

1.3.4 Financial Viability

- No item within this proposal requires the hiring of any new staff or Faculty .
- This proposal contains no requirement for new facilities or equipment.
- The proposed changes require that 23 courses receive a change in title or description, 7 courses be removed, and 8 new courses be added (note that, of the 8 newly proposed courses, 3 are in the Wood Science specialization as electives). Hence, changes to current teaching-loads will be minimal.
- This proposal will not have an adverse effect on the enrolment of other programs currently offered at Lakehead University. At present, Lakehead University has a successful environmental science/studies program, and we cannot foresee any conflict with this program; for the student demand for “environmental science/studies” is very different from the student demand for “environmental management” (see Figure I and its supporting document).

- The financial costs of implementing this proposal will be minimal, involving the changing of letterhead, signage, new marketing pamphlets, new web-page, etc.

1.3.5 Student Demand

- The evidence for student demand in Natural Resources Management and Environmental Management is presented in Figure I and its supporting document (the reader is encouraged to download and read this document as a .pd- file—see footnote under Figure 1 for web-page). The trend across Canada has been one of increasing demand.
- We expect to increase enrolment into our programs and anticipate that, within 5 years, 1st-year enrolment should exceed 100 students, with at least 50% of new students attracted by our Environmental Management Program.

1.3.6 Societal Need

- Evidence that environmental employment is a significant and growing component of the Canadian labour market is provided in

another document, authored by ECO Canada.² Therein, the following trends can be observed:

- “Workers with a broader range of skill-sets have a broader range of career options and are increasingly in demand by sectors with growing environmental issues.” (p. 16)
- “Ontario accounts for the largest percentage of environmental employees, with 42 percent of environmental employees located in Ontario.” (p. 11)).
- 31 % of employees in environmental employment are classified in the occupational group “management” – as distinct from Trades and Technical (50%), administrative (11%), and sales and services (8%).
- Hence, we are convinced that there is a strong demand in Canadian society for graduates from our proposed undergraduate programs.

1.3.7 Duplication

- In Ontario, the Faculty of Forestry and the Forest Environment is the only academic institution that provides the academic requirements for students to be certified as Registered

² ECO Canada. 2007. Profile of Canadian environmental employment. 45 pages. [downloadable as a .pdf document from: http://www.eco.ca/pdf/LMI_Industry_Final_2007_EN.pdf]

Professional Foresters. This established managerial perspective and history **uniquely positions us** to expand, with significant momentum, into the field of Environmental Management .

1.4 Restructured Honours Bachelor of Science in Forestry

1.4.1 Learner Outcomes

Upon completion of the Forest Management Specialization, students will be able to:

Comprehend various fire-disease-pest issues challenging the health of ecosystems.

Demonstrate an understanding of forest operations and forest renewal.

Evaluate the impact of modeling on the decision making process.

Demonstrate comprehension between social, economic and ecological factors on public and private lands.

Apply the concepts of ethics to all facets of forest intervention including professionalism and proper codes of conduct.

Explain probable impacts and feasible adaptation measures to climate change.

Synthesize options in forest management to meet current societal demands and in anticipation for future change.

Evaluate multiple-use of public lands including both conservation and intensive forest management.

Effectively communicate natural resource and environmental issues orally, in writing and by on-line means.

Assess the role of healthy ecosystems, viable economic endeavors, governments, industry and civil society on a global scale as it relates to the environment.

Explain the advantages of forest stewardship and certification.

Create management plans for multi-size forest estates on both public and private lands including urban forests, conservation authorities, community forests, industrial sustainable forest licenses.

Synthesize literature, experience and practical research discovery into hypotheses testing and independent theses creation.

Upon completion of the Forest Health and Protection Specialization, students will be able to:

Recognize, analyze and plan for links between terrestrial ecosystems and wildlife.

Describe basic harvest and renewal cycles and identify links to forest health.

Distinguish between and apply different sampling protocols suitable for natural resources to assess health and/or risk.

Identify agents and symptoms of economically and ecologically important diseases of trees.

Identify agents and symptoms of economically and ecologically important pests of trees.

Describe pertinent features of fire as a disturbance and employ tools for control and prevention.

Apply basic quantitative tools to assess outcomes of forest health and protection decisions (e.g. herbicide application and salvage harvest, respectively).

