

**NEW PROGRAM
UNDERGRADUATE
MAJOR OR CONCENTRATION
Within an Existing Degree Program***

*For a new degree program, use procedures and forms found in the "SCHEV Guidelines"

THIS IS A COVER SHEET FOR A NEW DEGREE PROGRAM. SEE SCHEV FORMS ATTACHED.

Type of Program (Check One):

Major or Concentration (circle one) Name Environmental Science
Department BES Degree B.A., B.S.

Interdisciplinary Program (or Cross-Disciplinary Major or Minor)
Name of Program _____

Date 2/15/08 Resubmission of previous proposal? If so,
Date of previous submission _____

- I. Outline of the proposed major, minor, or concentration. *Attach extra sheets. Please see attached sheets*
- II. New courses which will be proposed as part of this program. *Please see attached proposal sheets*
- GEOG 360 Cultural Ecology**
- ENSC 400 Capstone in Environmental Science**
- III. Rationale for the program:
This major will provide an understanding of the underlying science of our environment and the role of human actions in the environment.

Please see attached "Justification for Environmental Science Major" for additional information.

- IV. Resource Assessment
- A. Estimate additional staff requirements for this program. **New faculty hire in atmospheric sciences.**
- B. Estimate the amount and cost of equipment, library resources, computer hardware and software, and other resources that will be required to carry out this program. **\$1,500**

V. Anticipated enrollment in program after five (5) years. **See attached "Summary of Projected Enrollment"**

VI. Affected Departments or Programs.

If the proposed program changes could have an impact on other departments or programs, the appropriate affected chairs or program directors should be notified of the proposed changes. Where teaching licensure may be affected, the licensure officer should also be notified.

Licensure Officer _____ Date Notified _____

List other departments/programs that might be affected: **Department of Chemistry and Physics, Department of Math, Department of Accounting, Economics and Finance, Department of Health, Recreation and Kinesiology, Department of History, Political Science, and Philosophy**

Individuals contacted and date contacted:

	Date Contacted
Dr. Mellissa Rhoten (Dept. of Chemistry and Physics)	_____ <u>2/25/08</u> _____
Dr. William Abrams (Department of Math)	_____ <u>2/25/08</u> _____
Dr. William Brown (Department of Accounting, Economics and Finance)	_____ <u>2/25/08</u> _____
Dr. Charles Blauvelt (Department of Health, Recreation and Kinesiology)	_____ <u>2/25/08</u> _____
Dr. James Munson (Department of History, Political Science, and Philosophy)	_____ <u>3/3/08</u> _____

VII. Approvals

	Date Rec'd	Signature	Date	Approved
1. Department Curriculum Committee Chair	_____	_____	_____	_____
2. Department Chair	_____	_____	_____	_____
3. College Dean	_____	_____	_____	_____
4. School Curriculum Committee	_____	_____	_____	_____

5. Educational Policy _____
Committee _____

6. Faculty Senate _____

7. Date received by Registrar _____

Proposals must be submitted early enough to reach EPC by March 1 in order to be included in next year's catalog.

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
**FORMAT FOR REVISING ACADEMIC PROGRAM
 TITLE, CIP CODE OR DEGREE DESIGNATION
 COVER SHEET**

1. Institution apply): Longwood University	2. Program action (Check all that apply): Change of program title ___ Change of CIP code ___ Change of degree designation ___
3. Title, existing program	
4. Degree designation, existing program	5. CIP code, existing program
6. Last term and year for granting existing degree	
7. New program title (if applicable) Environmental Science	
8. Degree designation, revised program B.A., B.S.	9. CIP code, revised program 3.0104
10. Term and year of initiation, revised program : 2009	11. Term and year of first graduates, revised program: Spring, 2014
12. Location of program within institution (complete for every level, as appropriate). If any organizational unit(s) will be new, identify the unit(s). Department(s) of Biological and Environmental Sciences <hr style="width: 60%; margin-left: 0;"/> Division(s) of <hr style="width: 60%; margin-left: 0;"/> School(s) or colleges of Cook Cole College of Arts and Sciences <hr style="width: 60%; margin-left: 0;"/> Campus (or off campus site) Farmville, Virginia <hr style="width: 60%; margin-left: 0;"/>	

13. Name, title, and telephone number(s) of person(s) other than the institution's chief academic officer who may be contacted by or may be expected to contact Council staff

regarding the revision.

