – from the EVSC Program. These include the Physical Geography Program in Geography, the Ecology, Evolution and Conservation stream in Biological Sciences and the Bachelor of Environment Programs in Geography and REM.

Physical Geography Program in Geography:

The Department of Geography offers an undergraduate Bachelor of Science in Physical Geography where students can specialize in one of three streams: 1) Biogeophysical Science, 2) Geoscience, 3) Physical Geography and Spatial Information Science. The Biogeophysical Science stream and the Environmental Earth Systems in EVSC are similar. EVSC students have more lower division science requirements, can take a broader range of upper division science electives, and are also offered a broader range of 'techniques' courses at the upper division, beyond GIS and remote sensing courses. A further distinction is that Physical Geography students take some Human Geography courses while EVSC students take courses more directly related to the practice of environmental science (environmental ethics, policy/law and economics). Current enrollment in the Physical Geography program is 34 with <10 in the Biogeophysical Science stream.

Ecology, Evolution and Conservation (EEC) Stream in Biological Sciences:

The Department of Biological Sciences offers an undergraduate stream in Ecology, Evolution and Conservation (EEC) Stream. The Applied Biology concentration and EEC stream share most lower division courses and many upper division courses. Applied Biology EVSC majors take a greater breadth of science courses than in the EEC stream, including courses from Geography and REM, as well as some social science courses. The EVSC steering committee is currently working with applied biologists in Biological Sciences and REM to identify opportunities to better differentiate the Applied Biology concentration in EVSC from the EEC stream in Biological Sciences. Current enrollment in the EEC stream in Biological Sciences is 46.

Bachelor of Environment:

FENV recently developed a new undergraduate Bachelor of Environment (BEnv) credential. The BEnv provides students with a core foundation in earth systems, ecology, biology, the human role in nature, the social and built environments, environmental stewardship and governance and the global scale. Students can choose to specialize in one of two majors: Global Environmental Systems (GES) or Resource and Environmental Management REM). Sustainable Business, a joint major in Business and Environment, is offered collaboratively between the Beedie School of Business and the Faculty of Environment. The BEnv program provides some training in Biology, Ecology and Earth Systems, but focuses on the integration of the social and natural sciences. While the BSc in Environmental Science is also interdisciplinary in incorporating traditional science disciplines, the BEnv is more broadly inclusive of the social sciences and humanities within its curriculum. The BEnv program began in Fall 2014 and,

overall, has exceeded enrolment expectations. There 294 BEnv students enrolled in Spring 2018; 90 students in the GES major, 174 in the REM major and 20 in the Sustainable Business major.

5. Graduate Programming and Enrolments

The aim of the proposed Master of Science in Ecological Restoration (MER) degree is to create a highly qualified personnel talent pool urgently needed in Canada's ecological restoration industry. The master's program significantly builds upon the knowledge students gain in their undergraduate degrees, to provide them with the critical thinking and experiential skills to be leaders and educators in the rapidly developing ecological restoration industry. The unique, multi-institutional curriculum aims to produce graduates with an integrated body of knowledge, methods, and tools for advancing the practice and science of restoring degraded ecosystems.

The program, equally shared across SFU and BCIT, requires the completion of a minimum of 36 units at the graduate level, composed of 10 core courses (30 units) and two elective courses in the student's area of specialization (6 to 10 units). Included in the core program is a capstone applied research project composed of two courses (6 units). Only graduate-level courses will contribute to the requirements for graduation. Students require four academic semesters over two years to complete the degree requirements in the full-time program. Part-time study in the program is not yet an option, but is being considered, which would give working professionals a maximum of six years to complete the program. The calendar entry for the MER program is given in Appendix E.

The conceptual design of the program is shown in Figure 5. Practically, the program is broken into three main areas: 1) the core program; 2) an area of specialization; and 3) an applied research project. All students complete the core program that includes the following courses:

- ECO 611 - Concepts of Ecological Restoration and the Biological Environment
- ECO 621 - Graduate Seminars in Research Methods
- ECO 622 - Project Management & Policy for Ecological Restoration
- ECO 641 - First Nations & Social Perspectives of Ecological Restoration
- ECOR 9100 - Concepts of Ecological Restoration and the Physical Environment
- ECOR 9110 - Planning and Monitoring for Ecological Restoration
- ECOR 9200 - Field Applications of Restoration Principles
- ECOR 9210 - Restoration of Terrestrial Ecosystems *or* ECOR 9220 (BCIT) - Restoration of Aquatic Ecosystems
- ECO 930/ECOR 9300 Applied Research Project I
- ECO 940/ECOR 0400 Applied Research Project II

ECO courses are taught at SFU's Burnaby Campus and ECOR courses are taught at BCIT. Course descriptions can be found in Appendix F.

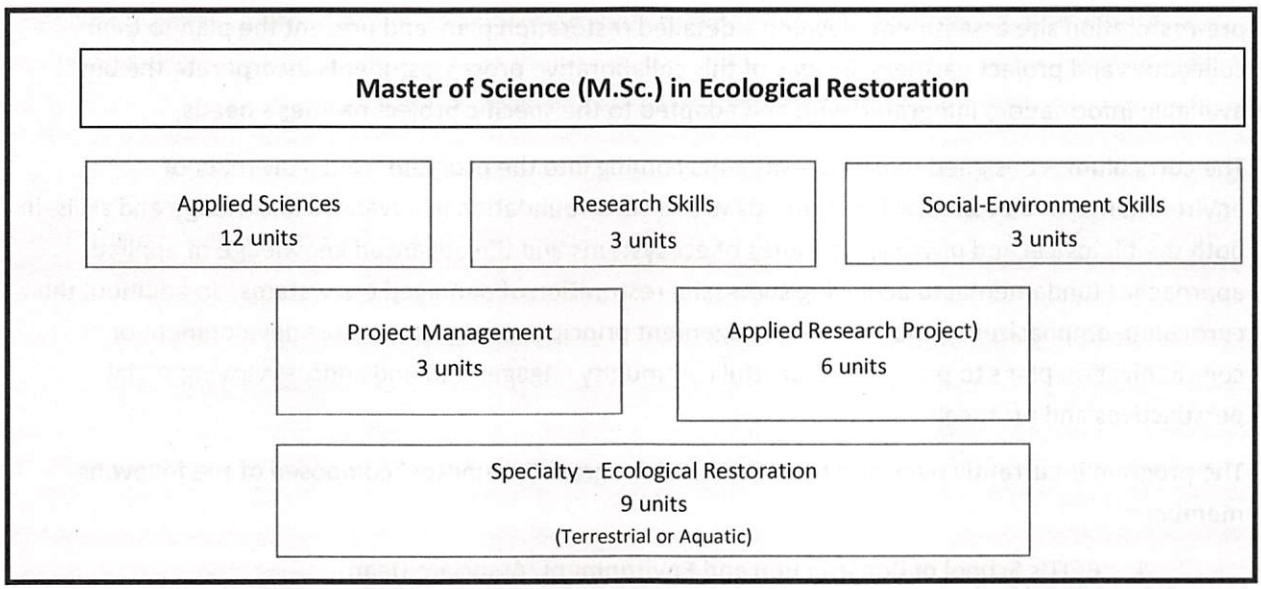


Figure 5. Program structure map for M.Sc. in Ecological Restoration

Students select either terrestrial or aquatic ecosystem restoration as an area of specialization, which determines whether they take ECOR 9210 or ECOR 9220 as part of the core. They then select two courses from a number of elective courses that can support the aquatic or terrestrial restoration clusters at SFU. A selection of relevant courses is given in Table 6. Course selection should focus on integration of the physical and ecological components of ecological restoration.

Table 6: Elective courses available at SFU

Aquatic Cluster	Terrestrial Cluster
BISC 829 Conservation Ecology EASC 601 Advanced Groundwater Geochemistry GEOG 611 Hydrology GEOG 613 Fluvial Geomorphology REM 625 Risk Assessment of Natural Resources STAT 650 Quantitative Analysis in Resource Management and Field Biology	BISC 829 Conservation Ecology BISC 838 Population Ecology GEOG 617 Soil Science REM 611 Applied Population and Community Ecology REM 625 Risk Assessment of Natural Resources REM 610 Applied Environmental Toxicology & Environmental Management of Contaminants REM 670 Introduction to Forestry STAT 650 Quantitative Analysis in Resource Management and Field Biology

In their applied research project, student supervision is facilitated through a collaborative model, with a small group of students organized into project 'pods', and each pod is led by a faculty supervisor. Each pod undertakes fieldwork, normally in collaboration with an industry or organizational (e.g. non-profit) partner. Within this relationship, students assess the needs of their research project sponsor, conduct

pre-restoration site assessment, develop a detailed restoration plan, and present the plan to their colleagues and project partners. By way of this collaborative process, students incorporate the best available information, integrated with and adapted to the specific project partner's needs.

The curriculum is designed to provide students coming into the program from a diversity of environmental and ecological backgrounds with a solid foundation in advanced knowledge and skills, in both the biological and physical attributes of ecosystems and the advanced knowledge of applied approaches fundamental to achieving successful restoration of damaged ecosystems. In addition, the curriculum emphasizes sound project management principles and incorporates development of communication plans to promote respectful community engagement and address varying social perspectives and protocols.

The program is currently overseen by a 'Graduate Program Committee' composed of the following members:

1. BCIT's School of Construction and Environment, Associate Dean
2. SFU's Faculty of Environment, Associate Dean
3. Program Director
4. BCIT's Program Champion
5. SFU's Program Champion
6. Student Representative

The Graduate Program Committee has the following responsibilities:

1. Reviewing applications and advising prospective students on the details of programs and the admission process.
2. Ensuring courses within programs are reviewed regularly and maintained.
3. Implementing and enforcing the regulations, procedures, and policies related to graduate studies at BCIT and SFU.
4. Developing and providing direction and guidance to the Applied Research Committees.

The use of experiential learning is a major strength of the proposed program, with many courses offered in class and/or in the field. A case-based learning methodology is used throughout the program to provide students exposure to restoring ecosystems in other areas of the world. This method is student-centered and involves the exchange of ideas among participants. The instructor's role is that of a facilitator, while students address problems collaboratively.

Faculty at BCIT and SFU, coupled with sessional instructors, are well suited for this type of delivery. Faculty and sessional instructors are experts in their respective fields and have extensive experience applying ecological and physical theories to natural systems, through research opportunities or restoration initiatives. They are able to draw on numerous local examples, case studies, and the scientific literature to emphasize the learning outcomes for each course, and the program goals overall.

Given that the SFU/BCIT program has required upper-level, institutional approvals on both sides (and is governed by a Program Agreement), we anticipate little to no change in the actual structure of the program as it is incorporated within a new School of Environmental Science. As mentioned above, housing the program within the new School will, however, provide a more robust presence for the program at SFU, facilitate administrative ownership, leverage program investment opportunities and enhance student identity.

6. Organization, Governance and Space for the School of Environmental Science

The School of Environmental Science will be led by a Director, appointed by the Dean with ratification of the membership of the steering committees. Programming will be overseen by steering committees for the undergraduate EVSC program and the professional MER graduate program that are already in place and functioning productively.

The EVSC program is currently governed by a Terms of Reference (TOR) developed by the Dean's Office in September 2012 (Appendix G). A steering committee, struck in Fall 2012, oversees the program and is advisory to the program Director. The committee operates on a consensus basis, formally voting only when consensus cannot be met. The composition of the Steering Committee is laid out in the TOR and includes members from the Departments of Archaeology, Biological Sciences, Earth Sciences, Geography, Statistics and Actuarial Sciences as well as the School of Resource and Environmental Management.

The MER program is also governed by a Steering Committee (officially, the MER Graduate Program Committee), which adheres to a Program Agreement, organized between SFU and BCIT in 2015. This committee similarly operates on a consensus basis. The program is led by a Director who chairs the steering committee whose membership currently consists of the FENV Associate Dean, Graduate and Research; Scott Harrison (REM); and two members from BCIT. The current Director is from BCIT and is appointed for three years, but there is an arrangement in place to have the program directorship shared between BCIT and SFU, commencing shortly.

The productive and collegial work of these committees will continue. The Director of the School of Environmental Science can act as the EVSC steering committee chair in the beginning. Ultimately, however, there is a need to appoint an Undergraduate Program Chair to lead the EVSC steering committee, freeing the Director of those responsibilities so that he or she may focus more squarely on guiding the development of the new School of Environmental Science.

In the meantime, both steering committees will be able to continue under the current structure until the School develops a sufficiently strong base of faculty members who might fill undergraduate and graduate Chair roles.

At present, there are no formal faculty or teaching appointments made directly to either the EVSC Undergraduate or Graduate MER programs. With the creation of a School, that structure would change. Should faculty members' appointments shift to the new School, a Tenure and Promotions Committee would be struck by the Director, drawing from membership of the undergraduate and graduate steering committees.

A major problem with the current "program" structure for the undergraduate Environmental Science offerings has been that there is currently nowhere to formally appoint lecturers and faculty to hold positions to teach in that program. Appointment of lecturers and faculty exclusively to partner units is problematic because they will ultimately report to a disciplinary unit's chair or director and be reviewed biannually by that unit's Tenure and Promotions Committee (TPC), forming an allegiance to that unit. Favouring one unit over another can prove problematic for a program that is a collaboration between many units. The newly appointed limited-term lecturer in Environmental Science was appointed to Archaeology, the only unit in FENV that does not play a significant role in EVSC, specifically to avoid any potential conflict of interest. Moving this limited-term appointment to a School of Environmental Science and creating a place for future appointments to support the EVSC and MER programs is an obvious priority in the FENV.

With the creation of a School, there is an opportunity to appoint lecturers and research faculty. As a first step, the recently hired EVSC limited-term Lecturer's appointment (100%) will immediately be moved to the new school from the Archaeology department, where she has been temporarily placed. Such an imminent move was clearly understood by the Chair of Archaeology as a possibility before the limited-term Lecturer was appointed to that department.

The cohort model designed by the EVSC steering committee and the new MER courses require appointments of tenured or tenure-track research faculty. It is particularly important to have faculty with research programs to teach at the upper division and graduate levels. There is currently no direct research capacity in either the EVSC or MER programs (as the MER is a non-thesis Masters program), so it is advisable for the foreseeable future to cross-appoint tenured or tenure-track faculty between disciplinary units and the new School of Environmental Science.

Movement of faculty from existing disciplinary units will be considered on a case by case basis. The FENV Dean supports 100% Lecturers for the new School, but is advising that generally, 50% appointments, cross-listed with departments, will be the preferred model for the first planning period of five years. It is unlikely that existing faculty members will wish to move their appointments to the new School of Environmental Science immediately, given that their existing research programs will continue to benefit from their identities within their own departments.

For budgetary reasons as well as to minimize risks overall, appointments and cross-appointments will be pursued only gradually and with careful consultation between the Director, the Dean, other Deans (where appropriate), collaborating departments and the School's steering committees around curriculum needs, as well as programming and financial impact. While future, new hires will be considered by the Dean for appointment to the School, cross-appointments for tenure track positions

will be strongly favoured, thereby helping to strengthen both departmental and interdisciplinary teaching and research. Should cross-appointments be proposed between Faculties, approvals will be required not only amongst Chairs/Directors but also at the decanal level as well. Any faculty teaching buyouts across Faculties will be for an agreed portion of existing salary of the faculty member seeking cross-appointment to FENV.

Formal appointments to the School will require teaching courses specifically designed as interdisciplinary science courses to service the EVSC or MER programs, filling gaps between courses taught by disciplinary units. Simply rebranding existing courses from disciplinary units as EVSC or MER courses and moving research faculty positions to the new School of Environmental Science is not part of the current plan. Moreover, moving entire groups of faculty from existing units is not supported by the Dean, given that it risks undermining the discipline-based partner units' ability to support courses required by the EVSC and MER programs and will ultimately weaken the EVSC and MER collaborative programs. Ideally, appointments to the new School of Environmental Science will be mutually beneficial, providing discipline-based expertise to a unit while contributing to the interdisciplinary science mission of the new School of Environmental Science.

To ensure such benefit, existing faculty hires who wish to pursue cross-appointments to the School will be in accordance with the collective agreement and will require consultation approval (in the following sequence) with:

1. The School Director, to ensure that the cross-appointment is in appropriate alignment with current curricular and program needs;
2. The current departmental Chair or Director;
3. The Dean of a collaborating Faculty, should the faculty member hold a position outside of FENV;
4. The Dean of FENV who will approve budgetary support for such a move;
5. The Vice-President, Academic or his designate.

Faculty Renewal Plans (FRP) for the School will initially focus on providing support for existing EVSC and MER courses and be developed in consultation with the EVSC and MER steering committees. The FRP will be communicated to collaborating department Chairs and relevant Deans if a perceived conflict of interest between the School and collaborating departments is deemed by the FENV Dean to be a realistic possibility. Where cross-appointments of tenure-track research faculty are sought, consultation with cognate department Chairs and relevant Deans will take place.