Upon completion of the Wood Science Specialization, students will be able to:

Appreciate the management of forests as an economic activity and to apply the tools of economic analysis for production and marketing of forest products.

Understand the basics of wood properties, wood classification and wood processing.

Learn advanced technologies in wood processing and manufacturing through lectures and hands-on projects.

Gain hands-on knowledge and experience on portable milling machines, and understand patterns, quality, and grading of lumber produced from different milling techniques.

Acquire knowledge in a specific area of wood science

Gain hands-on knowledge and experience of testing mechanical, chemical and physical properties of wood products.

Understand wood properties and wood quality.

Identify and understand current and new wood products and what dictates changes in the industry.

Apply the concepts of stress and strain, shear forces and bending moments under static and dynamic loading to wooden load bearing members.

Assess the properties of timber as an engineering material, when it is used with concrete framework.

Understand wood morphology and its chemical composition.

Apply the fundamentals of marketing principles of forest products for developing marketing intelligence for the forestry sector.

Evaluate the main theories in international trade of forest products, and understand their empirical relevance and role for Canada's economy.

Apply the tools of economic analysis for production and marketing of bio-products.

Apply the concepts and techniques of market opportunity identification to new venture planning.

Assess the customs and conventions, opportunities and threats, and operational factors in entering international markets.

1.4.2 Alignment with University Mission

1.4.2.1 Institutional Appropriateness

- This proposed reorganization of the Bachelor's of Science in Forestry program is consistent with Lakehead University's objective to develop high quality academic programs that are aligned with the mission of the university and are financially sustainable. Similar to the objective of the proposed Bachelors of Environmental Management program, our major objective is to increase enrolment and improve retention, thus contributing to Lakehead University's academic sustainability.
- This proposed reorganization requires students to take core courses outside of our Faculty and fits into the broader array of program offerings at Lakehead University.
- Resources required for this proposed reorganization are already in existence.
- Canadian society's demand for Professional Foresters remains strong. The Canadian Council of Forest Ministers observed:³

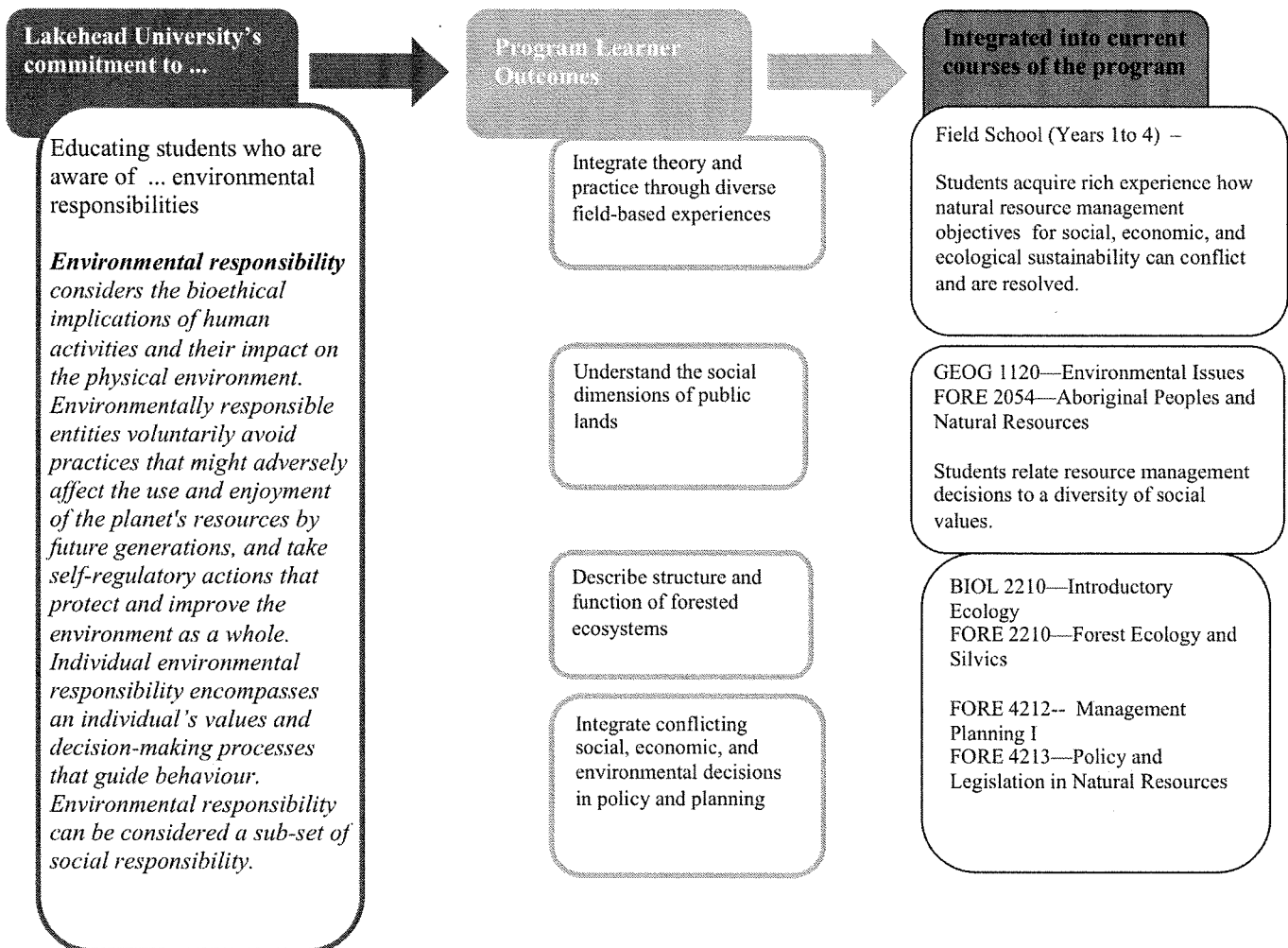
Employers predict a 3% increase nationally in the number of foresters employed over the next 5 years. While not an immediate crisis in terms of numbers currently graduating, these results combined with an aging demographic, early retirement, and an older forester demographic in management positions (not part of the survey), suggests the need to produce close to 300 forestry university graduates nationally per