Dr. Joseph E. Garcia
Professor of Geography and Earth Science
(Chair of Env. Sci. Major Development Committee)
434-395-2588

• **Description of Proposed Program**

The proposed major in environmental science will require 120 credit hours for either a B.A. or B.S. degree. The major will include 41 hours of general education courses, 6-7 hours of additional requirements, 57-65 hours of major requirements and 8-15 hours of electives. Students may take a maximum of 4 credits total in internship and research (see courses listed under Gen Ed Goal 15 below). Beyond 4 credits, such courses must be taken on a pass/fail basis. MATH 267 may be substituted with MATH 260 or MATH 261. Students who complete MATH 261 or MATH 267 are exempt from Gen Ed Goal 5. (*Course prefixes for selected major requirements will be changed to ENSC once this proposal has been approved. Currently, only ENSC 400 carries this new prefix designation.*)

	Credits
A. General Education Requirements	41
MATH 164 is recommended for Gen Ed Goal 5	
Either PHYS 101, PHYS 201, or GNED 162 is recommended for Gen Ed Goal 6	
ECON 314 (Env and Resource Economics) is recommended for Gen Ed Goal 12	
PHIL 316 (Env Ethics) is recommended for Gen Ed Goal 13	
Choose 1 of the following courses as a requirement for Gen Ed Goal 15:	
EASC 490, EASC 492, GEOG 490, GEOG 492, BIOL 492, BIOL 496, CHEM 492, CHEM 496, PHYS 492, or PHYS 496	
 B. Additional Requirements	
<i>B. A. Degree:</i>	6
Humanities	3
Foreign Languages (202 level or above)	3
 <i>B. S. Degree:</i>	7
Mathematics or Computer Science	3
CHEM 111	4
 C. Major Requirements	57-65
<i>1. Core Requirements</i>	34-42
BIOL 121 Unity of Life	4
BIOL 122 Diversity of Life	4
BIOL 341 General Ecology	4
 PHYS 101 General Physics I*	4
or PHYS 201 University Physics I*	(4)
	(* Satisfied if taken for Gen Ed Goal 6)
PHYS 102 General Physics II	4
or PHYS 202 University Physics II	(4)
 CHEM 111 Fundamentals of Chemistry I *	4
	(*may be satisfied by additional degree requirements)
CHEM 112 Fundamentals of Chemistry II	4

MATH 267	Applications of Calculus	4
EASC 275	Intro to Geographic Information Systems	4
EASC 300	The Dynamic Planet	3
ENSC 400	Capstone in Environmental Science	3
<i>2. Integrative courses</i>		14
EASC 355	Climatology	3
EASC 210	Physical Geology (<i>to be reactivated from storage</i>)	4
GEOG/BIOG/EASC 342	Terrestrial Biogeography	4
GEOG 360	Cultural Ecology	3
<i>3. Environmental Science Electives</i>		9
BIOG 304	Microbiology	4
BIOG 361	Aquatic Ecology	4
BIOG/CHEM 412	Biochemistry	4
BIOG 430	Conservation Biology	4
BIOG 435	Advanced Ecology	4
BIOG 471	Ornithology	2
CHEM 305	Organic Chemistry I	3
CHEM 307	Organic Chemistry Laboratory I	1
CHEM 350	Quantitative Analysis	4
CHEM 372	Environmental Chemistry	3
EASC/GEOG 252	Physical Geography	3
EASC/GEOG 261	Meteorology	4
EASC/GEOG 353	Geography of Virginia	3
EASC/GEOG 354	Hydrology	3
EASC/GEOG 358	Map Design and Analysis	4
EASC 363	Physical Oceanography	4
EASC/GEOG 410	Geomorphology	3
ECON 314	Environmental and Resource Economics	3
HLTH 400	Environmental Health	3
MATH 270	Introductory Statistics	3
PHYS 324	Thermodynamics	4
D. General Electives		
<i>B. A. Degree:</i>		8-12
<i>B. S. Degree:</i>		11-15

- **Learning Outcomes and Assessment for the Environmental Sciences Major:**

Learning outcomes for the proposed major in environmental science will include skills and knowledge within specific areas. Considering skills, through this major, students will be able to utilize **scientific reasoning** to formulate research questions, design experiments, and interpret results. Students will also apply **interdisciplinary problem solving** skills to analyze and critique environmental research and cultural issues. As part of their ability to solve interdisciplinary problems using scientific reasoning, students will master techniques in the following three categories: 1) **Analytical techniques** (such as statistics, analytical chemistry, and computer modeling) that may be applied in a laboratory setting, 2) **Field techniques** (such as biological, hydrological, geological, and atmospheric sampling) that require knowledge and experience in hands-on methods in the environment, 3) **Geospatial techniques** (such as GIS, aerial photography, and GPS) that demonstrate expertise in new technologies prevalent with environmental science.