Should the School propose new hires that clearly show potential to impact resources of departments and schools within the Faculty of Environment, approval shall be sought from relevant Chairs/Directors. In the case of departments significantly affected within other Faculties, consultation and approval will be sought at the decanal level. Curriculum changes that may significantly and adversely impact resources of departments and schools in FENV and other faculties will be addressed at the decanal level, in consultation with the relevant chairs.

Finally, no new space is required for the creation of a School at the present time. As part of the external review process, the students expressed a desire for a clearer, physical identity for the current Undergraduate EVSC program. Consequently, space reorganization has already been undertaken by the Dean's Office. Advisory and administrative staff for both the undergraduate and graduate programs currently sit in the Dean's Office in TASC2. We have made accommodation for the Director of the Program, as well as the limited-term Lecturer and TAs to hold offices within the same location. In addition, the student lounge has been relocated from West Mall to TASC2, providing both an undergraduate and graduate student space. This has helped to form a central, legible location for the programs and greatly enhances the sense of 'home' that the EVSC and MER students desire. An approved renovation in TASC2 that is forthcoming will further enhance the visibility of the new School.

7. Budget and Administration

Formation of a School of Environmental Science will have no significant net budgetary consequences for the FENV and will be supported by internal transfers from existing units and the Dean's Office.

From a budgetary perspective, the Environment Science program currently hosts >650 students annually across multiple offerings of five EVSC labelled courses. Currently the FAM model yields approximately $270K per year. The new cohort program that started in Fall 2017 is expected to increase revenues to $400K. The Ecological Restoration Program has a very different complexion, given that it is a joint program between SFU and BCIT. The Program straddles the two institutions in design, with the curriculum divided equally across the two schools, as well as in terms of budgetary matters where revenue and expenses are treated as collective program resources and liabilities. At steady state, the program accommodates 50 students in two cohorts. These enrollment numbers will yield $495K in gross tuition against program expenses. Expenses for both SFU and BCIT are covered and remaining funds are shared equally by each institution.

The costs of delivering the EVSC and MER programs are given in Table 7 and will form the initial budget of the School of Environment Science. The EVSC program complement includes a Program Director (currently from Geography) and one limited term lecturer (currently appointed to Archaeology). The limited term lecturer's salary will be transferred from Archaeology to the new School.

The day-to-day administration of the EVSC and MER programs is currently handled by the FENV Manager, Academic and Administrative Services, who arranges course scheduling, hiring, instructor and TA support, grade submissions, student advising, enrollment management, website changes, calendar entries, event planning, open houses and on-campus recruitment for the Undergraduate EVSC program. This position will be transferred from the Dean's office staff to the new School of Environment – full time for the Manager, Academic and Administrative Services. This position and relevant portions of their salaries will be transferred to the new School.

The remainder of the budget consists of existing costs of temporary instruction and a faculty stipend for representing SFU on the MER program committee as well as a new operating budget for EVSC 305. The

staff, limited-term lecturer and director's offices are located in the Dean's office and will remain there for the foreseeable future.

Table 7: Proposed Budget for School of EVSC

Description	Expense	Transfers/Fund Source
Formal Secondment for School Director (50% EVSC / 50% Tenure Home)	$65,000	from Tenure Home
Limited-term Lecturer	$85,000	from Archaeology
Program Manager	$59,000	from FENV Deans Office
Temporary Instruction	$140,000	current EVSC budget
Faculty Stipend MER Grad Program Committee	$6,000	
Benefits	$57,208	as above
Operating	$15,000	new
TOTAL EXPENSES	**$427,208**	

8. Collaborating Units: Impact and Support

Formation of a School of Environmental Science provides a strategy to increase awareness of environmental programming at SFU. This elevated stature will support the possibility of increasing the number of undergraduate majors by providing a more identifiable brand on campus to attract undergraduates from secondary schools for EVSC and graduate students for MER. The recent rapid growth of the EVSC and MER programs suggest there is considerable room for further growth.

This is ultimately good for all the units that participate in offering courses for EVSC and MER students, because their own enrollments will increase. Should such enrolment growth be perceived as causing any increased, unanticipated pressure on departments, Chairs should consult with Deans who will seek solutions that are mutually beneficial to the cognate units.

Letters of support, along with some comments from Biology and Geography are provided in Appendix H.

9. Conclusions

The Environmental Science program at SFU has gone through two external reviews in its 22-year history. The first, in 2006, recommended formation of a Department of Environmental Science. This proved impractical because environmental science is inherently interdisciplinary and there are faculty members with an environmental science focus across various departments at SFU. Formation of a department would have excluded and marginalized many of the environmental scientists on campus.

Deans of the Faculty of Environment, Faculty of Science, and Faculty of Health Sciences have begun to meet to discuss harmonizing life sciences programming on campus and those discussions will continue.

The latest external review recommended formation of a School that would serve as a hub for interdisciplinary teaching in environmental science, connecting the units that offer the courses that make up the Environmental Science program. This is a more inclusive strategy that draws on the strengths of the various partner units and reinforces their enrollments.

Formation of a School of Environmental Science is ultimately driven by efforts to improve the experience of undergraduate and graduate students at SFU. It will provide an identifiable, centralized home for EVSC undergraduate and MER graduate students. Students will receive interdisciplinary science training in a unit that has the culture of a science department. The new school will facilitate growth in the EVSC and MER programs by improving their marketability. This ultimately benefits students who become part of a large cohort, improving the social environment in which they learn. The appointment of lecturers and faculty dedicated to integrating disciplinary knowledge and catering to the specific needs of students interested in broad training in science encourages a supportive learning environment.

SFU was founded on the principle that it would do things differently than its larger counterparts across the country and, in doing so, advance unique and innovative programming. This already provides SFU with a competitive edge and reinforces its national reputation as a leader of the future. It is time to build on that legacy by forming a School of Environmental Science.

Appendix A: EVSC Student's Program Evaluation 2014/2015

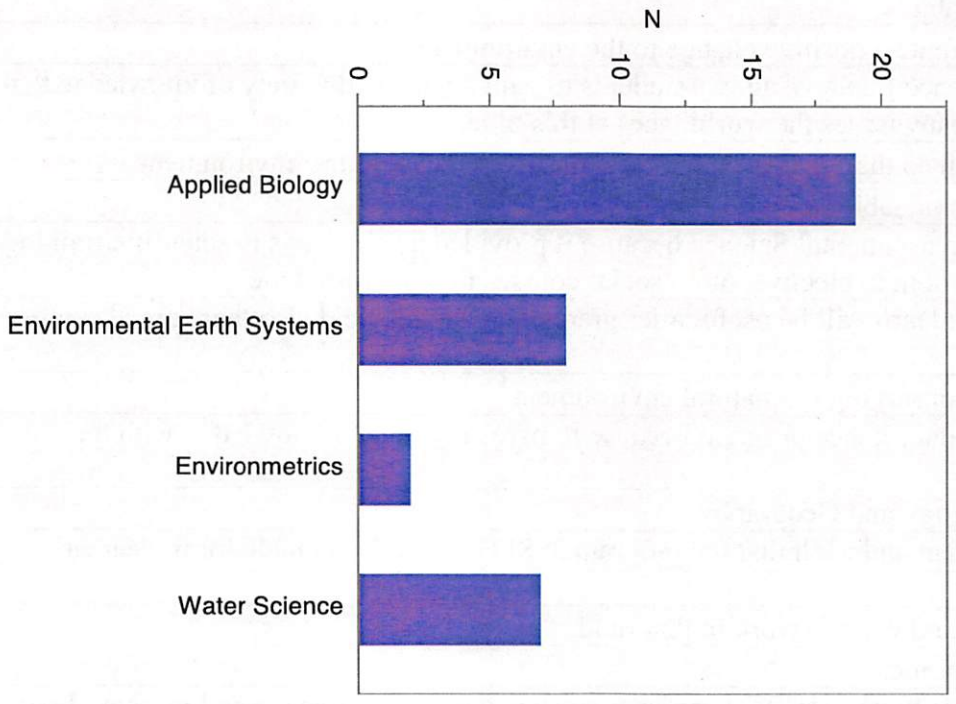
Survey conducted by the SFU Environmental Science Student Union
Total number of participants: 37
Survey type: web survey

Q1. Why did you choose the environmental science program? Please answer in one sentence?

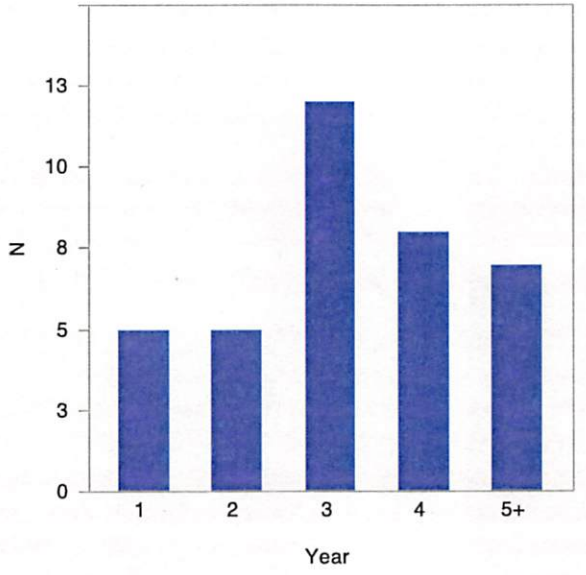
I love the environment and could be called a minor tree hugger. Thought it would be an interesting and fulfilling career in the environmental sector. I also wanted a bachelor of science, so this program seemed very applicable.
I chose environmental science because of my passion for the environment and the fact that my degree incorporates sciences as well as social science aspects.
I am interested in science but wanted a degree in something that has more implications for policy and law than perhaps an average general science degree.
The changes required for a sustainable future can be learned in this program
I was interested in combining nature and science in my field of study.
Both science and environmentalism have always been interesting to me.
I would love to study weather and climate and impact people's lives!
I wanted to obtain the skills needed to be able to protect the environment
Great development potential
Literally an epiphany - I was walking home from school and suddenly realized I want to do what I can to let everyone in the future to experience nature, like I was able to every summer at my grandparent's cabin.
Passionate to contribute a positive change to the environment.
Environmental Science I believe allows students to gain a wide and variety of knowledge that is able to combat many issues the world faces at this time.
I chose this program so that I could be part of a positive change in the environment.
It is about the most valuable resource: water.
I chose the SFU Environmental Science because it provided a solid basis in scientific training while also leaving room to elective, more social courses that interested me.
The information we learn will be useful after graduation. In this field also there are also more job openings
I am interested in conserving our natural environment
I chose environmental science program because it mixes my love of knowledge with the outdoors.
Cross between Biology and Geography
I like the environment and I felt that the program at SFU would be suitable for my career aspirations.
I enjoy the subject and want to work in that field.
It's the perfect fit for me.
Because this is the only program that connects science with social science and teaches about the environment

I become interested after taking some zoology courses which made me want to learn more about the ecosystems as a whole and how they are governed and protected.
It combines my interest in physical sciences and social environmental issues
Because I was given information that this was the best program that would lead to my ability to register with APEG
I chose to take environmental science courses because they give more societal context to my other science courses.
More applicable than straight biology. More breadth in the course requirements than many other programs.
I am very interested in how animals are interconnected in the environment.
I understand the urgency of the climate and biodiversity crises and wanted to spend my university years studying in a relevant program
I am interested in learning more about the relationship between humans and nature and how to preserve the environment better. I am also fascinated by natural processes and want to learn more. I felt that this was the right pathway for me and would enable me to find a career that I would love having
Because I am interested in taking Science courses.
It's my personal interest.
I wanted to work in a field that can make the world a better place.
Required as per my degree.
I realized that I was very passionate about environmental issues and learning how to solve them.

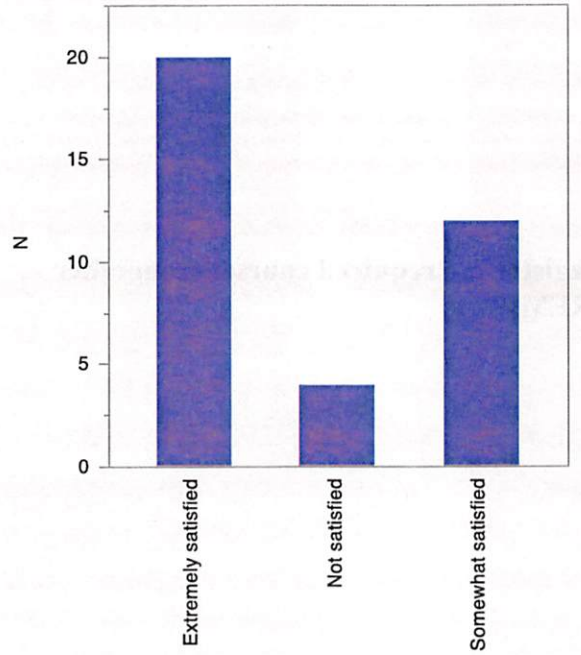
Q2. What EVSC concentration are you registered in?



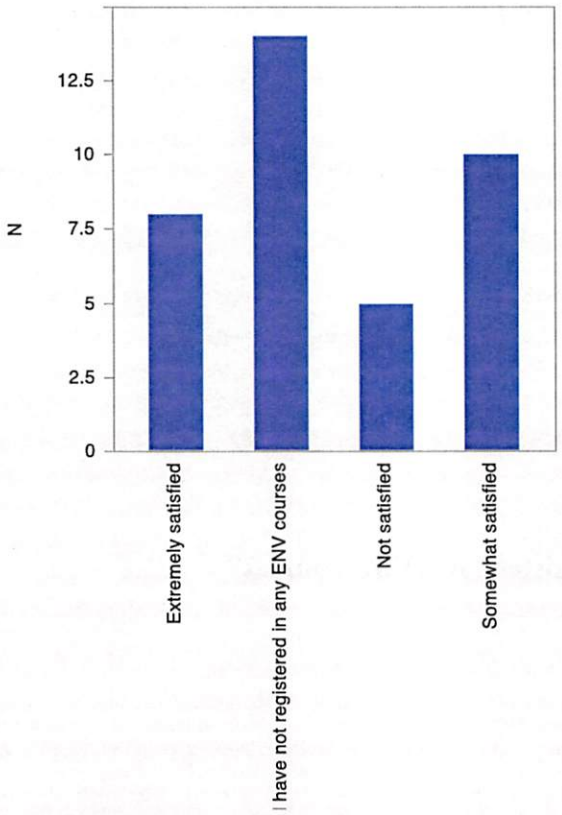
Q3. What year of study are you in?



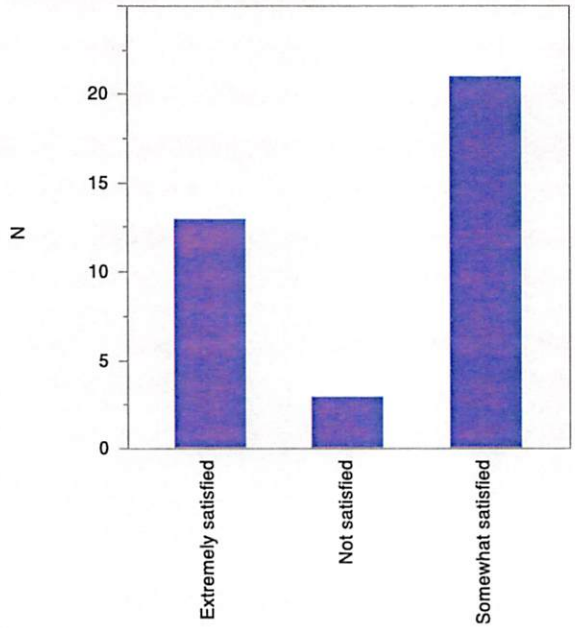
Q4. How satisfied are you with your ability to register for EVSC courses?



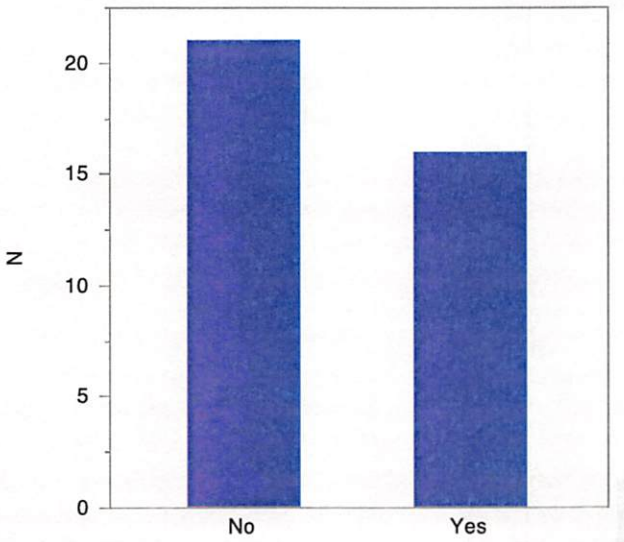
Q5. How satisfied are you with your ability to register for ENV courses (i.e. ENV 319, 320, 321)?



Q6. How satisfied are you with your ability to register for required courses from other departments (ie. GEOG, BISC, STAT, EASC, REM)?