³ Canadian Council of Forest Ministers (2004). National Employer Demand Survey for Foresters and Forestry Technicians. 26 pp. This document may be found on-line at: http://www.nafaforestry.org/forest_home/documents/CCFM-HRdemand.pdf

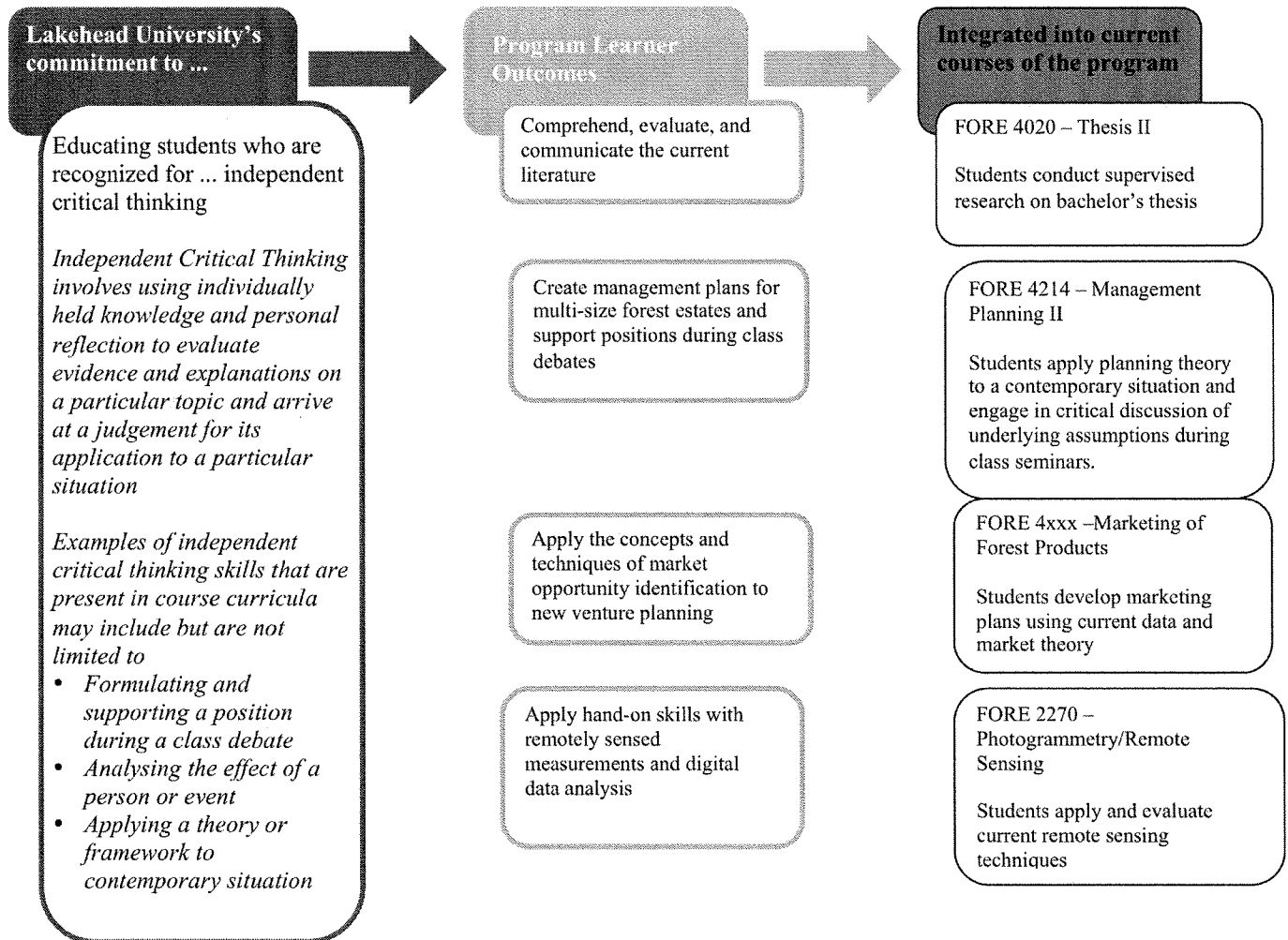
year during the years of highest retirement. As it takes 4 years to graduate a potential recruit, it is therefore important that action be taken to reverse the continuing declining enrollment trend. Without a supply of qualified foresters, the sustainability of Canada's forests may be put in jeopardy.