Students will also learn knowledge of environmental science content. Through this major, students will develop a geographical approach to the study of the environment focusing on the importance of spatial and temporal scales in scientific analysis. Students will be able to communicate current and prior conditions of the regional and global environments. Students will be able to critically evaluate causes and consequences of human actions in the environment. Students will be able to analyze interconnections between physical and biological processes within the earth system. Students will be required to earn a C- minimum in the following courses: BIOL 341, EASC 275, EASC 300, ENSC 400, and the four integrative courses for a degree.

Assessment of student learning will be conducted in a capstone course ENSC 400 for upper level undergraduates. This assessment will use a major field test or equivalent and will contribute to the institution's overall assessment of scientific literacy.

- **Benchmarks**

The benchmark by which the program will be deemed successful will be meeting the projected enrollments and graduation rates by target year 5 of the program's existence. (please see attached "Summary of Projected Enrollments in Proposed Program"). If these anticipated enrollments are not met, an initial response will be to conduct campus wide student surveys to determine how enrollments/graduate rates can be improved.

• **Justification for Environmental Science Major**

The effects of human actions on the environment have been receiving increasing attention over the past few decades. While this awareness has often taken the form of popular media (such as the recent record-breaking global *Live Earth* concerts or the Oscar-winning documentary *An Inconvenient Truth*), the scientific community has steadily observed the impacts of human actions on many aspects of the earth system including the atmosphere, biosphere, hydrosphere, and geosphere. Recently, the Intergovernmental Panel on Climate Change also released the Fourth Assessment Report on the scientific state of knowledge on climate. This report has also achieved great acclaim by receiving a Nobel Peace Prize for 2007. Amongst its many important findings, the 450 scientists from more than 130 countries who author the report now find that the recent decadal warming is more than 90% likely due to human activity. This report highlights needed expertise to guide governmental policy at not only international levels, but also at regional and state levels of government. Recently, Timothy M. Kaine, the Governor of Virginia, signed Executive Order 59 establishing The Governor's Commission on Climate Change calling for an inventory of Virginia's greenhouse gas emissions, an assessment of the impact of climate change on state resources and inhabitants, and recommended actions to achieve a more sustainable society. While enhanced levels of greenhouse gases are clearly a global concern, many other environmental issues are regional and local in extent. For instance, water quality in the Chesapeake Bay is directly affected by those who live in the states comprising its watershed, including Virginia. Or, over a smaller area, the distribution and extent of natural areas affects regional biological diversity. From local to global scales, scientists and technicians who study our environment have been and will remain crucial to elucidating the interconnections between the biological and physical world as well as the impacts of human actions on these processes. For this reason, a degree in environmental science would strengthen the ability of Longwood University students to serve as citizen leaders whether they assist in their local community or our global community.

However, a thorough scientific understanding of our environment is more difficult than may typically appear from popular media. Because of the interconnections present in our world, an environmental scientist must have a core understanding of biology, geology, chemistry, meteorology, and culture. For this reason, environmental science is inherently an interdisciplinary field of study and cannot be fully appreciated by only studying one component. Accordingly, this proposal sets forth a new interdisciplinary undergraduate major in environmental science, the first at Longwood University. This major will provide an understanding of the underlying science of our environment and the role of human actions. Additionally, Longwood University is uniquely situated to impart a geographical focus to the study of our environment because of the expertise of faculty members present in the Department of Biological and Environmental Sciences. Combined with expertise of other contributing faculty members, this major will facilitate Longwood University's ability to provide needed skills in several areas. First, Longwood University will be able to offer an

endorsement in earth science for secondary teachers. Second, Longwood University would be able to enhance the teaching of geography within Virginia. Third, Longwood University would be able to impart needed environmental skills, including geospatial technology and analysis. For example, geographical information systems or GIS is considered a 'High Growth Industry' by the U.S. Department of Labor. Additionally, other environmental fields, such as environmental science and protection technicians are also considered amongst the fastest growth occupations (Zupek 2007). In particular, four career paths that are possible with this major (environmental scientists, hydrologists, geoscientists, and atmospheric scientists) were recently ranked amongst the top six fastest growing careers in science and biotechnology (Balderrama 2007). Finally, this major would provide a means to re-organize existing minors in geography, earth science, and environmental studies currently offered by Longwood University.