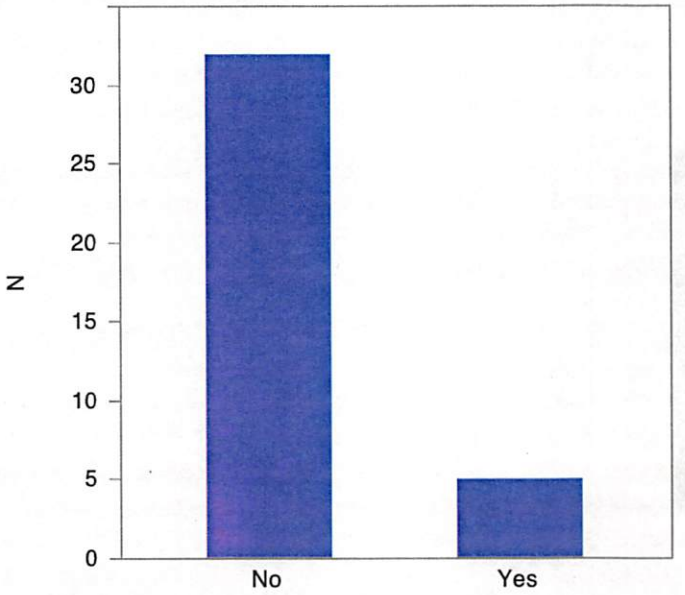
Q7. Are you interested in taking more social science courses as part of your degree?



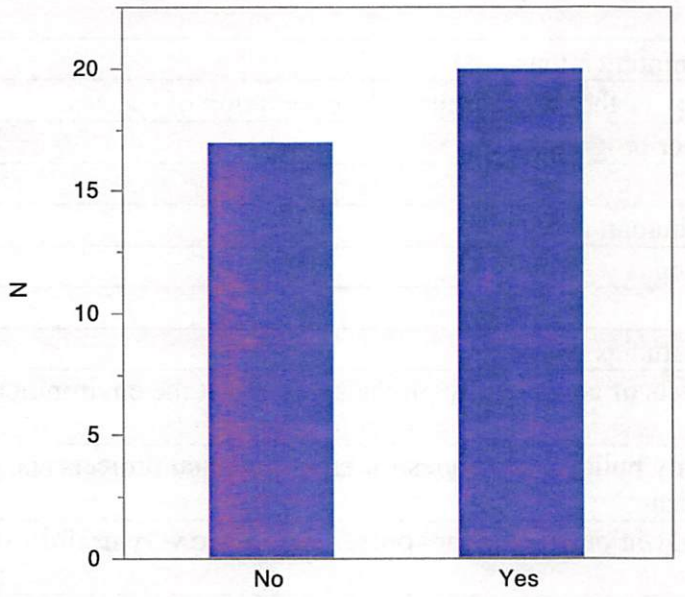
Q8. If you answered "Yes" to wanting more social science courses, What sort of social science courses do you think should be added to the EVSC program?

I haven't really looked at specific classes, but I'm always open to learn new things that interest me. Environmental Human Behavior perhaps, I dunno.
A course that focuses on how to interact with other people in a professional setting that can be used in a potential work environment
First nations studies Environmental communications
More pertaining to environmental policy, or the social aspect of conservation of species.
More on policy and also integrating other programs.
REM
First Nations studies, political science, human geography
Human geography, more problem solving
I'm not sure
more communication and international studies courses
Courses that focus socioeconomic impacts of construction projects that effect the environment would be useful.
More courses that teach about community building strategies for environmental projects and about the psychology of environmentalism
I took an economics course and an organizational behavior course. They were very useful during co-op.
Participatory Research
Geography, DEVS, and SCD courses as upper year electives.

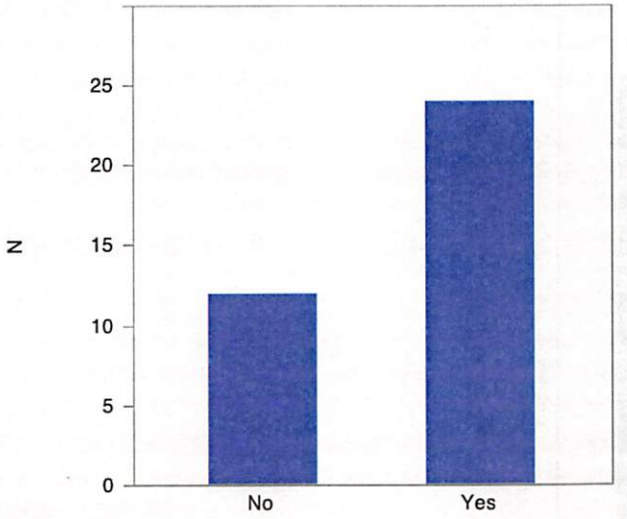
Q9. Are you affiliated with a research lab at the university?



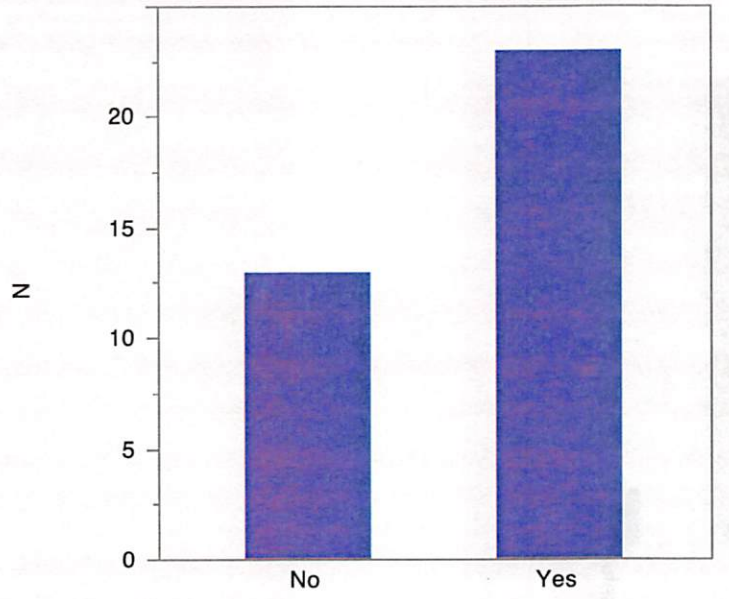
Q10. Are you registered in the SFU the co-op program?



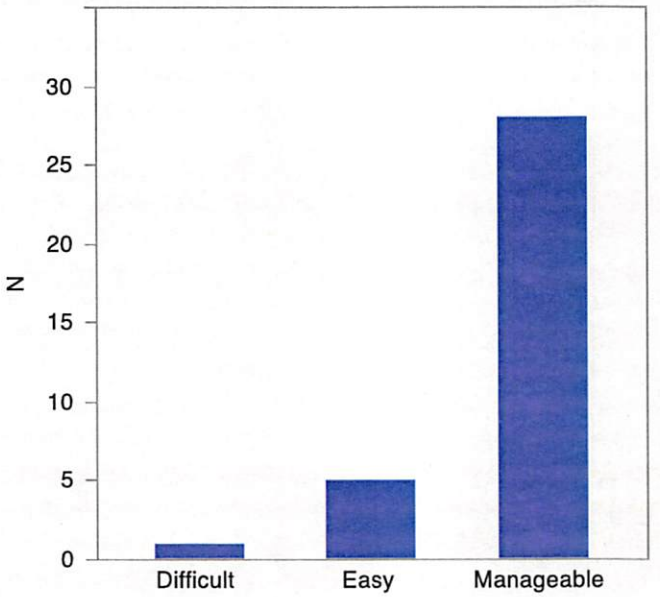
Q11. Do you think you gain the technical and background knowledge needed for a job from the courses listed in your stream?



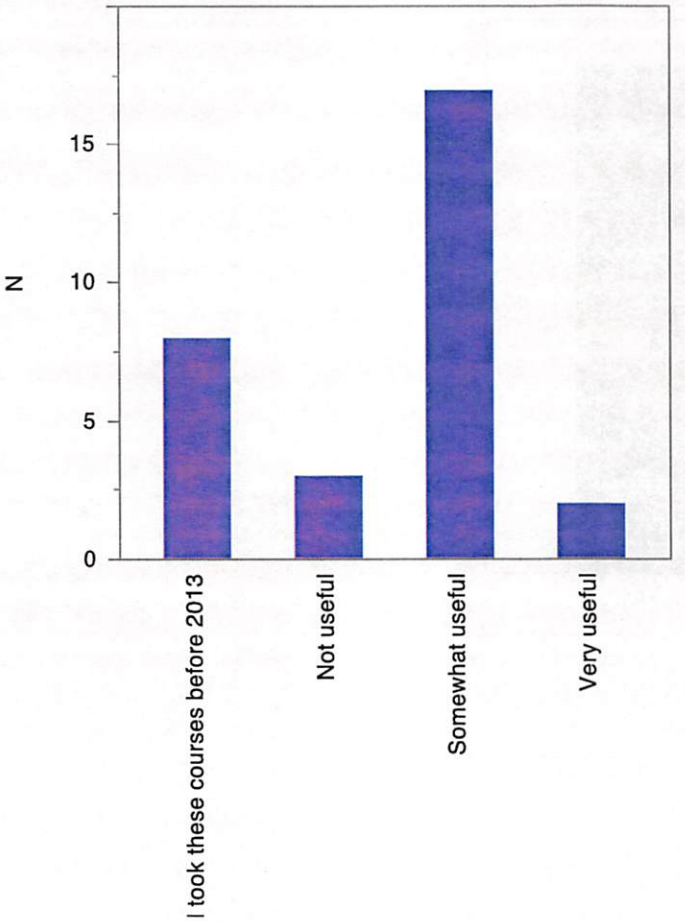
Q12. Does the course sequence of EVSC 100, 205, 399 and 499 promote a sense of community among the cohort of EVSC students?



Q13. What is the level of difficulty for EVSC 205?



Q14. How useful do you find the courses EVSC 399 and 499 in their present* format? (* year 2013 or 2014)

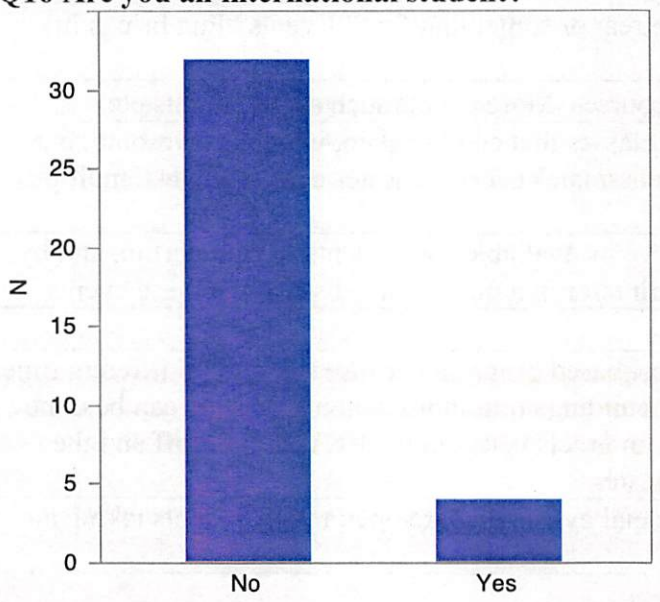


Q15. Are there ways the program and director could promote a better sense of community among the EVSC students?

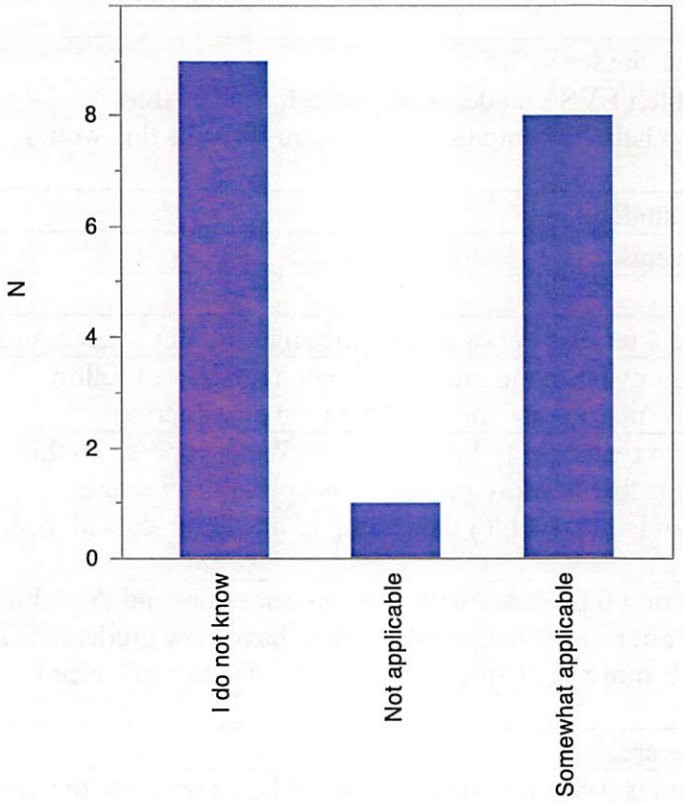
Erm, for this whole semester I was at surrey and didn't have the time nor energy to go to the EVSC union on the mountain. I dunno, a retreat or something fun?! Events? Fun brings in people, people bring in community.
Maybe offer more environmental specific courses. More events such as pub nights etc.
It is a broad progrm with a large variety of classes that can be taken, which is awesome, but unfortunately it means you have different classmates every semester and rarely take multiple courses with the same group
By having more environmentally focused events available for students to take part in, and by providing an opportunity to meet with the director in a more relaxed setting at these events
no
I really dont feel like our program is a cohort based program because we start at different times in the year and take very different courses. building community among students can be done through the student union or possibly meet an greets between the ENV office staff and the students in our program at least once a semester
once the EVSU has more members more social events that are open to all students taking an EVSC course or are an EVSC major.
Maybe having some events and get-togethers
The faculty meet and greet is good
Encouraging students to get involved with the EVSC student union.
A semesterly event hosted for students!
I'm not sure, I have only taken one of the classes so far
Hold more outdoor/hikings events in which EVSC students can attend, such as the Snowshoeing trip to Manning Park. Also help promote the Faulty team room as this would encourage peer interactions.
More social nights with the faculty and students.
More research assistant positions and events.
More events!
having other EVSC courses not only the 4 required ones and promoting more the student union
I once attended a Faculty of Environment event in the museum. I met a number of fellow environmental science students at that event. Perhaps more of that type of gathering
More EVSC courses. There are enough to really get to know anyone. We are spread so thin throughout so many different departments that I hardly recognize people. Plus it makes registration so hard (trying to course plan is impossible) that trying to pick courses with people you know is hard too
Co-op messes up the whole cohort system. I'll graduate with 5 co-op semesters and I'm taking classes with people who started 2 years after me. Most people I know have now graduated. The EVSC student union is very good. Needs more academic activities, less social stuff. Needs WAYY more participation.
Maybe an environmental science lounge/area
Not that I can think of. The student union is well promoted - joining it helps promote the sense of community even more.

Design courses that encourage community work and outreach.
Be more involved in the running of the student union. Move the common room to one of the TASC buildings so it's closer to REM labs and SSB.

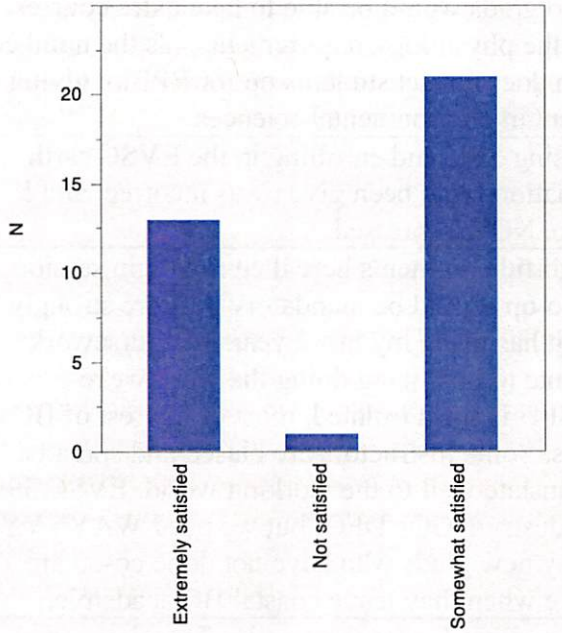
Q16 Are you an international student?



Q17. How applicable is the EVSC degree to jobs in other countries?



Q18. Overall, how satisfied are you with your experience in the EVSC program?



Q19. Do you have any additional comments?