1.4.2.2 Commitment Statements

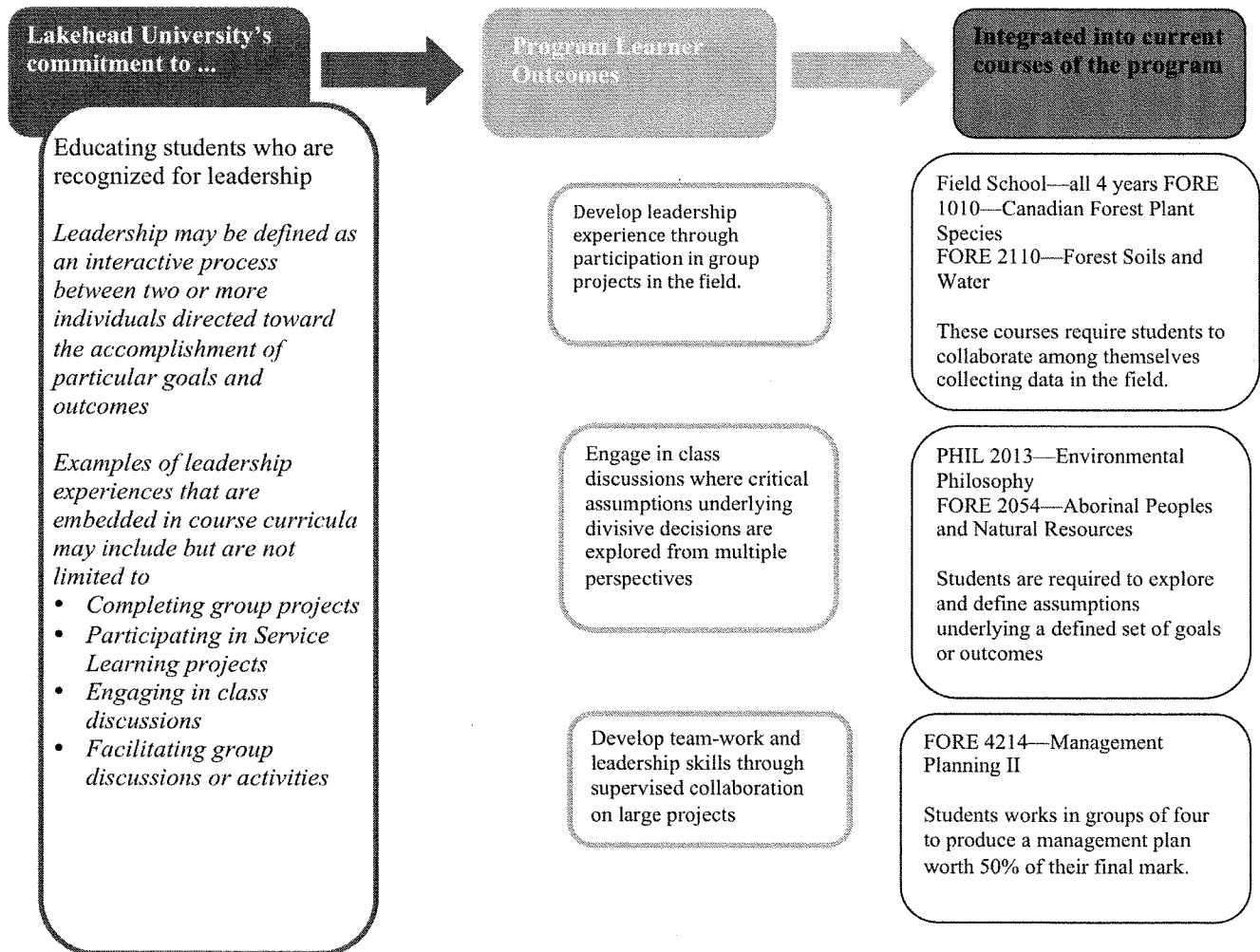
Environmental



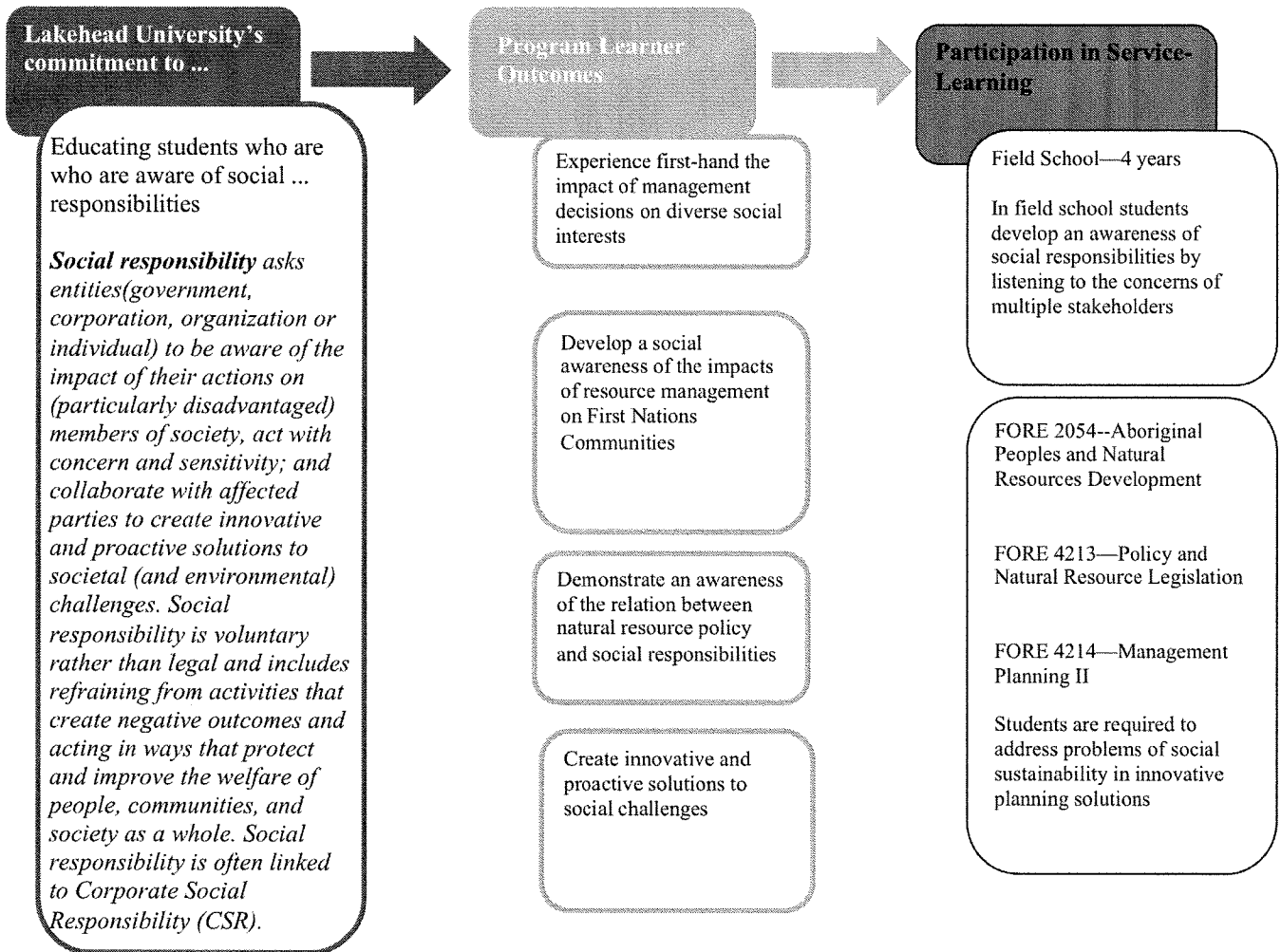
Independent Critical Thinking



Leadership



Social Responsibility



1.5 Review of Proposed Curricula

We divide our description of the undergraduate program changes into three parts:

1. the common foundational courses required in years 1 and 2;
2. the specialization courses required in the H. Bachelor of Environmental Management; and
3. the specialization courses required in the H. Bachelor of Science in Forestry.

1.5.1 Common Foundational Courses for Years 1 and 2

The common foundational courses for years 1 and 2 are listed in Table 1. Note that the course-codes ending in “xxx” are newly proposed courses, at present without a defined code number.

Table 1: Common foundational courses for years 1 and 2

Common Year 1	Common Year 1
Term 1	Term 2
1st Year Field School (FORE 1094)	
Writing Across the Curriculum I (FORE 0190)	