References

Balderrama, Anthony. 2007. *Top 10 Jobs in Science and Biotech*. CareerBuilder.com February 13, 2008.

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Contribution of Working Group I of the Fourth Assessment Report of the IPCC. 2007. *Climate Change - 2007: The Physical Science Basis*. Edited by S. Solomon, D. Quinn, M. Manning, M. Marquis, K. Averyt, M. M. B. Tignor, and H. L. Miller. Cambridge University Press, New York.

Employment and Training Administration. 2008. *High Growth Industry Profile: Geospatial Technology*. U.S. Department of Labor. Thursday January 17, 2008.

http://www.doleta.gov/brg/Indprof/geospatial_profile.cfm

Gore, Al. 2006. *An Inconvenient Truth*. A Documentary Directed by Davis Guggenheim. Paramount Classics and Participant Productions.

Kaine, Timothy M. 2007. *The Governor's Commission on Climate Change*.

http://www.governor.virginia.gov/Initiatives/ExecutiveOrders/2007/EO_59.cfm Office of the Governor Timothy M. Kaine. Commonwealth of Virginia.

Phillips, S. 2006. U.S. Geological Survey Chesapeake Bay Studies: *Scientific Solutions for a Healthy Bay and Watershed*. USGS Factsheet 2006-3046. <http://pubs.usgs.gov/fs/2006/3046/> Department of Interior. United States Geological Survey.

SOS. July 7, 2007. *Live Earth: The Concerts for a Climate in Crisis*. <http://www.liveearth.org/>

Zupek, R. 2008. *30 Top Jobs of 2008*. CareerBuilder.com November 1, 2008.

<http://www.careerbuilder.com/JobSeeker/careerbytes/CBArticle.aspx?articleID=796>

• **Employment Demand**

Local, State, and National Employment, Employment Prospects, and Starting Salaries in the Environmental Sciences, 2004-2016

Local

- At the local level, environmental scientists provide a variety of services in county and city government, including:
 - erosion and sediment control
 - public works (water, sewage, transportation, etc.).
 - rural and urban planning
 - sanitation (soil perk testing)
 - water quality
- Many positions with county and city government also benefit from a familiarity with plan review, map interpretation, and GIS skills. (Hardin)

Virginia

- Employment in the environmental sciences at the state level is broken down into several subcategories:
 - atmospheric scientists
 - environmental science and protection technicians
 - environmental scientists and specialists
- Employment of environmental scientists in 2004 totaled 4,190:
 - 3,344 environmental scientists and specialists
 - 720 environmental science and protection technicians
 - 126 atmospheric scientists
- An estimated 176 job openings are expected annually as a result of growth and from replacement
- Employment growth within the environmental sciences is projected to average 2.26% annually over the coming decade (state employment is projected to grow at least 1.60% annually), with the greatest growth among atmospheric scientists (3.02%), then environmental science and protection technicians (2.43%), and environmental scientists and specialists (2.19%)
- Starting salaries for environmental scientists average \$43,532 and range from \$58,652 for atmospheric scientists to \$24,681 for environmental science and protection technicians (Virginia Employment Commission)
- Numerous agencies and organizations within the Commonwealth employ or potentially could employ environmental scientists, including:
 - Agriculture and Consumer Services (Department of)
 - Chesapeake Bay Commission
 - Chesapeake Bay Local Assistance Department
 - Chesapeake Bay Program
 - Conservation and Recreation (Department of)
 - Cooperative Extension Service
 - Drinking Water Office
 - Emergency Management (Department of)
 - Energy Management (Department of)
 - Environmental Quality (Department of) (DEQ)
 - Forestry (Department of)