Really love EVSC so far, I'm looking forward to upper division courses.
Love the program! However I feel more like a biology major than an environmental science major and rarely run into other environmental science majors in my classes. I feel as though I have not met that many people in my program...
Pub nights are good for bonding
I am glad that there is now a Bachelor of Environment offered at SFU. Although it is too late in my academic career to switch over, if I were in a position where I could switch over, I would. Environmental Science is great due to its interdisciplinary characteristic - it would be great to either maintain it as is or expand on it.
The EVSC department and REM department are always the last departments to put next semester on goSFU, making it difficult to plan ahead.
Host GEOG 310 more frequently! And offer more 4th year physical geography courses.
I think GIS courses should be required for all streams - it teaches a valuable skill that many companies regard as an asset.
I'm not sure the increased sense of community as a cohort is worth requiring students to take EVSC 205, 399, and 499 in succeeding spring semesters. It makes course planning harder than it has to be.
It would be nice to have more organized social events to meet new ppl.
I would like more emails regarding Co-op opportunities and registration, please.
Add more science courses
I don't feel a sense of community with my fellow students because we have always share classes with BIO CHEM MATH and so, it would be better if EVSC was offer only to EVSC students and if those EVSC courses were taught more than just once a semester. The required courses should be reevaluated in order to fit the profile that is been asked by many companies, when we apply to jobs.

I am on an old stream of applied bio, so perhaps things have changed. But in the sept 2011 program, it is unrealistic to suggest that applied bio grads would be able to take extra courses and be able to apply for RPBio status. It's not just the physiology requirements, it's the number of bio courses needed in total. The EVSC program does not set students up for RPBio, giving us a disadvantage in the largest field of employment in environmental sciences.
I had spoken with 3 different people prior to choosing SFU and enrolling in the EVSC earth systems program. 3 semesters in I discover information I had been given was incorrect and I had wasted my time in terms of APEG designation. NOT impressed
AUGHHH I spent 30 minutes writing many thoughtful comments here then my login session expired and they got deleted. The gist of it was: Co-op should be mandatory or more strongly encouraged. I did 4 semesters of co-op so far and it has made my last 2 years of coursework much easier and more valuable. There's no substitute to practicing doing the work we're learning how to do in university. EVSC/REM at SFU is sorta isolated, most of the rest of BC and Canada does not work like the west coast does. Some instructors are biased and spread a culture of hyper-environmentalist that does not translate well to the working world. EVSC 399 was good because we heard presentations from industry/NGOs/DFO, but we need WAYYYY more stuff like that in the program. I fear that many new grads who have not done co-op are going to be shocked and confused by what they see when they leave coastal BC academia.
It would be helpful for upper division courses to be offered more frequently. Especially as a co-op student, it can be very difficult to plan your course schedule without courses conflicting or just courses not being offered.
The worst thing about the degree is that a lot of the courses overlap! I know it's hard to coordinate among all the faculties and departments from which the EVSC requirements are drawn from, but it was very frustrating when courses overlapped and ultimately can't get taken during your BSc (this happened to me with EVSC 205 and STAT 403).

Appendix B: EVSC Educational Goals

(Compiled by steering committee in Fall 2014; revised Spring 2016)

When students complete their Environmental Science degrees they will be able to demonstrate the following:

1. broad understanding of environmental science underpinned by a foundational knowledge of biological and physical sciences, mathematics and statistics
2. ability to critically evaluate scientific studies, interpret data, and synthesize information from multidisciplinary studies
3. effective oral, visual, and written communication, including scientific writing for scientific, government, industrial or general audiences
4. an understanding of social science perspectives on environmental issues, including i) environmental valuation and trade-off analysis, ii) key environmental policies, laws and institutions, and iii) environmental ethics.
5. discipline specific knowledge that focuses on
    a. Applied Biology:
        ways abiotic and biotic processes (both natural and anthropogenic) influence the dynamics of populations, the structure of communities and the function of ecosystems.
    b. Environmental Earth Systems:
        the atmosphere, biosphere, hydrosphere and geosphere, and how these interacting earth systems affect natural and human-modified environments.
    c. Environmetrics:
        statistical and quantitative knowledge as applied to environmental problems, design of monitoring programs for environmental data collection, and the theoretical justifications and implications of statistical decisions, with attention to law, ethics, and economy.
    d. Water Science:
        the fundamental processes affecting the cycling of water through Earth's systems, water use and consequences of use, water quality, and the role of water in the functioning and dynamics of aquatic ecosystems.
6. proficiency in
    a. Applied Biology:
        sampling and experimental design, quantitative methods of data analysis and interpretation (species classification, estimation of abundance, diversity of one or more taxa, geospatial analysis, population modeling, and multivariate statistical methods).
    b. Environmental Earth Systems:
        quantitative analysis of spatial and temporal dynamics in one or more of Earth's systems, or interactions among them, utilizing mathematical or

statistical modeling, Geographic Information Systems, remote sensing and field/lab analyses.

c. Environmetrics:
   statistical methods and model selection techniques within statistical software for the analysis of environmental data

d. Water Science:
   quantitative methods of data analysis and interpretation in one or more (or interactions among) aspects of the Earth's water system, estimating uncertainty, measurement of water fluxes and use, and assessment of aquatic ecosystem health.

Appendix C: EVSC Calendar Entry

Environmental Science Program

Simon Fraser University Calendar | Summer 2018

Environmental Science Major

BACHELOR OF SCIENCE

This program provides a broad education with specialization in one of four areas of concentration: Applied Biology, Environmental Earth Systems, Environmetrics, and Water Science. Students choose one of these areas of concentration and complete the requirements as shown below.

Minimum Grades

The minimum cumulative grade point average (CGPA) for continuation and graduation is 2.00.

Program Requirements

Students complete 120 units, as specified below.

Students choose one of the following areas of emphasis, and complete all the required courses as listed. Additional upper division units will be required to total a minimum of 44 upper division units.

Visit the program overview for a suggested course sequence and for lists of course groupings.

Course Substitutions

Substitutions of program requirements, including courses deemed equivalent to these required courses, are not allowed without written permission from the program. Such courses taken without approval will not be applied to graduation requirements. Students should consult their academic advisor for details on obtaining permission for substitutions.

Applied Biology Area of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

BISC 202 - Genetics (3)

BISC 204 - Introduction to Ecology (3)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

CHEM 126 - General Chemistry Laboratory II (2)

CHEM 215 - Introduction to Analytical Chemistry (4)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

REM 100 - Global Change (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

BISC 316 - Vertebrate Biology (4)

BISC 337 - Plant Biology (4)

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

REM 311 - Applied Ecology and Sustainable Environments (3)

REM 445 - Environmental Risk Assessment (3)

and one of

STAT 302 - Analysis of Experimental and Observational Data (3)

STAT 305 - Introduction to Biostatistical Methods for Health Sciences (3)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and two from the following

BISC 300 - Evolution (3)

BISC 306 - Invertebrate Biology (4)

BISC 309 - Conservation Biology (3)

BISC 326 - Biology of Algae and Fungi (3)

BISC 366 - Plant Physiology (3)

BISC 407 - Population Dynamics (3)

BISC 414 - Limnology (3)

BISC 420 - Community Ecology (3)

REM 412 - Environmental Modeling (3)

REM 471 - Forest Ecosystem Management (3)

STAT 403 - Intermediate Sampling and Experimental Design (3)

Environmental Earth Systems Area of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

EASC 101 - Dynamic Earth (3)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

and one of

GEOG 100 - Our World: Introducing Human Geography (3)

REM 100 - Global Change (3)

and two of

GEOG 213 - Introduction to Geomorphology (3)

GEOG 214 - Weather and Climate (3)

GEOG 215 - Biogeography (3)

and one of

GEOG 253 - Introduction to Remote Sensing (3)

GEOG 255 - Geographical Information Science I (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and six of, with at least one from the 400 division

BISC 414 - Limnology (3)

EASC 209W - Environmental Geoscience (4) *

EASC 304 - Hydrogeology (3)

EASC 314 - Principles of Glaciology (3)

GEOG 310 - Physical Geography Field Course (4)

GEOG 311 - Hydrology (4)

GEOG 313 - River Geomorphology (4)

GEOG 314 - The Climate System (4)

GEOG 315 - World Ecosystems (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

GEOG 317 - Soil Science (4)

GEOG 411 - Advanced Hydrology (4)

GEOG 412W - Glacial Processes and Environments (4)

GEOG 414 - Climate Change (4)

GEOG 417W - Advanced Soil Science (4)

and one of

BISC 309 - Conservation Biology (3)

BISC 420 - Community Ecology (3)

REM 311 - Applied Ecology and Sustainable Environments (3)

REM 445 - Environmental Risk Assessment (3)

REM 471 - Forest Ecosystem Management (3)

and one of

EASC 305 - Quantitative Methods for the Earth Sciences (3)

GEOG 351 - Multimedia Cartography (4)

GEOG 352 - Spatial Analysis (4)

GEOG 353 - Advanced Remote Sensing (4)

GEOG 355 - Geographical Information Science II (4)

GEOG 356 - 3D Geovisualization (4)

REM 412 - Environmental Modeling (3)

STAT 302 - Analysis of Experimental and Observational Data (3)

* Students who select this course may be required to complete additional upper division units to meet their degree requirements. Please see the Environmental Science Advisor.

Environmetrics Area of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

MATH 232 - Applied Linear Algebra (3)

MATH 251 - Calculus III (3)

REM 100 - Global Change (3)

STAT 270 - Introduction to Probability and Statistics (3)

STAT 285 - Intermediate Probability and Statistics (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

STAT 350 - Linear Models in Applied Statistics (3)

STAT 410 - Statistical Analysis of Sample Surveys (3)

STAT 430 - Statistical Design and Analysis of Experiments (3)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and one of

STAT 341 - Introduction to Statistical Computing and Exploratory Data Analysis - R (2)

STAT 342 - Introduction to Statistical Computing and Exploratory Data Analysis - SAS (2)

and one of

STAT 445 - Applied Multivariate Analysis (3)

STAT 475 - Applied Discrete Data Analysis (3)

STAT 485 - Applied Time Series Analysis (3)

plus 12 upper division units from the Faculty of Environment or the Faculty of Science with approval from the Director.

Water Science Area of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

CHEM 126 - General Chemistry Laboratory II (2)

EASC 101 - Dynamic Earth (3)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

GEOG 213 - Introduction to Geomorphology (3)

GEOG 214 - Weather and Climate (3)

and one of

BISC 204 - Introduction to Ecology (3)

GEOG 215 - Biogeography (3)

and one of

GEOG 253 - Introduction to Remote Sensing (3)

GEOG 255 - Geographical Information Science I (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

BISC 414 - Limnology (3)

EASC 304 - Hydrogeology (3)

EASC 315W - Geochemistry of Natural Waters (3)

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

GEOG 311 - Hydrology (4)

GEOG 313 - River Geomorphology (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and three of, with at least one from the 400 division

EASC 314 - Principles of Glaciology (3)

EASC 405 - Water, Environment, and Climate Change (3)

EASC 410 - Groundwater Contamination and Transport (3)

EASC 416 - Field and Lab Techniques in Hydrogeology (3)

GEOG 310 - Physical Geography Field Course (4)

GEOG 314 - The Climate System (4)

GEOG 317 - Soil Science (4)

GEOG 411 - Advanced Hydrology (4)

GEOG 412W - Glacial Processes and Environments (4)

GEOG 414 - Climate Change (4)

GEOG 417W - Advanced Soil Science (4)

REM 412 - Environmental Modeling (3)

REM 445 - Environmental Risk Assessment (3)

Environmental Science Honours

BACHELOR OF SCIENCE

This honours program provides a broad education with specialization in one of four areas of concentration: Applied Biology, Environmental Earth Systems, Environmetrics, and Water Science. Students choose one of these areas of concentration and complete the requirements as shown below.

Minimum Grades

The minimum cumulative grade point average (CGPA) for continuation and graduation is 3.00.

Program Requirements

This program requires 120 units including writing, quantitative and breadth requirements. At least 60 units must be in upper division courses. Exceptions must be approved by a faculty advisor. Other courses may be substituted subject to the approval of a faculty advisor.

University and Faculty of Environment regulations also apply.

Visit the program overview for a suggested course sequence and for lists of course groupings.

Course Substitutions

Substitutions of program requirements, including courses deemed equivalent to these required courses, are not allowed without written permission from the program. Such courses taken without approval will not be applied to graduation requirements. Students should consult their academic advisor for details on obtaining permission for substitutions.

Applied Biology Area Of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

BISC 202 - Genetics (3)

BISC 204 - Introduction to Ecology (3)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

CHEM 126 - General Chemistry Laboratory II (2)

CHEM 215 - Introduction to Analytical Chemistry (4)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

REM 100 - Global Change (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

BISC 316 - Vertebrate Biology (4)

BISC 337 - Plant Biology (4)

BISC 490 - Research Design (5)

BISC 491 - Research Technique (5)

BISC 492W - Research Reporting (5) or EVSC 490 - Environmental Science Thesis (4)

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

REM 311 - Applied Ecology and Sustainable Environments (3)

REM 445 - Environmental Risk Assessment (3)

and one of

STAT 302 - Analysis of Experimental and Observational Data (3)

STAT 305 - Introduction to Biostatistical Methods for Health Sciences (3)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and two from the following

BISC 300 - Evolution (3)

BISC 306 - Invertebrate Biology (4)

BISC 309 - Conservation Biology (3)

BISC 326 - Biology of Algae and Fungi (3)

BISC 366 - Plant Physiology (3)

BISC 407 - Population Dynamics (3)

BISC 414 - Limnology (3)

BISC 420 - Community Ecology (3)

REM 412 - Environmental Modeling (3)

REM 471 - Forest Ecosystem Management (3)

STAT 403 - Intermediate Sampling and Experimental Design (3)

Environmental Earth Systems Area Of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

EASC 101 - Dynamic Earth (3)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

and one of

GEOG 100 - Our World: Introducing Human Geography (3)

REM 100 - Global Change (3)

and two of

GEOG 213 - Introduction to Geomorphology (3)

GEOG 214 - Weather and Climate (3)

GEOG 215 - Biogeography (3)

and one of

GEOG 253 - Introduction to Remote Sensing (3)

GEOG 255 - Geographical Information Science I (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

EVSC 490 - Environmental Science Thesis (4) or GEOG 491 - Honours Essay (4)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and six of, with at least one from the 400 division

BISC 414 - Limnology (3)

EASC 209W - Environmental Geoscience (4) *

EASC 304 - Hydrogeology (3)

EASC 314 - Principles of Glaciology (3)

GEOG 310 - Physical Geography Field Course (4)

GEOG 311 - Hydrology (4)

GEOG 313 - River Geomorphology (4)

GEOG 314 - The Climate System (4)

GEOG 315 - World Ecosystems (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

GEOG 317 - Soil Science (4)

GEOG 411 - Advanced Hydrology (4)

GEOG 412W - Glacial Processes and Environments (4)

GEOG 414 - Climate Change (4)

GEOG 417W - Advanced Soil Science (4)

and one of

BISC 309 - Conservation Biology (3)

BISC 420 - Community Ecology (3)

REM 311 - Applied Ecology and Sustainable Environments (3)

REM 445 - Environmental Risk Assessment (3)

REM 471 - Forest Ecosystem Management (3)

and one of

EASC 305 - Quantitative Methods for the Earth Sciences (3)

GEOG 351 - Multimedia Cartography (4)

GEOG 352 - Spatial Analysis (4)

GEOG 353 - Advanced Remote Sensing (4)

GEOG 355 - Geographical Information Science II (4)

GEOG 356 - 3D Geovisualization (4)

REM 412 - Environmental Modeling (3)

STAT 302 - Analysis of Experimental and Observational Data (3)

* Students who select this course may be required to complete additional upper division units to meet their degree requirements. Please see the Environmental Science Advisor.

Environmetrics Area Of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

MATH 232 - Applied Linear Algebra (3)

MATH 251 - Calculus III (3)

REM 100 - Global Change (3)

STAT 270 - Introduction to Probability and Statistics (3)

STAT 285 - Intermediate Probability and Statistics (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

EVSC 490 - Environmental Science Thesis (4)

STAT 350 - Linear Models in Applied Statistics (3)

STAT 410 - Statistical Analysis of Sample Surveys (3)

STAT 430 - Statistical Design and Analysis of Experiments (3)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and one of

STAT 341 - Introduction to Statistical Computing and Exploratory Data Analysis - R (2)

STAT 342 - Introduction to Statistical Computing and Exploratory Data Analysis - SAS (2)

and one of

STAT 445 - Applied Multivariate Analysis (3)

STAT 475 - Applied Discrete Data Analysis (3)

STAT 485 - Applied Time Series Analysis (3)

plus 12 upper division science based units with approval from the Director.