Canadian Forest Plant Species (FORE 1010)	Crust of the Earth (GEOL 1131)
Natural Resources Inventory I (FORE 1110)	Natural Resources Biometrics I (FORE 1330)
Plant Biology (BIOL 1130)	Animal Biology (BIOL 1110)
Environmental Issues (GEOG 1120)	Environmental Issues (GEOG 1120)
Chemistry (CHEM 1050 with lab component OR 1110)	Basic Economics (ECON 2014)
Common Year 2	Common Year 2
Term 1	Term 2
2nd Year Field School (FORE 2094)	
Writing Across the Curriculum II (FORE 0290)	
Introductory Ecology (BIOL 2210)	Forest Ecology and Silvics (FORE 2210)
Natural Resources Biometrics II (FORE 2150)	Forest Disturbances (FORE 2xxx)
Forest Soils and Water I (FORE 2110)	Environmental Philosophy (PHIL 2013)
Forest Genetics (FORE 2xxx)	Tree Development and Function (BIOL 2050)
Photogrammetry/Remote Sensing (FORE 2270)	GIS in Management Planning (FORE 2350)

In observing Table 1, one should note that: a) the “Writing Across the Curriculum” courses are non-credit courses that are taught within another course; and that b) the “Field School” courses occur two weeks prior to the start of the Fall Term.

Hence, the workload expected of each student during each year should be regarded as equivalent to 5 full courses. The “Field School” courses, it should also be noted, do push the total course-load per year beyond the level of 5 full course equivalents; but we are of the opinion that the learning outcomes of these programs could not be satisfied without an adequate field-school component in the curriculum.

1.5.2 Required 3rd and 4th-Year Courses in the Honours Bachelor of Environmental Management

The required third- and fourth-year courses for each specialization of the Honours Bachelor of Environmental Management program are presented in Table 2.

Table2: Required 3rd and 4th-year courses in the three specializations of the Honours Bachelor of Environmental Management program.