- Game and Inland Fisheries (Department of)
- Geographic Information Network
- Hampton Roads Sanitation District Commission
- Health (Department of)
- Historic Resources (Department of)
- Marine Products Board
- Marine Resources Commission
- Mines, Minerals and Energy (Department of)
- Science Museum of Virginia
- Soil and Water Conservation (Department of)
- State Parks (Department of)
- Transportation (Department of) (VDOT)
- Various regional Planning district Commissions
- Virginia Coalfield Economic Development Authority
- Virginia Institute of Marine Science (VIMS)
- Virginia Museum of Natural History
- Virginia Resources Authority
(Virginia)

United States

- Employment in the environmental sciences at the national level is broken down into several subcategories:
 - atmospheric scientists
 - environmental scientists and hydrologists
 - geoscientists
- Employment of environmental scientists in the public and private sectors combined in 2006 totaled 131,800:
 - 8,800 atmospheric scientists
 - 92,000 environmental scientists and hydrologists
 - 31,000 geoscientists
- Employment growth within the environmental sciences is projected to average 2.27% annually over the coming decade (national employment is projected to grow 1.60% annually), with the greatest growth among environmental scientists and hydrologists (2.39%), followed by geoscientists (2.26%) and atmospheric scientists (1.02%)
- Starting salaries for environmental scientists average \$38,291 and range from \$40,786 for geoscientists to \$35,752 for atmospheric scientists
- Employment of environmental scientists is greatest in the professional, scientific, and technical services overall, with government employment (42%) dominating the employment of environmental scientists and hydrologists, 25% of employment of geoscientists in mining, and 40% of atmospheric scientists employed in management, scientific, and technical consulting services (US Department of Labor)
- Numerous agencies and organizations within the federal government employ or potentially could employ environmental scientists, including:
 - Department of Agriculture
 - Forest Service
 - Natural Resources Conservation Service
 - Department of Commerce
 - National Marine Fisheries Service
 - National Ocean Service
 - National Oceanographic and Atmospheric Administration (NOAA)
 - National Weather Service

- Office of Oceanic and Atmospheric Research
 - Department of Defense
 - Army Corps of Engineers
 - Army Environmental Center
 - Defense Environmental Network and Information Exchange
 - Defense Logistics Agency
 - Installations and Environment
 - National Defense Center for Environmental Excellence
 - Department of Energy
 - Office of Civilian Radioactive Waste Management
 - Office of Energy Efficiency and Renewable Energy
 - Office of Environmental Management
 - Office of Health, Safety and Security
 - Department of Health and Human Services
 - Agency for Toxic Substances and Disease Registry
 - Centers for Disease Control and Prevention
 - Department of Homeland Security
 - Federal Emergency Management Agency (FEMA)
 - US Coast Guard
 - Department of the Interior
 - Bureau of Reclamation
 - Bureau of Land Management
 - Minerals Management Service
 - National Park Service
 - Office of Environmental Policy and Compliance
 - Office of Surface Mining Reclamation and Enforcement
 - US Fish and Wildlife Service
 - US Geological Survey (USGS)
 - Department of Justice
 - Environmental and Natural Resources Division
 - Department of Labor
 - Mine Safety and Health Administration
 - Environmental Protection Agency
 - National Aeronautics and Space Administration
 - National Science Foundation

(DuBois; Environmental Career Opportunities; Office of Personnel Management, FedScope)

 - According to the US Office of Personnel Management website USAJOBS, currently (January 24, 2008) there are 5,268 positions being advertised by the federal government under the category “environmental science,” 4,852 for “environmental sciences,” and 1,042 for “environmental scientist”; total employment of environmental scientists in the federal workforce was 72,476 in September 2007 (Office of Personnel Management, USAJOBS)
 - A plethora of domestic and international private environmental businesses and NGOs employ environmental scientists (Dubois; Environmental Career Opportunities)