Water Science Area Of Concentration

LOWER DIVISION REQUIREMENTS

Students complete all of

BISC 101 - General Biology (4)

BISC 102 - General Biology (4)

CHEM 121 - General Chemistry and Laboratory I (4)

CHEM 122 - General Chemistry II (2)

CHEM 126 - General Chemistry Laboratory II (2)

EASC 101 - Dynamic Earth (3)

EVSC 100 - Introduction to Environmental Science (3)

EVSC 201W - Environmental Science in Practice (4)

GEOG 111 - Earth Systems (3)

GEOG 213 - Introduction to Geomorphology (3)

GEOG 214 - Weather and Climate (3)

and one of

BISC 204 - Introduction to Ecology (3)

GEOG 215 - Biogeography (3)

and one of

GEOG 253 - Introduction to Remote Sensing (3)

GEOG 255 - Geographical Information Science I (3)

and one of

MATH 151 - Calculus I (3)

MATH 154 - Calculus I for the Biological Sciences (3)

and one of

MATH 152 - Calculus II (3)

MATH 155 - Calculus II for the Biological Sciences (3)

and one of

PHYS 101 - Physics for the Life Sciences I (3)

PHYS 120 - Mechanics and Modern Physics (3)

and one of

PHYS 102 - Physics for the Life Sciences II (3)

PHYS 121 - Optics, Electricity and Magnetism (3)

and one of

STAT 201 - Statistics for the Life Sciences (3)

STAT 270 - Introduction to Probability and Statistics (3)

UPPER DIVISION REQUIREMENTS

Students complete all of

BISC 414 - Limnology (3)

EASC 304 - Hydrogeology (3)

EASC 315W - Geochemistry of Natural Waters (3)

EVSC 300 - Seminar in Environmental Science (3)

EVSC 305 - Methods in Environmental Science (3)

EVSC 400 - Environmental Science Capstone (4)

EVSC 490 - Environmental Science Thesis (4)

GEOG 311 - Hydrology (4)

GEOG 313 - River Geomorphology (4)

GEOG 316 - Global Biogeochemical and Water Cycles (4)

and two of

ENV 319 - Environmental Law (3)

ENV 320W - Ethics and the Environment (3)

GEOG 389W - Nature and Society (4)

REM 321 - Ecological Economics (4)

REM 356 - Institutional Arrangements for Sustainable Environmental Management (3)

and three of, with at least one from the 400 division

EASC 314 - Principles of Glaciology (3)

EASC 405 - Water, Environment, and Climate Change (3)

EASC 410 - Groundwater Contamination and Transport (3)

EASC 416 - Field and Lab Techniques in Hydrogeology (3)

GEOG 310 - Physical Geography Field Course (4)

GEOG 314 - The Climate System (4)

GEOG 317 - Soil Science (4)

GEOG 411 - Advanced Hydrology (4)

GEOG 412W - Glacial Processes and Environments (4)

GEOG 414 - Climate Change (4)

GEOG 417W - Advanced Soil Science (4)

REM 412 - Environmental Modeling (3)

REM 445 - Environmental Risk Assessment (3)

Appendix D: EVSC Course Syllabi

Syllabus for EVSC 100 for Spring 2018
Syllabus for EVSC 201W for Fall 2017
Syllabus for EVSC 300 for Spring 2018
Syllabus for EVSC 305 for Spring 2018

Course Description

EVSC100 introduces students to environmental science: a highly interdisciplinary, collaborative field of research that integrates understanding of physical and biological processes to study both natural and anthropogenically-influenced environments. The importance of understanding Earth systems in assessing impacts of human activities is emphasized. Students will develop an appreciation of the science that underlies environmental problems, and fields that can be further studied in Environmental Science. They will also learn the importance of effective communication of complex environmental science topics.

Requirement Designation: Breadth-Science **Units:** 3

Course Content

EVSC100 emphasizes the importance of the scientific method to understanding complex environmental problems, how environmental science differs from environmental activism, and why environmental science has become a critically important field of study.

Students will learn about Earth systems (lithosphere, hydrosphere, atmosphere and biosphere) and cycles and flows of energy and matter (nutrients), which are the foundations for understanding environmental science. This underlying knowledge is used to examine the diversity of Earth's ecosystems, their ecological structures and processes, how human activities are altering them, and how we can conserve them.

Throughout the term we consider many environmental problems beginning with humanity's lack of environmental literacy, over-extraction of non-renewable resources, water pollution, stratospheric ozone depletion, biodiversity loss and landscape change, deforestation and overfishing, the impacts of agriculture and climate change.

Course Learning Objectives

At course completion, successful EVSC 100 students should be able to:

- ✓ describe key Earth systems, cycles, properties and processes
- ✓ identify human activities and attitudes that alter Earth systems, cycles, properties and processes
- ✓ describe the environmental problems that stem from these activities and attitudes
- ✓ explore solutions to environmental problems
- ✓ demonstrate basic data, scientific, and environmental literacy skills
- ✓ communicate environmental science knowledge in oral and written formats
- ✓ collaborate successfully with peers

Instructor

Marnie Branfireun, Lecturer
Faculty of Environment, SFU
Contact: marnie_branfireun@sfu.ca
Office Hours: Tuesdays, 1:00 - 2:00 p.m.
TASC2 8902 (Technology and Science Centre 2)

Teaching Assistants

Eric Cao (EC): ecao@sfu.ca
Office Hours: tba
Stefano Borgato (SB): sborgato@sfu.ca
Office Hours: tba
TASC2 8902.1 (Technology and Science Centre 2)

Textbook (required)

***Environmental Science for a Changing World**, 1st Cdn Ed.*
Branfireun, Karr, Interlandi & Houtman, 2014
W.H. Freeman and Company, New York, NY.

Available as paperback, looseleaf and online e-book.
Limited copies on 24 hour reserve at SFU libraries.

Lectures (Section: D300, class number: 12493)

Tuesdays, 2:30 - 4:20 p.m., SWH 10041

Tutorial Sections (SB=Stefano Borgato, EC = Eric Cao)

D301 (12495): Wed, 8:30 - 9:20 a.m., WMC 2533 (SB)
D302 (12497): Wed, 9:30 - 10:20 a.m., WMC 2533 (SB)
D303 (12499): Wed, 12:30 - 1:20 p.m., AQ 5025 (EC)
D304 (12501): Thu, 8:30 - 9:20 a.m., AQ 5028 (EC)
D305 (12503): Thu, 11:30 a.m. - 12:20 p.m., AQ 5014 (EC)
D306 (12505): Thu, 12:30 - 1:20 p.m., AQ 5020 (EC)

Final Exam: Tuesday 17 April 2018, 8:30 -11:30 a.m.
Location: *Check GoSFU later in term for exam location*

Evaluation

Tutorials	20%
Midterm Exam(s)	40%
Final Exam	40%

Course grades are not routinely curved.

Grading Scheme

A+	90+	C+	67-69
A	85-89	C	63-66
A-	80-84	C-	60-62
B+	77-79	D	50-59
B	73-76	F	00-49
B-	70-72	N/DE incomplete/ deferred exam	

COURSE COMPONENTS

LECTURES

Lectures present *most* course content and are based on chapters from the textbook, with supplementary content to enhance understanding, keep the course up to date and address current issues. Each lecture runs 110 minutes. Lecture slides are posted to Canvas in advance, and are a framework and do not include all examinable content. Taking additional notes during lecture is important for course success. Emphasize understanding and explanation in your notes, not just things to memorize. Occasionally lectures may be given by teaching assistants or invited speakers. The instructor may record lectures for review on Canvas if their schedule requires them to be away during the term. Students may record lecture audio only with permission of the instructor, and only where such accommodation is arranged via the Centre for Students with Disabilities.

If you miss a lecture, it is your responsibility to catch up on notes by consulting with classmates.

TUTORIALS (20%)

Tutorials support development of core academic skills in the context of environmental science. These skills include critical thinking, analysis, synthesis, collaboration, summarization, concise writing, literature research, report writing, communication and presentation skills, along with data, science and environmental literacy. Be prepared to think through problems, work in groups, and speak aloud. Tutorials usually require online research so bring a laptop. SFU libraries have a small number of laptops available on loan if you lack one. Tutorial instructions are posted on Canvas in advance for you to work on in class. Each tutorial is worth 2% of the course mark, and is graded for thoroughness, effort, accuracy, and clarity. Attendance is mandatory: you cannot submit exercises for missed tutorials.

You must attend the tutorial section you are registered to.

EXAMINATIONS (80%)

Exams are not cumulative: the final exam will cover content from after the midterm exam(s) only. All exams are mixed format, and may include any combination of multiple choice, short answer, fill in the blank, figure labelling, long answer questions. Lectures (including films and guest lectures), textbook, tutorials, this syllabus, and exam guidelines (first page of each exam), are all examinable. Question banks may be provided to help you succeed on the exams. Avoid using previous question banks, websites, and notes from other courses to study for your exams; these resources may mislead you. Exams are carefully graded by a trained and calibrated TA team for understanding, not just 'keywords'. Some exams and exam grading may be automated. Graded midterm exams are a good guide to where you need to improve, so please review your midterm(s) before the final exam.

NOTE: *While grammar is not graded directly in EVSC100, an ability to write grammatically coherent sentences is important for course success. Environmental science requires clarity in communication whether verbally, in writing, or even graphically (e.g., figure labelling); try to be as accurate and clear as possible.*

CANVAS

Lecture slides, tutorial instructions, exam question banks, the syllabus and course schedule, and readings and resource materials are posted to Canvas. Announcements are made regularly to let you know of any changes or other important course information. Canvas is also used to post grades, and to host discussion boards about the course. Your Instructor uses Canvas to communicate with you; please ***turn Canvas notifications on and read announcements***. Use Canvas as a starting point when you have any general course-related questions. Most student questions are answered in the syllabus, in Canvas announcements, on Canvas discussion boards, or in lectures.

STUDY STRATEGY

It is hard to know what to study most in EVSC100 because environmental science has such breadth. This can be very daunting for students who have not taken any science for years. To succeed, study continuously over the term, read ahead, and make good notes that help *you* to *understand* content and remind you of what was emphasized in lecture. Allow enough time to work through sample questions. Group study outside of class is beneficial to struggling students. If you study with motivated peers you will find that you learn even more.

If you want help understanding course material, visit your Instructor or Teaching Assistant during office hours. We are here to help you! No appointment necessary!

QUESTIONS ABOUT EVSC100?

General course questions? ➠ check Canvas announcements, this syllabus and the course schedule first.
e.g. "Is the final exam cumulative?", "Is there a tutorial this week?
General questions not addressed on Canvas or in the syllabus? **➠ post your questions to a Canvas discussion board.**

Questions about course content? ➠ come to Instructor or TA office hours for help (no appointment needed).
Help with understanding course concepts, or exam preparation, is not available by email or Canvas message.

Questions about class and final exam schedules or locations? ➠ check GoSFU *(the SFU Student Information System).*

Questions that relate to *your situation in particular*? ➠ Email your instructor or TA
e.g. to request accommodation for a missed tutorial or exam (see below), or ask a question about your own grades.
If your question is about your tutorial grades ➠ email your TA.
If your question is about your course or exam grades, or to request 'accommodation' ➠ email your instructor.

Missed Tutorial? ➠ There is no need to notify the Instructor about missing a tutorial *unless* you are requesting accommodation, in which case... **Email** your instructor to request accommodation

Missed Exam? ➠ **Email** your instructor to let them know your situation. If your situation warrants scheduling a make-up exam, then one will be set up for you, even if you do cannot immediately contact your Instructor.

Email etiquette...

- **Email only for individual issues, such as accommodation requests, not for general course questions**, which are addressed on Canvas, in the syllabus, or in lecture. Check there first.
- **Always email from your official SFU email address.** Other email addresses get treated as junk mail.
- **In your email subject line**, include the course number, section, term and year, and an indication of your query.
- **Compose your email clearly** and politely, so that we understand what you are requesting.
- **Be patient:** allow two business days (M-F) during business hours (9-5) (e.g. late wed emails may wait until monday)
- **If your concern is urgent** (both *extremely* serious and time-sensitive) ***then mark your email 'urgent'.***
- ***If you have an emergency that we need to know about, call the Faculty of Environment office at (778) 782-8787.***
- ***Missing the final exam is not an emergency - if you are going to miss, or have missed, the final exam, the only solution is to make arrangements with your Instructor, so email them directly and allow time for a reply.***

ACCOMMODATION: REQUESTS TO MAKE UP FOR LATE OR MISSED ASSIGNMENTS OR EXAMS

Students in temporary extenuating circumstances *may* be 'accommodated' by your Instructor via deferred ('make-up') exams, deadline extensions, or allowed absences. Requests for accommodation based on 'need' (e.g., your program's g.p.a. requirements) will not be approved. Additional work to help boost grades is not offered.
Legitimate extenuating circumstances: conflicts with other SFU exams or mandatory course events, mandatory SFU academic or athletic team activities; academic conference presentations, major religious observances (e.g., holy days, not cultural festivals); physical or mental health challenges, accidents, serious injury, hospitalization, bereavement.
Not legitimate: cultural events; vacations; family events; volunteer or work activities; student club activities, forgetfulness; traffic; weather (unless SFU declares a weather emergency or closure), program grade requirements.
To request accommodation, email your Instructor (not TA) with clear documentation attached as soon as possible.
Clear documentation includes exam conflict as shown on GoSFU screenshot, an official form, or letter on official (e.g., SFU) letterhead, indicating date(s) effected, signed by a doctor /SFU team manager /counsellor, hospitalization record or similar (see www.sfu.ca/students/health/resources/faq/sick-notes). Any official SFU activity letter should be signed by an SFU employee. Image files (e.g. smartphone picture attachments) are adequate.
Accommodation is at the discretion of the Instructor; do not ask your TA. See Accommodation guide on Canvas.

'EXAM HARDSHIP'

As per SFU policy (see student services or Academic Calendar), if you have three or more final exams within a 24 hour period, you can be given a new exam date for the *middle* exam by *that* instructor/ department/ faculty. If you have two exams on the same day at more than one campus with insufficient travel time in between, your instructor/ department/ faculty can arrange for you to write both exams on one campus *at their original dates and times*. Having two exams on the same day is not accommodated. **Final exam schedules are posted on GoSFU before term begins; check your exam schedule and *notify your instructor/department of conflict* at least one month before exams.**

Student Resources at SFU

Academic Advisors
Students who need to **change sections** or who want **advice on their programs** should speak to their own department/ program's academic advisor. Students in **ongoing distress** who wish to seek accommodation for multiple courses can also speak with their academic advisor. The course Instructor cannot view or change course/section registration.
www.sfu.ca/students/academicadvising

Centre for Student with Disabilities (CSD)
Students with hidden or visible disabilities who believe they may need ongoing classroom or exam accommodations are encouraged to register with the SFU Centre for Students with Disabilities as soon as possible to ensure that they are eligible and that approved accommodations and services are implemented in a timely fashion.
www.sfu.ca/students/disabilityaccess

SFU Libraries
Get to know your library. SFU has an extensive collection of books, subscribes to thousands of scholarly journals (in print, and in digital format accessed via journal databases), maps and learning resources.
www.lib.sfu.ca/about/overview/services-you/undergrads

Student Learning Commons (SLC)
If you are facing difficulties in taking good notes, writing well, or studying effectively, visit the SFU SLC in any SFU library, or online to find out how SFU can support your academic success. They also have good resources for ESL/EAL students. Main floor of the W.A.C. Bennett Library, Room 3020. Open 9:00am - 4:30pm M-F. **www.lib.sfu.ca/about/branches-depts/slc** **www.sfu.ca/learning/learning-support**

Embrace Diversity
Help make SFU campuses safe, welcoming and respectful spaces for everyone, irrespective of differences. Discriminatory, offensive, or disrespectful behaviour of any type is not tolerated in EVSC100.
Out on Campus - LGBTQ+ Centre: ooc.sfss.ca **SFU Women's Centre: wctr.sfss.ca**

Environmental Science Student Union (EVSCSU)
For students taking EVSC courses to network and enjoy their time at SFU with peers of similar interest.
www.sfu.ca/evsc/evsc-student-union

Health and Counselling Services
Health and Counselling provides health care to students at SFU. Their health clinic (doctors and nurses), counselling, psychiatrist, chiropractor, physiotherapist, and health care team are there to support your health and well-being.
www.sfu.ca/students/health/

Sexual Assault Support
If you or someone you know has experienced sexual violence, options are immediately available at SFU to provide support and advice. The Active Bystander Network is an innovative, new program that is part of a campus-wide initiative to create a culture of zero-tolerance for sexual violence at Simon Fraser University.
www.sfu.ca/sexual-assault.html

SFU Academic Dishonesty and Misconduct Policy
Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. SFU's Academic Integrity web site has information on what is meant by academic dishonesty, and is where you can find resources to help with your studies and the consequences of cheating.
www.sfu.ca/policies/gazette/student/s10-01
www.sfu.ca/students/academicintegrity/resources/academichonestyguide

Where is Everything?
Campus maps: www.sfu.ca/fs/Campus-Maps

EVSC100 Course Schedule Spring 2018 - Burnaby (D300)

TERM WEEK	DATE	Lect. #	Lecture Topics & Textbook Readings	Weekly Tutorial Topics & Readings	Term Dates
1	Tue Jan 2		Orientation Day - No Class	no tutorials week one	
2	Tue Jan 9	1	Introduction to Environmental Science CH1: Environmental Literacy	1. Data Literacy I: Numeracy *Textbook Appendix 1: Basic Math Skills*	Jan 9: last course +/_/ change GsSFU
3	Tue Jan 16	2	CH2: Science Literacy, Ozone Depletion CH3: Information Literacy, Toxicology	2. Data Literacy II: Graphing Part A *App. 2: Data Handling & Graphing Skills*	Jan 16: last course drop day w/o WD
4	Tue Jan 23	3	CH4: Human Population, Growth & Impacts CH5: Ecological Economics & Consumption	3. Data Literacy III: Graphing Part B *App. 2: Data Handling & Graphing Skills*	Jan 23: last course add with permission
5	Tue Jan 30	4	CH6: Ecosystems & Nutrient Cycling CH17: Solid Waste	4. Data Literacy IV: Basic Statistics *App.3: Statistical Analysis*	
6	Tue Feb 6	5	CH7: Population Ecology CH8: Community Ecology	5. Exam Skills: how to write effective written answers to science questions	Feb 6: last course drop day (WD)
7	Tue Feb 13		Reading Week - No Classes		
8	Tue Feb 20	6	CH9: Biodiversity CH10: Evolution & Extinction	6. Information Literacy I - the literature *Chapter 3, SFU library databases*	
9	Tue Feb 27		**Midterm Exam (in-class)**	no tutorials this week	
10	Tue Mar 6	7	CH11: Forests CH12: Grasslands	7. Information Literacy II - G.I.S. *Google Earth*	
11	Tue Mar 13	8	CH13: Marine Ecosystems CH14: Fisheries & Aquaculture	8. Information Literacy III - Imagery *NASA Earth Observatory*	
12	Tue Mar 20	9	CH15: Freshwater Resources CH16: Water Pollution	9. Environmental Science Collaboration I - Research	
13	Tue Mar 27	10	CH18: Agriculture CHs19&20: Coal, Oil & Natural Gas	no tutorials this week	
14	Tue Apr 3	11	CH22: Climate Change	10. Environmental Science Collaboration II - Presentation	
15	Tue Apr 10	12	(The Great Squeeze - optional)		Last class
16	(Apr 16 - 22)		**FINAL EXAM TUESDAY 17 APRIL 8:30 to 11:30 a.m. (for location see GoSFU later in term)**		
17	(Apr 23 - 27)		EXAMS		

Schedule is subject to change - please watch Canvas for updates

Course Description

A survey of environmental science in practice, with guest presentations by environmental scientists from contributing disciplines and workplaces, that familiarize students with different career paths and the kinds of communication tasks they require.