Honours Bachelor of Environmental Management		
Wildlife Conservation and Management	Conservation Planning and Management	Directed Specialization
Year 3 (Term 1)		
3 rd Year Field School	3 rd Year Field School	3 rd Year Field School
Writing Across the Curriculum III	Writing Across the Curriculum III	Writing Across the Curriculum III
Aboriginal Peoples and Natural Resources (FORE 2054)	Aboriginal Peoples and Natural Resources (FORE 2054)	Aboriginal Peoples and Natural Resources (FORE 2054)
Fish and Wildlife Fundamentals (FORE 3116)	Restoration Ecology (FORE 3xxx)	Canadian Politics(POLI 2213 or 2212)
Natural Resources Inventory II (FORE 3218)	Wetland Ecology (BIOL 4430)	ELECTIVE***
ELECTIVE*	Climatology (GEOG 2331)	ELECTIVE***
ELECTIVE*	FREE ELECTIVE	ELECTIVE***
Year 3 (Term 2)		
Geographical Inquiry and Interpretation (GEOG 2251)	Geographical Inquiry and Interpretation (GEOG 2251)	International Resource Conservation (FORE 3251)
Decision Support Tools (FORE 3212) OR Remote Sensing (FORE 4217)	Remote Sensing (FORE 4217)	Forest Recreation Management (ORPT 3290)
Evolutionary Concepts (BIOL 3671)	Decision Support Tools (FORE 3212)	ELECTIVE***
Habitat Planning (FORE 3219) OR Biogeography (BIOL 3151)	Biogeography (BIOL 3151)	ELECTIVE***
Dendrology II (FORE 2050)	FREE ELECTIVE	ELECTIVE***
Year 4 (Term 1)		
4 th Year Field School	4 th Year Field School	4 th Year Field School
Thesis I (FORE 4xxx)	Thesis I (FORE 4xxx)	Thesis I (FORE 4xxx)
Management Planning I (FORE 4212)	Management Planning I (FORE 4212)	Management Planning I (FORE 4212)
Fish and Wildlife Practice (FORE 4251)	Policy & Legislation in Natural Resources (FORE 4213)	Policy & Legislation in Natural Resources (FORE 4213)
ELECTIVE*	ELECTIVE**	ELECTIVE***
ELECTIVE*	FREE ELECTIVE	ELECTIVE***
Year 4 (Term 2)		
Thesis II (FORE 4020)	Thesis II (FORE 4020)	Thesis II (FORE 4020)
Management Planning II (FORE 4214)	Management Planning II (FORE 4214)	Management Planning II (FORE 4214)
Environmental Assessment (FORE 4250)	Environmental Assessment (FORE 4250)	Environmental Assessment (FORE 4250)
FREE ELECTIVE	Public Administration (POLI 3711 or POL 3713)	ELECTIVE***
ELECTIVE*	FREE ELECTIVE	ELECTIVE***

*** Electives in Wildlife Conservation & Management fall into these categories:**

Wildlife Biology--2 courses required from: Ornithology (BIOL 4231), Herpetology (BIOL 4435) or Mammalogy (BIOL 4211)

Zoology--1 course required from: Forest Entomology (FORE/ BIOL 3217), Comparative Animal Physiology I (BIOL 3250), or Animal Behaviour (PSYCH 3511)

Social Sciences--1 course required from: Forest Economics (FORE 2170), Forest Recreation Management (OUTD 3290), Human Dimensions in Parks and Protected Areas Management (OUTD 3812), Park Planning and Management (OUTD 4810), or Water Management (GEOG 4211)

Free Electives (1)

*****Electives in the Directed Specialization fall into these categories:**

1 FCE (at year level 2 or higher) in Arts

3 FCE (at year level 2 or higher) in Forestry or Science

1 FCE Free Elective

Note: All Forestry courses must be selected from those offered within other Forestry streams.

**** Elective in Conservation Planning and Management**

1 course from: Geomorphology (GEOG 2351), Conservation Geography (GEOG 4431) or Water Management (GEOG 4211)

1.5.3 Required 3rd and 4th-Year Courses in the Honours Bachelor of Science in Forestry

Honours Bachelor of Science in Forestry program are presented in Table 3.

Table3: Required 3rd and 4th-year courses in the three specializations of the Honours Bachelor of Science in Forestry program.