Sources: DuBois, David [Desert Research Institute], “Physical and Environmental Science and Engineering Job Search Resources” (<http://wolfweb.unr.edu/homepage/daved/jobs.html>; accessed 1/5/2008 1:45 PM); Environmental Career Opportunities, Inc., “Environmental Career Opportunities” (<http://www.ecojobs.com/index.php>; accessed 12/31/2007 12:31 PM); Hardin, Elizabeth W., BA, MS, AICP, interview, January 24, 2008; Partnership for Public Service, “Environmental Jobs in the Federal Government” [December 2006] (<http://makingthedifference.org/federalcareers/environmental.shtml>; accessed 12/27/2007 10:44 PM); US Department of Labor, Bureau of Labor Statistics, “Occupational Employment and Wages,” May 2006 (<http://www.bls.gov/oes/home.htm>; accessed 12/27/2007 1:03 PM); US Office of Personnel Management, “USAJOBS” (<http://www.usajobs.gov/>; accessed 12/28/2007 1:14 AM) and “FedScope Employment Cubes,” September 2007 (<http://www.fedscope.opm.gov/employment.asp>; accessed 1/31/2008); Virginia, Commonwealth

of, “2007 Organization of Virginia State Government” [chart]; Virginia Employment Commission, “Virginia Workforce Connection” (<http://www.vawc.virginia.gov>; accessed 12/27/2007 3:16 PM) (<http://www.commonwealth.virginia.gov/StateGovernment/StateOrgChart/OrgChart2007-2008.pdf>; accessed 1/24/2008 11:15 AM)

**EMPLOYMENT, EMPLOYMENT PROSPECTS, AND STARTING SALARIES
IN THE ENVIRONMENTAL SCIENCES
Virginia & United States, 2004-2016**

Virginia

	Employment			Annual growth 2004- 2014	Annual Openings		Starting salary
	2004	2014	Total		from growth	from replacement	
	Environmental Scientist and Specialists	3,344	4,076		2.19%	132	
Environmental Science and Protection Technicians	720	895	2.43%	35	18	17	\$24,681
Atmospheric and Space Scientists	126	164	3.02%	9	4	5	\$58,652
Total	4,190	5,135	2.26%	176	95	81	\$43,532

Source: Virginia (Commonwealth of), Virginia Employment Commission, “Virginia Workforce Connection” (<http://www.vawc.virginia.gov>; accessed 12/27/2007 3:16 PM)

United States

	Employment			Annual growth 2006- 2016	Starting salary
	2006	2016			
Environmental Scientists and Hydrologists	92,000	114,000	2.39%	\$38,336	42% govt.; 42% prof., sci., tech. serv.
Geoscientists	31,000	38,000	2.26%	\$40,786	43% prof., sci., tech. serv.; 25% mining
Atmospheric Scientists	8,800	9,700	1.02%	\$35,752	41% prof., sci., tech. serv.; 40% mgt., sci., tech. consult. serv.
Total	131,800	161,700	2.27%	\$38,291	

Source: US Department of Labor, Bureau of Labor Statistics, “Occupational Employment and Wages,” May 2006 (<http://www.bls.gov/oes/home.htm>; accessed 12/27/2007 1:03 PM)

• **Support from Prospective Employers/Need for Major**

The following is a sample of email correspondence as evidence for current and future need for environmental science major graduates:

From: chenn@apexc.com
Subject: RE: Meeting
Date: August 30, 2007 9:34:35 AM EDT
To: whitege@longwood.edu

Hi Glenn. I certainly understand how important your time is. About Apex...we are an environmental consulting and (civil) engineering firm. We provide these services nationally to commercial and government clients. Some of the consulting services we offer include: remediation design and engineering, geophysics, site assessment, industrial hygiene, health & safety, storm water management, wetlands delineation, stream and harbor restoration, wastewater operations/design, site planning and land development, and landscape architecture. In addition, we have a small construction services division that performs primarily environmentally-related construction. For a more detailed description of our company, feel free to check out our website at www.apexc.com.

What we would like to do is develop a relationship with your Bio and Environmental Sciences Department and those involved in your **upcoming Environmental program**. We have internship opportunities, are open to co-op student employment, and have entry-level openings at multiple locations. As far as the internship positions go, we would ultimately prefer that all of our locations are actively employing and training interns. We feel that this is key to laying a strong foundation for future employment opportunities for graduating students.

I hope this helps. Please let me know if you have any other questions.