EVSC201 students will develop breadth of knowledge, as you gain insight into a wide variety of environmental science fields, and depth of knowledge, as you pursue individual and group research on a topic relevant to your EVSC concentration (applied biology, environment al earth systems, environmetrics or water science).

Students will also develop core communication skills that prepare them for a diverse environmental science job market that includes academia, consulting, government, industry, education, planning, resource management and community outreach.

Coursework emphasizes interdisciplinary literature research, analysis and synthesis along with scientific writing and communication skills, and project collaboration that prepares EVSC students for collaborative research in upper division courses. This course is required for EVSC students.

Prerequisite: EVSC100 **Requirement Designation:** Writing **Units**: 3

Course Content

This course will consist of one weekly two-hour lecture delivered by course instructor and a guest speaker, and one weekly two-hour tutorial where communication skills are introduced and practiced with the guidance of the instructor, teaching assistant and SFU staff from the Student Learning Commons at SFU.

This course will use Canvas to manage assignments and post important course content.

Course Learning Objectives

At course completion, successful EVSC 201 students should be able to demonstrate:

- ✓ *broad understanding of environmental science practice across diverse workplaces*
- ✓ *ability to critically evaluate environmental science literature using journal databases and online resources*
- ✓ *ability to effectively summarize scholarly articles and other sources of information*
- ✓ *ability to synthesize findings from multidisciplinary environmental science studies*
- ✓ *effective written articulation of knowledge in a concise, scientific style*
- ✓ *effective visual, oral, and written communication of knowledge for scientific, government, industrial and general audiences*
- ✓ *ability to cite information sources properly and consistently*
- ✓ *understanding and avoidance of plagiarism*
- ✓ *ability to collaborate successfully with peers*

Instructor

Marnie Branfireun, Lecturer
Faculty of Environment, SFU
Contact: marnie_branfireun@sfu.ca
Office Hours: Tues & Thur, 11:30 a.m. - 12:20 p.m.
Technology and Science Centre 2, TASC2 8902

Teaching Assistant

Rodrigo Solis, Ph.D. Candidate, REM
rsolis@sfu.ca
Office Hour: tba

Reference Textbook (strongly recommended)

Making Sense in Geography and Environmental Sciences: A Student's Guide to Research and Writing. (6th Ed.)
Northey, Draper & Knight, 2015.
Oxford University Press, Toronto, ON.

Available as paperback at SFU bookstore and online.

Limited copies on 24 hour reserve at SFU libraries.

Lectures (D100): Tues, 2:30 - 4:20 p.m., WMC 2202
Tutorials (D101): Tue, 4:30 - 6:20 p.m.,WMC 2202
Final Exam: NONE
GoSFU indicates an exam by default, but there is none.

Evaluation

Participation (10%)

Students should participate in discussions during lectures and tutorials, submit notes and question ideas generated each week, and contribute to peer assessments for full marks.

Tutorial Exercises that Build a Literature Review (55%)

A series of low-risk (5% each) 'draft' exercises (see schedule) that build skills and content that contribute to the two major course assignments. These are peer-assessed during tutorial.

Individual Literature Review Assignment (15%)

Research, analysis, and synthesis of an environmental science topic in an EVSC concentration area, written utilizing contents and skills developed in earlier tutorial exercises.

Group Project (20%)

A collaborative synthesis of individual literature reviews, grouped by EVSC stream area, in one of several formats: presentation, poster, factsheet, or report.

Grading Scheme

A+	90+	C+	67-69
A	85-89	C	63-66
A-	80-84	C-	60-62
B+	77-79	D	50-59
B	73-76	F	00-49
B-	70-72	N/DE incomplete/ deferred exam	

QUESTIONS ABOUT EVSC201?

General course questions? ➡ check Canvas announcements, this syllabus and the course schedule first.
e.g. "Is there a tutorial this week?
General questions not addressed on Canvas or in the syllabus? **➡ post your questions to a Canvas discussion board.**

Questions about assignments? ➡ come to Instructor or TA office hours for help (no appointment needed).
Help with assignments is not available by email or Canvas message.

Questions that relate to *your situation in particular*? ➡ Email your instructor or TA
e.g. to request accommodation for a missed tutorial or exam (see below), or ask a question about your own grades.
If your question is about your assignment grades ➡ email your TA or Instructor.
If your question is about your course grade, or to request 'accommodation' ➡ email your instructor.

Missed tutorial? ➡ There is no need to notify the Instructor about missing a tutorial or exam *unless* you are requesting accommodation, in which case... **Email** your instructor or TA

Email etiquette...

- **Email only for individual issues, such as accommodation requests, not for general course questions**, which are addressed on Canvas, in the syllabus, or in lecture. Check there first.
- **Always email from your official SFU email address.** Other email addresses get treated as junk mail.
- **In your email subject line**, include the course number, section, term and year, and an indication of your query.
  - **e.g. Email *Subject: EVSC201 Fall 2017 -*** *Assignment Accommodation Request*
- **Compose your email clearly** and politely, so that we understand what you are requesting.
- **Be patient:** We usually respond within two business days (M-F) during business hours (9-5); if you email late in the day / week you may not hear back from us until the next day or two / week.
- **If your concern is urgent** (both *extremely* serious and time-sensitive) ***then mark your email 'urgent'.***
- ***If you have an emergency that we need to know about, call the Faculty of Environment office at (778) 782-8787.***

ACCOMMODATION: REQUESTS TO MAKE UP FOR LATE OR MISSED ASSIGNMENTS

Students in temporary extenuating circumstances *may* be 'accommodated' by your Instructor via assignment deadline extensions, submission without tutorial attendance, or other alteration of course requirements deemed appropriate by the Instructor. Requests for accommodation based on 'need' will not be approved; there must be a legitimate conflict or extenuating circumstance.
Legitimate extenuating circumstances: conflicts with other SFU exams or mandatory course events, mandatory SFU academic or athletic team activities; academic conference presentations, major religious observances (e.g., holy days, not cultural festivals); physical or mental health challenges, accidents, serious injury, hospitalization, bereavement.
Not legitimate: cultural events; vacations; family events; volunteer or work activities; student club activities, forgetfulness; traffic; weather (unless SFU declares a weather emergency or closure), program grade requirements.

To request accommodation, email your Instructor (not TA) with clear documentation attached as soon as possible.
Clear documentation includes exam conflict as shown on GoSFU screenshot, an official form, or letter on official (e.g., SFU) letterhead, indicating date(s) effected, signed by a doctor /SFU team manager /counsellor, hospitalization record or similar (see www.sfu.ca/students/health/resources/faq/sick-notes). Any official SFU activity letter should be signed by an SFU employee. Image files (e.g. smartphone picture attachments) are adequate.
Accommodation is at the discretion of the Instructor only; please do not ask your TA.
Official accommodation for ongoing challenges is arranged via the Centre for Students with Disabilities (see below).

Student Resources at SFU

Academic Advisors

Students who need to **change sections** or who want **advice on their programs** should speak to their own department/ program's academic advisor. Students in **ongoing distress** who wish to seek accommodation for multiple courses can also speak with their academic advisor. The course Instructor cannot view or change course/section registration.
www.sfu.ca/students/academicadvising

Centre for Student with Disabilities (CSD)

Students with hidden or visible disabilities who believe they may need ongoing classroom or exam accommodations are encouraged to register with the SFU Centre for Students with Disabilities as soon as possible to ensure that they are eligible and that approved accommodations and services are implemented in a timely fashion.
www.sfu.ca/students/disabilityaccess

SFU Libraries

Get to know your library. SFU has an extensive collection of books, subscribes to thousands of scholarly journals (in print, and in digital format accessed via journal databases), maps and learning resources.
www.lib.sfu.ca/about/overview/services-you/undergrads

Student Learning Commons (SLC)

If you are facing difficulties in taking good notes, writing well, or studying effectively, visit the SFU Learning Commons in any SFU library, or online to find out how SFU can support your academic success. They have good resources for ESL/EAL students. Main floor of the W.A.C. Bennett Library, Room 3020. Open 9:00am - 4:30pm M-F.
www.lib.sfu.ca/about/branches-depts/slc **www.sfu.ca/learning/learning-support**

Embrace Diversity

Help make SFU campuses safe, welcoming and respectful spaces for everyone, irrespective of differences. Discriminatory, offensive, or disrespectful behaviour of any type is not tolerated in EVSC100.
Out on Campus - LGBTQ+ Centre: ooc.sfss.ca **SFU Women's Centre: wctr.sfss.ca**

Environmental Science Student Union (EVSCSU)

For students taking EVSC courses to network and enjoy their time at SFU with peers of similar interest.
www.sfu.ca/evsc/evsc-student-union

Health and Counselling Services

Health and Counselling provides health care to students at SFU. Their health clinic (doctors and nurses), counselling, psychiatrist, chiropractor, physiotherapist, and health care team are there to support your health and well-being.
www.sfu.ca/students/health/

Sexual Assault Support

If you or someone you know has experienced sexual violence, options are immediately available at SFU to provide support and advice. The Active Bystander Network is an innovative, new program that is part of a campus-wide initiative to create a culture of zero-tolerance for sexual violence at Simon Fraser University.
www.sfu.ca/sexual-assault.html

SFU Academic Dishonesty and Misconduct Policy

Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. SFU's Academic Integrity web site has information on what is meant by academic dishonesty, and is where you can find resources to help with your studies and the consequences of cheating.
www.sfu.ca/policies/gazette/student/s10-01
www.sfu.ca/students/academicintegrity/resources/academichonestyguide

Where is Everything?

Campus maps: www.sfu.ca/fs/Campus-Maps

EVSC 300
Environmental Science Program
Simon Fraser University
Spring Semester 2018

Jeremy G. Venditti
Office: TASC II 8908
Phone: 604-767-2247
jeremy_venditti@sfu.ca

SEMINAR IN ENVIRONMENTAL SCIENCE

Modern Environmental Science deals with environmental problems where the fundamental problem may include an wide range of concerns that extend well beyond the scope of science. These concerns may be related to aboriginal rights and land claims, economics, resource development, fundamental and perceived human rights, human health or environmental protection. These issues are often conflated with scientific evidence in the media, by activists, by project development proponents, industry and others.

There is perhaps no better example of this than in the 'debate' over climate change. The scientific evidence in unambiguous and clear -- the climate is warming due to human activity. However, what to do about this environmental problem is not entirely clear and open to debate. While governments and individuals come to grips with what needs to be done, it has become commonplace to treat the scientific evidence of climate change in the debate about what to do about it. This is problematic because it gives the public the impression that facts obtained using scientific methods can be debated outside of science, which is false.

This course offers an opportunity provides Environmental Science students the opportunity to investigate an environmental science topic in depth, through lecture and bi-weekly guest speakers from diverse sectors (academia, government, industry and NGOs). The goal of the class is to examine a current environmental problem, to explore the science underlying it and find out what role science is playing in discussions about that problem.

Prerequisites
EVSC 201W. Students with credit for EVSC 399 or EVSC 499 may not take this course for further credit.

Required Text
None

Course Format
This course will consist of a series of short lectures/discussions led me the instructor, guest speaker seminars and presentations by students. There will be no class in the first week of classes.

Assessment
Participation: 20%
Proponent presentations 20%
Presentation summaries 15%
White paper 30%
White paper Presentation 15%

INSTRUCTOR

Dr. Sasmita K Das,
Sessional Instructor, Faculty of Environment,
Simon Fraser University,
Office: TASC2 8800
Contact: sasmita_das@sfu.ca

TEACHING ASSISTANT

Mike Curran
PhD candidate, Faculty of Environment,
Simon Fraser University
Contact: curran@sfu.ca

CLASS SCHEDULE

LECTURES: Thursday 3:30 p.m. - 4:20 p.m., SECB1011

TUTORIALS/LABS/FIELDSITE: Wednesday 9:30 a.m. -12:20 p.m., BLU9655
Thursday 9:30 a.m. - 12:20 p.m., WMC2223

FINAL EXAM: 20th April 2018, Friday, 12:00 p.m. -3:00 p.m., TBA

INTRODUCTION

This course introduces to basic methods of field work in Environmental Sciences which includes, sample collection, field observation, mapping and surveying, analytical techniques, instrumentation, data collection, interpretation and approaches to write and present research projects. The topics and exercises in this course are important to students interested in environmental science which encompasses various subjects like physical sciences, biological science, ecological sciences, natural resource management, sustainable development, etc to students who wish to understand various aspects of the environment surrounding them.

COURSE FORMAT

Lectures/field exercises will follow the course outline. There will be a few lectures to introduce the field/lab work. The exercises will introduce and illustrate the basics of field sampling, data collection, analysis and interpretation of soil, sediments and water samples in environmental sciences.

READINGS

Taccogna, G. and K. Munro (eds). 1995. The Streamkeepers Handbook: a Practical Guide to Stream and Wetland Care. Salmonid Enhancement Program, Dept. Fisheries and Oceans, Vancouver, BC

Watts and Halliwell (1996) Essential Environmental Science: Methods and Techniques, Routledge; London and New York.
-This textbook is available as a free e-text from the SFU library.

Kalra, Y.P. and Maynard, D.G. 1991. Methods manual for forest soil and plant analysis. Information report NOR-X-319. Forestry Canada, Northwest region northern Forestry Centre.

Edited by Clesceri, L.S., Greenerg, A.E. and Eaton, A.D. (20th Edition). Standard methods for examination of water and wastewater

Northey, M., Knight, D.B. and Draper, D, (5th Edition). Making sense of Geography and Environmental Science-A students guide to research and writing

Further readings for each individual assignment, announcements, lecture outlines, as well as field and lab instructions will be posted on the course canvas website.

PREREQUISITES

EVSC 100 (or equivalent)
Students with credit for EVSC 205 or EVSC 491W may not take this course for further credit.

STUDENT RESOURCES AND COMMUNICATION

CONTACTING INSTRUCTOR AND TEACHING ASSISTANT: All questions pertaining to course material/field exercises, etc are encouraged to be asked at the end of class and further queries can be clarified by making an appointment to meet during office hours. All questions about missed classes, missed field exercises, and other practical concerns about the course should be directed to me by email. Emails will be responded within 2 days Please place the course number EVSC 305 in the subject line to help us prioritize your email. You may also post to Canvas discussion boards as they are made available.
If your concern is extremely urgent please contact the main FENV office at (778) 782-8787.

CANVAS: For the Course EVSC 305, partial outlines of lecture notes, tutorial instructions, submission forms, syllabus, course schedule, readings, resource material, handouts of the field and lab exercises, and field project instructions will be posted to Canvas. Announcements will be made regularly, and should be read in order to be timely informed about any changes or important course updates.

You will be able to access the Canvas course site from the first week of classes.

LECTURES

Lectures will help to introduce to the week's lab/field exercises. Lecture notes will be posted to Canvas. If you miss a lecture, it is your responsibility to catch up on notes by consulting with classmates.