Honours Bachelor of Science in Forestry		
Forest Management	Forest Health and Protection	Wood Science
Year 3 (Term 1)		
3 rd Year Field School	3 rd Year Field School	3 rd Year Field School
Writing Across the Curriculum III	Writing Across the Curriculum III	Writing Across the Curriculum III
Aboriginal Peoples and Natural Resources (FORE 2054)	Aboriginal Peoples and Natural Resources (FORE 2054)	Aboriginal Peoples and Natural Resources (FORE 2054)
Silviculture I (FORE 2330)	Silviculture I (FORE 2330)	Silviculture I (FORE 2330)
Natural Resources Inventory II (FORE 3218)	Natural Resources Inventory II (FORE 3218)	Natural Resources Inventory II (FORE 3218)
Forest Economics (FORE 2170)	Forest Economics (FORE 2170)	Forest Economics (FORE 2170)
Forest Operations (FORE 3211)	Forest Pathology (FORE 3213)	Forest Operations (FORE 3211)
Year 3 (Term 2)		
Silviculture II (FORE 3214)	Depositional Environments (GEOL 3410) or Groundwater (GEOL 4137)	Forest Succession (FORE 3215)
Forest Succession (FORE 3215)	Fire Ecology and Management (FORE 2370)	Decision Support Tools (FORE 3212)
Decision Support Tools (FORE 3212)	Decision Support Tools (FORE 3212)	Wood Science (FORE 3178)
Wood Science (FORE 3178)	Forest Entomology (FORE 3217)	ELECTIVE****
Habitat Planning (FORE 3219)	Habitat Planning (FORE 3219)	ELECTIVE****
Year 4 (Term 1)		
4 th Year Field School	4 th Year Field School	4 th Year Field School
Thesis I (FORE 4xxx)	Thesis I (FORE 4xxx)	Thesis I (FORE 4xxx)
Management Planning I (FORE 4212)	Management Planning I (FORE 4212)	Management Planning I (FORE 4212)
Policy & Legislation in Natural Resources (FORE 4213)	Policy & Legislation in Natural Resources (FORE 4213)	Policy & Legislation in Natural Resources (FORE 4213)
Tree Improvement/Conservation (FORE 3131)	Tree Improvement/Conservation (FORE 3131)	Marketing of Forest Products (FORE 4xxx)
ELECTIVE***	Urban Forestry (FORE 4239)	ELECTIVE****
Year 4 (Term 2)		
Thesis II (FORE 4020)	Thesis II (FORE 4020)	Thesis II (FORE 4020)
Management Planning II (FORE 4214)	Management Planning II (FORE 4214)	Management Planning II (FORE 4214)
International Resource Conservation (FORE 3251)	International Resource Conservation (FORE 3251)	International Resource Conservation (FORE 3251)
ELECTIVE***	Environmental Assessment (FORE 4250)	Advanced Wood Science (FORE 4218)
FREE ELECTIVE	FREE ELECTIVE	ELECTIVE****

****List of Electives for Wood Science
In years 3 and 4, there are 4 slots for specialization electives. The students can choose electives from each of the following defined sets:
Wood Science (2 electives)
Portable Milling (Fore 4xxx)
Property, Quality and Testing of Forest/Wood Products (Fore-4xxx) prereq Fore-3178
Urban Forestry (Fore 4239)
Special Topics in Wood Science (Fore 4259)
Chemical Engineering (1 elective under direction of supervisor)
Mechanics of Materials (ENGI 1233)-- with permission of instructor or grade 12U Physics
Chemical Technology of Wood Products (ENGI 1234)
Engineering Technology II (ENG 1535)
International Trade and Marketing (1 elective)
International Trade of Forest Products in the 21st Century (Fore 4xxx) prereq Fore-2170 - offered alternate years
Bio-products & the Economy (Fore 4xxx) prereq Fore-1071
Principles of Entrepreneurship (BUSI 3215)
Entrepreneurial Marketing (BUSI 2514)
International Entrepreneurship (BUSI 3235)
Special Topics in Marketing (Fore 4259)

***List of Electives for Forest Management
Electives must be selected from the following set of courses:
International Forestry (Fore 2310)
Fish and Wildlife Fundamentals (Fore 3116)
Advanced Forest Ecology (Fore 3237)
Applied GIS Techniques (Fore 4259)
Remote Sensing Applications in Forestry (Fore 4217)
Environmental Assessment (Fore 4250)
Forest Harvesting II (Fore 3234)
Forest Harvesting III (Fore 4230)
Urban Forestry (Fore 4239)
Sustainably Managed Forests (Fore 4277)
Water Resource Management (GEOG 4411)
Geomorphology (GEOG 2351)
Conservation Geography (GEOG 4431)
Climatology (GEOG 2331)