TUTORIALS IN FIELD OR 'LAB'

Tutorials support development of field and lab skills in the context of environmental science. These skills include critical thinking, analytical skills, team work, literature survey, research skills, communication and presentation skills along with data, science and environmental literacy. There exercises will be graded for effort, accuracy, and thoroughness in implementation and submissions. All exercises are to be submitted on Canvas and in hard copy. We grade on the hard copy, and the digital submission allows us to keep an archive and track day and time submitted.

FIELD/LAB WORK

Working outdoors in rough conditions and poor weather carries risks and you will be required to sign a risk waiver in order to take EVSC305. We will go out in all weather except dangerous conditions. You will be asked to sign photo use permission so that we can share our experiences with the SFU community. It is your responsibility to take your own safety seriously. While we will have lots of fun, we all must ensure that we behave maturely, and watch out for ourselves and each other. Students who engage is risky behavior in the field will not be allowed to continue in the course. Every student must come to the field site prepared for the weather, and with appropriate clothing for the conditions (including hiking shoes/boots). All field work, even in urban settings, can be cold, damp, and unpleasant when you are unprepared.
If you have health concerns that we should know about (e.g. diabetes/low blood sugar, asthma, serious allergies), please let the instructor and your TA know before your first field session. Be careful and tidy in how you organize equipment and samples so that you do not lose them. Please ensure that the sites of field work along with the adjoining ecosystems are least disturbed during our work.

FIELD /LAB NOTEBOOK

All field and lab should be recorded in your field notebook. Each exercise requires describing site conditions, describing how to conduct the particular field method, and recording data collected. Neat, tidy field books will help fetching good grades. Maps, drawings, field visuals and graphs should be included in notes. Be innovative in making it as informative, resourceful and presentable.
Essential: Each student must have a waterproof "Rite in the Rain" side-spiral bound field notebook (4 5/8" x 7"), available online from Rite in the Rain or at many local retailers. You can use a pencil or all-weather pen to write in them.

EVALUTION

Assignment 20%
Quiz 10%

Project Presentation 10%
Field Notebook 10%
Final Exam 50%

ASSIGNMENTS (4)

1. Annotated Bibliography assignment
2. Statistics assignment
3. Term-paper project assignment
4. RS and GIS Assignment

QUIZ (3): Best two scores of the three quizzes will be considered for grading. Syllabus for each of the quiz would be course covered until the previous class.

PRESENTATION: A short presentation based on the term-paper project assignment at the end of the semester.

COURSE POLICIES

Policy for students representing SFU, BC or Canada (at academic or sports events): I fully support students involved with organizations and teams that travel during the semester; however, with this privilege comes additional responsibility. You are responsible for providing formal documentation identifying the organization you represent and potential schedule conflicts with this course.

Policy for academic dishonesty: As SFU students, you are expected to uphold the highest standards of academic conduct. Plagiarism or cheating on assignments/reports will be reported to SFU authorities and result in a grade of zero for that particular assignment/report in addition to any other appropriate measures according to SFU policy. All students should be aware of the contents of SFU's policy on academic honesty and the consequences of its violation (see SFU policy on academic honesty and the SFU library tutorial on plagiarism for advice).
http://www.sfu.ca/policies/gazette/student.html
http://www.lib.sfu.ca/help/tutorials/plagiarism-tutorial

SCHEDULE

There will be lectures, field exercises (5), lab exercises (3), assignments (4), quizzes (3), a short project presentation and a final exam at the end of the semester.

WEEK	DATE	LAB/LECTURE OR FIELD ACTIVITY	READINGS	ASSIGNMENT
1	Jan 3rd& 4th	• Introduction to the course • Lecture: Annotated bibliography assignment and scope of Environmental Science	• Watts and Halliwell, 1996 • Lertman, 1995 • Ch-2, Geography & Environmental Sciences, Northey et al., 2012	• Assignment-1: Annotated Bibliography assignment
2	Jan 10th&11th	• Field Exercise-1: Soil sampling-Surface samples • Lecture: Soil classification & Sampling	• Watts and Halliwell,1996 • Ch-11, Geography & Environmental Sciences, Northey et al., 2012	• Safety Conduct Form and Personal Data Sheet via email to TA
3	Jan 17th&18th	• Lab exercise-1: Analysis of collected surface soil samples • Lecture: Soil bulk property characterization	• Watts and Halliwell,1996	
4	Jan 24th&25th	• Field Exercise-2: Soil sampling-Vertical core samples • Lecture: Soil profiles of vertical core samples		
5	Jan 31st & Feb 1st	• Lab Exercise-2: Lab analysis of collected vertical core soil samples • Lecture: Weathering and Soil formation		• Quiz-1
6	Feb 7th &8th	• Guidelines on Statistics assignment • Lecture: Introduction to Statistics	• Watts and Halliwell,1996	• Assignment 2: Statistics
7	Feb 14th &15th	NO CLASSES		
8	Feb 21st &22nd	• Field Exercise-3:Water Sampling • Lecture: Introduction to	• Watts and Halliwell,1996 • Streamkeepers Handbook	

		Hydrology		
9	Feb 28th & March 1st	• Lab Exercise-3: Water Quality analysis • Lecture: Water quality parameters	• Watts and Halliwell,1996 • Streamkeepers Handbook	• Assignment 3: Term paper project assignment
10	March 7th &8th	• Field Exercise-4: Stream discharge measurements • Lecture: Stream Geomorphology		• Quiz-2
11	March 14th&15th	• Field Exercise-5: Biodiversity: invertebrate count • Lecture: Benthic invertebrates as water quality indicators		
12	March 21st &22nd	• Guidelines to RS and GIS assignment • Lecture: Introduction to RS and GIS		• Assignment 4 : RS and GIS
13	March 28th &29th	• Presentations		• Quiz-3
14.	April 4th &5th	• Presentations		

- Reading will be updated regularly and suggested individually for each exercise.

Appendix E: MER Calendar Entry

Ecological Restoration Program

Simon Fraser University Calendar | Summer 2018

Ecological Restoration

MASTER OF SCIENCE

Simon Fraser University and the British Columbia Institute of Technology (BCIT) collaborate on the master of science (MSc) in ecological restoration, a full-time professional graduate program offering a combined emphasis on applied technical experience and advanced theoretical foundations of ecological restoration. This joint BCIT-SFU credential requires students to satisfactorily complete coursework at BCIT and SFU. For further information visit: http://www.sfu.ca/ecologicalrestoration/Admission.html.

Admission Requirements

The MSc in Ecological Restoration is administered by SFU and BCIT. Applicants must satisfy the University admission requirements as stated in Graduate General Regulations 1.3 in the SFU Calendar.

The student must hold a four year bachelor's degree in ecology, plant science, animal science, soil science, environmental science, resource science (land, water, fish and wildlife, forestry), physical geography, environmental engineering, or a related program from a recognized post-secondary institution.

In addition, students must have completed:

- One introductory course each in ecology and statistics;
- Two upper level courses; in biology, ecology (plant, fish, wildlife, restoration/reclamation, etc.), statistics, plants science, soil science, physical geography (hydrology, geomorphology, limnology, etc.), forest science, natural resource management, environmental science, or related courses.

See Graduate General Regulations for English language and reference requirements.

1.1 Program Requirements

This program consists of core courses, specialization courses, and an applied research project. A minimum of 18 units are completed at SFU. ECOR courses are based at BCIT.

Students complete a minimum of 36 units, including all of

ECOR 9100 - Concepts of Ecological Restoration and the Physical Environment (3)
ECOR 9110 - Planning and Monitoring for Ecological Restoration (3)
ECOR 9200 - Field Applications of Restoration Principles (3)

ECO 611 - Concepts of Ecological Restoration and the Biological Environment (3)
ECO 621 - Graduate Seminars in Research Methods (3)
ECO 622 - Project Management and Policy for Ecological Restoration (3)
ECO 641 - First Nations & Social Perspectives of Ecological Restoration (3)

and applied research project I and II

ECOR 9300 - Applied Research Project I (3)
ECOR 9400 - Applied Research Project II (3)

or

ECO 630 - Applied Research Project I (3)
ECO 640 - Applied Research Project II (3)

In the applied research project, students will conduct extensive fieldwork, normally in collaboration with industry partners and academic supervisors.

Students enrolled in ECOR 9300 and ECOR 9400 cannot enroll in ECO 630 or ECO 640 for further credit. Students enrolled in ECO 630 or ECO 640 cannot enroll in ECOR 9300 or ECOR 9400 for further credit.

To meet the 18 unit requirement, students are encouraged to access graduate courses offered by Geography, Biological Sciences, Earth Sciences, Resource and Environmental Management and the Bamfield Marine Station. Selection of courses should be done with advice from an ER faculty member and complement the area of specialization, either Terrestrial or Aquatic.

Course enrollment will be dependent on course availability and permission of the instructor.

1.2 Program Length

Students are expected to complete the program requirements in six terms.

1.3 Academic Requirements within the Graduate General Regulations

All graduate students must satisfy the academic requirements that are specified in the Graduate General Regulations, as well as the specific requirements for the program in which they are enrolled.

Appendix F: MER Course Outlines

Ecological Restoration Courses

ECO 611 - Concepts of Ecological Restoration and the Biological Environment (3)

A review of general ecology, including theories relevant to the individual, the population, and the community, and their interaction and their relationship with the physical (abiotic) environment. Prerequisite: Acceptance into the M.Sc. Program.

ECO 621 - Graduate Seminars in Research Methods (3)

An examination into the general philosophical foundations of science, the nature of scientific disputes, and the relevance of these to ecology. Topics covered include the following fundamental concepts: science, the scientific method, reliable knowledge, poor science, hypothetical-deductive approach, hypothesis testing and experimental design. Prerequisite: ECOR 9100 - Concepts of ER & the Physical Environment; ECO 611 - Concepts of ER & the Biological Environment; ECOR 9110 - Planning & Monitoring for ER.

ECO 622 - Project Management and Policy for Ecological Restoration (3)

An examination of project management in ecological restoration with an emphasis on managing uncertainty, risk assessment and communications. Reviews the legal system that governs use and protection of natural resources and the environment in Canada. Prerequisite: ECOR 9100 - Concepts of ER and the Physical Environment; ECO 611 - Concepts of ER and the Biological Environment; ECOR 9110 - Planning and Monitoring for ER.

ECO 641 - First Nations & Social Perspectives of Ecological Restoration (3)

An exploration of human-nature relationship from multiple perspectives to the practice of ecological restoration. Special emphasis on First Nations. Covers knowledge of ecological restoration and how to compromise among diverse perspectives, protocols. Prerequisite: ECO 622 - Project Management & Policy for ER; ECOR 911O- Planning and Monitoring for ER.

ECOR 9100 - Concepts of Ecological Restoration and the Physical Environment

This course focuses on scientific study of the physical environment, with an emphasis on its effects on living organisms and their restoration. We will examine concepts of rivers and their attributes; inland waters and limnology; geomorphology; and terrestrial processes. Through lecture and field experiences, students will become familiar with physical and chemical processes in water, especially those that have a direct effect on biological organisms. Field sessions outside of scheduled class time will be required.

ECOR 9110 - Planning and Monitoring for Ecological Restoration

Designed for students with no experience in ecological restoration, this course develops broad knowledge and skills needed to plan and implement restoration activities. The course begins by reviewing a step-by-step process applicable to a wide range of ecosystems for developing,

implementing, monitoring, and refining on-the-ground restoration projects. We will focus especially on designing defensible monitoring programs needed to assess restoration success, including appropriate use of statistical design (e.g., controls, sampling design) and qualitative information (e.g., photo monitoring). Students will identify and critically review a restoration plan in terms of this step-by-step process. A major component of this course entails students incrementally developing a restoration and monitoring plan for a degraded site in the Lower Mainland of British Columbia. Field sessions outside of scheduled class time will be required. Techniques to communicate effectively will be examined and integrated into the assignments.

ECOR 9100 - Field Applications of Restoration Principles

This course is specifically designed to provide students hands-on training and application of techniques used in restoring habitats and associated monitoring. Techniques will include vegetation sampling, water sampling (multiparameter meters, flow meters, turbidity meters, etc.), sampling for ground-water levels, fish and wildlife sampling, chainsaw safety, coarse woody debris, habitat structure, CABIN, and G.P.S. Course design will include modules that need to be completed before class, to enhance the hands-on training. The course will run as a two-week field course at the end of level 2 (spring).

ECOR 9210 - Restoration of Terrestrial Ecosystems

The Pacific Northwest is a global ecological "hotspot" because of its relatively healthy native ecosystems, a high degree of biodiversity, and the number and scope of restoration initiatives that have been undertaken there. This course gathers and presents the best examples of state-of-the-art restoration techniques and projects. Students will be profiling a chosen ecosystem (e.g., bunchgrass system, Garry Oak system, old-growth forests, riparian), and researching and presenting case studies of restoration projects conducted in each of the chosen systems. Students will conduct seminars on physical and ecological issues in a chosen case study about the restoration techniques used (whether they were they successful or not), how the case study did/did not follow critical steps associated with a formal restoration plan, incidences of adaptive management, presence/absence of strong experimental designs, challenges and solutions, and uncertainties, etc. Through this course students will learn about appropriate restoration techniques to be used in different ecosystems, while critically reviewing relevant works and strengthening past approaches. Students will design a restoration proposal and plan for a specific degraded terrestrial ecosystem. Field sessions will complement lecture material.

ECOR 9220 - Restoration of Aquatic Ecosystems

This course will give an overview of limnology and focus on specific aspects of applied limnology and environmental engineering required to undertake ecological restoration of lakes, reservoirs, rivers and streams. The overview lectures discuss lake formation and basin morphometry, stratification and circulation, water chemistry (including nutrient and carbonate chemistry), BOD tests, and hypolimnetic oxygen depletion. Applied aspects of the course include experimentally determining re-aeration rates and sizing of hypolimnetic aeration/oxygenation and destratification systems, calculation of nutrient loading programs for streams, rivers, lakes and reservoir enrichment, calculation of heat budgets, use of nutrient-loading models to assess eutrophication risk, and use of Streeter-Phleps oxygen sag curves to

assess oxygen depletion in organically enriched rivers and streams. Students will participate in lectures, lab experiments, and group and individual study sessions to work through problem sets and to design a restoration proposal and plan for an aquatic system. Field sessions will complement lecture material.

ECO 930/ECOR 9300 - Applied Research Project I

The purpose of the Applied Research Project courses is to enable students to pursue a topic relevant to ecological restoration. In addition, students will develop certain skills that will be useful in their future employment in the various areas of ecological restoration. These skills range from general to specific. General skills include the ability to: 1) conceptualize and formulate a manageable restoration project or research question, 2) organize the required steps, 3) integrate and synthesize concepts and findings of other researchers, 4) collect and analyze data, 5) evaluate the strength of evidence or conclusions, 6) integrate all this information into a detailed, effective, and well-organized restoration plan, or similar deliverable, and 7) communicate effectively both in writing and orally. Students will also improve their abilities in specific skills such as pre- and post-restoration monitoring, interacting with and communicating complex approaches to clients and project partners, proposal writing, designing restoration plans, decision analysis, statistics, risk assessment, conflict resolution, strategic planning, and others.

In ECOR 9300 (Applied Research Project I) students select a specific site and develop a professional relationship with their chosen client. Students will conduct reconnaissance surveys of their target ecosystem and appropriate reference ecosystems to identify the primary issues and stressors associated with their target ecosystem. They will then develop a proposal detailing the general approach to developing a restoration plan, all the while interacting with their client to ensure the approach and deliverables meet the client's needs.

ECO 940/ECOR 9400 - Applied Research Project II

The purpose of the Applied Research Project courses is to enable students to pursue a topic relevant to ecological restoration. In addition, students will develop certain skills that will be useful in their future employment in the various areas of ecological restoration. These skills range from general to specific. General skills include the ability to: 1) conceptualize and formulate a manageable restoration project or research question, 2) organize the required steps, 3) integrate and synthesize concepts and findings of other researchers, 4) collect and analyze data, 5) evaluate the strength of evidence or conclusions, 6) integrate all this information into a detailed, effective, and well-organized restoration plan, or similar deliverable, and 7) communicate effectively both in writing and orally. Students will also improve their abilities in specific skills such as pre- and post-restoration monitoring, interacting with and communicating complex approaches to clients and project partners, proposal writing, designing restoration plans, decision analysis, statistics, risk assessment, conflict resolution, strategic planning, and others.

ECOR 9400 is a continuation of ECOR 9300 (Applied Research Project I). Students will develop their proposal from ECOR 9300 into a detailed restoration plan (or similar deliverable) specific to the client's needs. Students will design a restoration plan that is scientifically defensible by drawing on the best

current knowledge available to alleviate the stressors and restore the degraded ecosystem. They will identify the uncertainties present with the specific site, and include an approach to minimize the risk associated with these uncertainties. When possible, students will detail a research design that will reduce these uncertainties, should the restoration plan be implemented. Students will orally defend their restoration plan.

Appendix G: Terms of Reference for the Environmental Science Steering Committee

Provided by John Peirce
Dean, Faculty of Environment
September 2012

Terms of Reference for the EVSC Program

The Environmental Science Program is an interdisciplinary program centred in the Faculty of Environment. Its governance should reflect this base and be designed to ensure interests are met for the Program, its students and the Faculty of Environment.

The EVSC Program is interdisciplinary. Hence by definition, there is some overlap with disciplines that are centred in several Departments and Programs at Simon Fraser University. However, the EVSC Program is distinct from these other units by its breadth of curriculum and pedagogical objectives, in particular, its interdisciplinary approach to teaching and learning. Governance of the EVSC Program should strive to maintain this distinction and seek ways to strengthen it. The EVSC will be an independent unit with decision making by committee. However, interests of both the EVSC and home Departments will be considered in decisions.

I – Membership

1. The Director of the Environmental Science Program is appointed by the Dean of Environment upon the advice of the Associate Dean of Environment for Undergraduate Studies, the Dean of Science, and other interested parties.
2. The Director is not limited to Faculty of Environment faculty.
3. The Chair of the Steering Committee will normally be the director.
4. The remaining eight faculty members of the Steering Committee will be appointed by the Dean of Environment upon the advice of the Director of the Program, the Associate Dean of Environment for Undergraduate Studies, the Dean of Science, and other interested parties, and with due regard to the mix of disciplinary perspectives needed to maintain and develop the program. The distribution of these members will be as follows:
   i) / Two members of the Department of Geography.
   ii) Two members of the School of Resource and Environmental Management.
   iii) One member of the Department of Archaeology.
   iv) One member of the Department of Biological Sciences.
   v) One member of the Department of Earth Sciences.
   vi) One member of the Department of Statistics and Actuarial Sciences.
5. Where possible, one of the faculty Steering Committee members should be a Lecturer of Senior Lecturer.
6. One student in good standing to be named by the EVSC Student Society. They must be a major or honours student in the EVSC Program, and have completed 60 credit hours. Student participation will be excluded from matters involving other students where confidentiality issues may arise.
7. All members of the Steering Committee, including the Director, are voting members.

II – Terms of Office

1. The term of office of the Director will normally be three years, renewable up to a limit of ten years.
2. The terms of office for the remaining Steering Committee members will normally be three years, depending in part on the composition of the Undergraduate Studies Committees of each of the participating academic units.

III – Responsibilities of the Program Director

Directors are to bring their disciplinary expertise and professional experience to support the interests of the EVSC Program and its students. The Program shall be autonomous while respecting the legitimate interests of the participating units. Specific duties of the Director include the following:

1. To work with the support staff in the day-to-day running of the program.
2. To represent the program at meetings of the Dean of Environment's Advisory Committee.
3. To consider and make recommendations to the Faculty of Environment Undergraduate Curriculum Committee (FENV-UCC) on all successfully approved EVSC Steering Committee recommendations and reports pertaining to the Environmental Science Program (see part V, section 8 for details pertaining to successfully approved motions).
4. In cooperation with the EVSC Steering Committee, to consult with Departments that have related programs to ensure those Departments are informed of changes to the EVSC Program and to ensure the EVSC Program is informed about changes to related programs.
5. With assistance from support staff and the EVSC Steering Committee, to identify, recruit, and appoint top-quality instructors and teaching assistants to teach the courses that fall under the Director's purview.
6. To work closely with support staff in advising and consulting students, and in developing the co-op and other program-related employment opportunities, including strategies for professional development and preparation for further studies in graduate school.
7. To work with support staff in promoting the program to prospective students.
8. To foster existing EVSC courses and promote new ones, taking into consideration fiscal realities and possible overlap with outside courses.
9. Where appropriate, to teach courses in the program (especially key introductory and capstone courses).
10. To represent the program at provincial and national meetings of environmental science program directors and other important functions.
11. Chairs and Directors must address their concerns in the same stepwise manner following the same protocol set out in part IV, sections 8-10.
12. To enhance the program in other ways as appropriate.

IV – Responsibilities of the Steering Committee Members

Members are to bring their expertise to constructive discussions aimed at improving the quality and delivery of the program and hence to enhance the educational opportunities for the students. Their specific duties include the following:

1. To work in a collegial manner to update and upgrade the curriculum for the program.

2. In cooperation with the Director, to consult with Departments that have related programs to ensure those Departments are informed of changes to the EVSC Program and to ensure the EVSC Program is informed about changes to related programs.
3. To assist the Director and support staff in identifying and recruiting top-quality instructors and teaching assistants to teach the courses that are taught under the purview of the Director.
4. To assist the Director and support staff in advising and counselling students, developing co-op and other program-related employment opportunities, including strategies for professional development and preparation for further studies in graduate school.
5. Where appropriate, to teach courses in the program.
6. To be willing to serve as alternates to the Director at provincial and national meetings of environmental science program directors and other important functions.
7. To provide advice to the Director on course substitutions within streams of the program, in cases where availability of a required course for a particular student is for legitimate reason a problem.
8. Disputes of a programming or curriculum nature must first be addressed to the Curriculum Committee. The Curriculum Committee is advisory only. All other disputes must first be addressed to the Director.
9. Only if disputes cannot be resolved by neither the Curriculum Committee nor the Director should the Associate Dean and finally the Dean become involved.
10. The Dean's decisions on all matters are final.
11. To assist the Director in other ways as appropriate.

V – Operation

1. There shall be meetings of the Steering Committee at least once per semester, and additionally as needed.
2. The time, place, and agenda of any meeting shall be set by the Chair.
3. The Chair shall be obliged to call a meeting within 10 days at the request of any Steering Committee member, such request having been made in writing with the business to be discussed stated and any necessary supporting documents supplied.
4. The quorum for a regular meeting shall consist of at least 75% of the voting membership of the Steering Committee.
5. In the case of the anticipated absence of a voting member at any Steering Committee meeting, it is the responsibility of the Chair of that member's academic unit to ensure that an alternate attends the meeting.
6. The Steering Committee is at liberty to invite guests to attend and participate in meetings when the presence of such a guest serves a reasonable purpose. Such guests are not eligible to vote on Committee recommendations and reports.
7. The Curriculum Manager will act as a resource person providing assistance both internally to the Steering Committee and between the Steering Committee and the Curriculum Committee. Keeping fully updated and appraised of the actions and success of other Environmental Science programs is vital in this regard.
8. Recommendations and reports to the FENV-UCC shall be by majority decision of the Steering Committee members if they arise out of a regular business item on the agenda of a regular meeting. An effort to reach consensus shall be made before voting. The Chair shall prepare and deliver the majority report to the FENV-UCC at its next meeting. If

there is a dissenting minority, it may present its own report to the FENV-UCC at the same meeting. The reports should be concise and give the reasons for the views of the Committee.

9. Changes to the terms of reference for this Committee shall require efforts to reach a full consensus of the Committee members. If a consensus is not possible after all reasonable efforts have been made, approval of changes will require consent from at least 75% of the voting membership of this Committee, or can be made at the discretion of the Dean of the Faculty of Environment.

Appendix H: Supporting Letters

Attached supporting letters for the School of Environmental Science from:

- **Dr. Brent Ward, Department Chair, Earth Sciences**
- **Dr. Mark Roseland, Director, Centre for Sustainable Development**
- **Dr. Tom Loughin, Department Chair, Statistics and Actuarial Sciences**
- **Dr. Elizabeth Elle, Department Chair, Biological Sciences**
- **Dr. David Burley, Department Chair, Archaeology**
- **Dr. Sean Cox, Director, Resource and Environmental Management**
- **Dr. Tracy Brennand, Chair, Geography**

SFU

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July 7th, 2017

Dr. Brent Ward
Department Chair, Earth Sciences
Simon Fraser University
8888 University Drive
Burnaby, BC V5A 1S6

Dear Brent,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because your department offers courses that are part of the program requirements and/or options, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes ✓ No _____

Brent Ward
Signature

Aug. 9, 17
Date

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July 7th, 2017

Dr. Mark Roseland
Director of the Centre for Sustainable Development
Simon Fraser University
TASC2 8800
8888 University Drive
Burnaby, BC V5A 1S6

Dear Mark,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because you are a member of DAC, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes X No _____

Mark Roseland

Signature

August 14, 2017

Date

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July 7th, 2017

Dr. Tom Loughin
Department Chair, Statistics and Actuarial Science
Simon Fraser University
8888 University Drive
Burnaby, BC V5A 1S6

Dear Tom,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because your department offers courses that are part of the program requirements and/or options, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes ✓ No _____

_____ 24 Jul 17

Signature Date

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MEMORANDUM

ATTENTION	Dr. Ingrid Leman Stefanovic Dean, Faculty of Environment	**DATE**	July 18, 2017
FROM	Dr. Elizabeth Elle Chair, Department of Biological Sciences	**PAGES**	1/2
RE:	Proposal for a School of Environmental Science		

Thank you for soliciting comments from Biological Sciences as the Faculty of Environment considers how to move forward with improving the undergraduate major in Environmental Science and Master degree in Ecological Restoration.

I served on the Steering Committee of EVSC many years ago, and teach some of the courses that contribute to the program. In considering your proposal I consulted with my Associate Chair, David Green, who in addition to his within-department duties currently serves on the EVSC Steering Committee. You may know that David contributed greatly to earlier versions of the Educational Goals for the program.

Your document nicely captures the challenges EVSC has been dealing with for many years—the lack of a home, the difficulties with offering interdisciplinarity in an institution dominated by departmentalized disciplines, and even the challenge of overlap with the Ecology, Evolution, and Conservation Stream in Biological Sciences. The proposal to create a School to house EVSC and MER addresses some of these challenges (though not the latter one) and Biological Sciences is generally supportive of moving forward with it.

However, we encourage further curriculum revision of the Applied Biology stream to better differentiate it from our program. Students would benefit from a clearer identity of the Applied Biology stream, and EVSC has a great opportunity to add interdisciplinarity to the stream as a way to differentiate it from our science-focused one. The propagation of Life Sciences across campus (and resulting overlap with Biological Sciences) has been an ongoing challenge for my department. While it is exciting for life scientists to have more colleagues at SFU, it also leads to some tension around the mission and identity of Biological Sciences as a department and our decisions regarding faculty renewal—which can wind up affecting EVSC. Differentiating the programs would make a big difference for both BISC and EVSC.

Regarding faculty renewal, I hope there can be ongoing dialogue about appointments to the new School. You note that there may be opportunity for shared hires, and I am supportive. I would argue, though, that the challenge of hiring into departments isn't that people "form allegiance" to units that hire them (pg. 20). Rather, faculty are hired to meet needs identified by particular units, making their fit to other units less than perfect. This issue will require

careful attention moving forward so that faculty renewal can be truly collaborative. The document also suggests some people may choose to move their appointment to the School, and I would say that without knowing more, this is of potential concern. I would hope that SFU will engage in a study of the structure of Life Science at our institution (including Applied Biology) and first determine our institutional priorities moving forward and then ways to support both disciplinary and interdisciplinary units without negative impacts.

The potential for faculty interest in changing appointments is one that is often approached with trepidation. You suggest movement is unlikely (pg. 21), in part because existing research programs "benefit from identities within their own departments". I disagree. This statement simply does not capture the reality that there is a large amount of interdisciplinarity already at SFU. I think researchers' identities can be very collaborative, depending on the individual, and it's not their department that determines this. Research programs of faculty in my unit certainly benefit from the space provided by their Faculty (through the VPA), but in many cases their closest research colleague is in a department or Faculty other than Biological Sciences (including FENV). There may indeed be interest in a reorganization of appointments to better align with how people identify themselves, including how they choose to interact across SFU. I think this could be exciting, if we have the stomach for it, but it must be done carefully and respectfully.

Again, I am supportive of this move and agree that creation of a new School will benefit EVSC and MER. I hope that we can continue to build a collaborative relationship moving forward, to ensure that content overlap is diminished, and that faculty renewal (or changes in appointment) proceeds in a way that is beneficial to SFU.

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July 7th, 2017

Dr. Elizabeth Elle
Department Chair, Biological Sciences
Simon Fraser University
8888 University Drive
Burnaby, BC V5A 1S6

Dear Elizabeth,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because your department offers courses that are part of the program requirements and/or options, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes ✓ No _____

Signature

18 July 2017
Date

SFU
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July 7th, 2017

Dr. David Burley
Department Chair, Archaeology
Simon Fraser University
8888 University Drive
Burnaby, BC V5A 1S6

Dear David,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because your department offers courses that are part of the program requirements and/or options, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes ✓ No _____

David Burley
Signature

18/7/17
Date

SFU

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July 7th, 2017

Dr. Sean Cox
Director of Resource and Environmental Management
Simon Fraser University
8888 University Drive
Burnaby, BC V5A 1S6

Dear Sean,

I am writing to you regarding a proposal that the Faculty of Environment wishes to take forward to Senate, to convert the existing Environmental Science Program into a School of Environmental Science.

With approximately 300 program enrolments, interest in the undergraduate program is high. In addition, we need a home for our recently-approved Professional Masters in Ecological Restoration, offered jointly with BCIT, now approaching its third year. A School seems to be an optimal option as we move forward to better accommodate both undergraduate and graduate offerings.

More details are contained in the attached proposal. Because your department offers courses that are part of the program requirements and/or options, we would like to receive your approval in advance of proceeding to SCUP and Senate. In fact, this was the suggestion of our current Vice-President, Academic, and Provost, Dr. Peter Keller.

Please indicate below (yes or no) whether you are prepared to support this proposal. Let me know if you have any questions or concerns, of course. Also, feel free to add any relevant comments on a separate sheet, if necessary.

Kind regards,

I. Stefanovic

Ingrid Leman Stefanovic,
Dean

I am willing to support the Faculty of Environment's proposal to convert the Environmental Science undergraduate program into a School of Environmental Science.

Yes ✓ No _____

_____ 7 Sept 2017

Signature Date

SFU
Faculty of Environment
Department of Geography

Tracy Brennand, Chair
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MEMORANDUM

ATTENTION Ingrid Stefanovic, Dean FENV
DATE 4 October 2017
FROM Tracy Brennand, Professor & Chair, GEOG
PAGES 2
RE: School of Environmental Science proposal (June 2017)

The Department of Geography is fully supportive of the Environmental Sciences Program and the Masters in Ecological Restoration Program. The Geography Department as a whole has considered the proposal for a new School carefully and its faculty realize it is not in the best interests of the Department to stand in the way of this proposal, given the weight of administrative support we have been told is behind it. Geography faculty, however, do not find the rationale for the creation of a new School fully compelling and anxieties remain around the creation of such a School. Departmental support for the proposal could be stronger if various concerns we have previously raised were better addressed. These are summarized below.

The main reasons given for creating a School of Environmental Science focus on: 1) the need for a physical home for these programs and students given their growth, 2) the wish to enhance cohort identity and community, 3) the need to balance interdisciplinary and disciplinary engagement, 4) the need for teaching and administrative capacity, and 5) marketability for enrolment and investment opportunities. Goals 1 and 2 have been largely addressed outside of School creation (as acknowledged in the proposal): the Dean has already reorganized FENV space to create a student lounge and centralize the Director's, Lecturer's, TAs and administrative staff offices; the Director and Steering Committee have already adjusted the EVSC program to include a sequence of cohort-building courses (though it is a waiting game to see the direction of disciplinary impacts). The Geography Department applauds these decisions because they are in the best interest of EVSC and MER students. Goal 3 is central to the TOR of the current programs' steering/curriculum committees. Administrative staff (academic program management, budget, recruitment and retention) are currently in the FENV Dean's Office and are to remain so with a new School, though, presumably, could be relocated or reallocated in future with limited budgetary or functional impact (Goal 4). Geography has thus far provided technical and equipment support for EVSC course instruction; the proposal is mute on continuation of this service and associated budget implications. The Department of Geography acknowledges the need for additional teaching capacity (Goal 4), particularly given the new EVSC cohort courses, some of which are likely to require multiple offerings per year. It is challenging to accept that creating a new School will be truly budget neutral. Some existing programs at SFU (e.g., Urban Studies) do have faculty appointed and cross appointed to them and appear to function well. Given these acknowledgements, Goal 5 is probably the most compelling, along with the stated perception by some members of the EVSC steering committee

that they will feel interdisciplinary collaboration could be harmed by an alternative model of unit merger.

In response to the April 2016 draft of the EVSC School proposal, the Department of Geography raised several concerns (memo to the Dean and Director, 26 Sept 2016) chief amongst them anxieties around: 1) identity – the potential for faculty migration on the one hand, or exclusion and marginalization on the other; 2) governance – the role of disciplinary voices in interdisciplinary School governance as EVSC faculty grow in number; and 3) budget, for example, the impact of Faculty level FRP decisions given the need to populate the EVSC School with cross-appointments in the current fiscal environment. No response to this memo was received. The June 2017 draft of the proposal touches on these issues but does not erase them. Faculty relocation will be decided on a case-by-case basis. The current Dean is not supportive of group migrations of faculty, but there are no guarantees beyond the current Dean. On the other hand, the intended barriers to migration will enhance the perception of marginalization and exclusion of some Geography faculty who identify as Environmental Scientists. The proposal does not address a vision for a governance plan for an EVSC School as its faculty compliment grows. FRP concerns would be more muted if the FENV budget was more realistic.