Carolyn

Carolyn M. Henn, SPHR
Manager of Recruiting Services
Apex Companies, LLC
(410) 294-9631 phone
(410) 525-1091 fax

*Looking to process your applications even FASTER?
Scan and email them to me to expedite!*

From: registerkm@longwood.edu
Subject: Re: Environmental Sciences Major at Longwood
Date: January 23, 2008 1:44:24 PM EST
To: whitege@longwood.edu

Dear Dr. White,

I am pleased to endorse the proposal for an environmental sciences major at Longwood University. Clean Virginia Waterways (CVW), affiliated with Longwood since 1999, is committed to offering internships and research assistant positions to Longwood students, and would welcome students who have studied the interconnections of environmental science and decision making. CVW annually manages several grant-funded programs that have positive impacts on Virginia's water resources. While water is our main focus, we work also on environmental problems related to solid waste, air pollution, land use, and other topics that are connected to water quality. CVW would benefit from having an environmental sciences major on campus.

Current environment problems present formidable challenges, so expanding environmental education in both the classroom and on campus is critical. Longwood's proposed environmental sciences major would increase awareness of the scientific, technological, social, cultural, political and economic complexities of our interactions with the environment.

In addition to filling an important need, I believe this major will be popular and vibrant. It will make students environmentally-aware leaders in our society. Given Longwood's stated desire to be a "greener" campus, such a program would seem a necessity.

I unhesitatingly endorse the new major, and would be pleased to respond to any specific questions if desired. I can be reached on campus at 395-2602.

--Kathleen Register

Kathleen Register, Executive Director
Clean Virginia Waterways
Longwood University
201 High Street
Farmville, VA 23909
Phone: 434-395-2602
Email: cleanva@longwood.edu
Web Site: www.longwood.edu/cleanva

• Student Demand

Environmental Science Major Student Survey Response Summary

We conducted a survey of biology and non-science majors in May 2007. The survey was an instrument of 14 questions given to 218 students (102 biology majors and 116 non-majors). Four questions were broadly-based to determine student demand for a major. The remaining 10 questions solicited specific information on student interest in post-graduate occupational goals. A copy of the questionnaire is provided in the Appendix A.

For each question, the possible responses were as follows: A -Yes, B - No, and C - Uncertain. The results of the survey were summarized by response per class level (i.e. freshman, etc.), per major category (i.e. biology and non-major) and overall for each major category and combined categories (biology and non-major). The results of the survey were tabulated by proportions of respondents answering Yes, No, and Uncertain (Appendix A).

We assessed demand among students for an Environmental Science major by response to questions 1-4. A synopsis of the results follows.

- Twenty-four percent of Biology majors and nine percent of non-majors indicated that they would be interested in majoring in Environmental Science if it was offered.
- Thirty-two percent of Biology majors and 12% of non-majors indicated that they would have been interested in majoring in Environmental Science if it had been offered prior to their arrival at Longwood.
- Fifty-eight percent of Biology majors and 25% of non-majors indicated that they would be interested in more information about employment opportunities for Environmental Science majors.
- Among possible employment opportunities listed in the survey, 48 percent of Biology majors and 24% of non-majors indicated that they would be interested in becoming a wildlife/aquatic ecologist. Among biology majors this response was more than twice as high than for any other career possibility.

Support from Prospective Students

The following is a sample of recent email correspondence from prospective students as evidence for current and future need for environmental science major graduates:

Original Message-----

From: mpritchett4@cox.net [mailto:mpritchett4@cox.net]

Sent: Sunday, July 01, 2007 9:23 PM

To: johnsondm@longwood.edu

Subject: environmental science degree

Hi,

I have a couple of questions concerning getting a Biology/ES degree. I have a daughter who has expressed an interest in majoring in this and I am curious as to what type of jobs are available with a degree in Biology/ES ?

Also, is this a 4 year degree? Is an internship required of this major and if so what types of internship jobs do students usually participate in?

Thank you for your help in this matter.

Sincerely,

Mary Pritchett

From: clp250@longwood.edu

Subject: Environmental Studies Minor

Date: January 17, 2008 4:23:08 PM EST

To: whitege@longwood.edu

Hello Dr. White,

My name is Cory Pappalardo. I took the Intro to Environmental Science class last semester with Dr. D and found it to be very interesting. Ive been trying to figure out if, with a business major, I could minor in Environmental Studies. And today I was told I could. I was looking at classes I would like to switch into and Biological Concepts - 20318 - BIOL 101 - 05 with Dr. Olvido sounded like a great place to go. But he told me he did not have the authority to put me in his class and to contact you. I am really enthusiastic about wanting to minor in Environmental Studies and would love to be able to take this class. If you could help me that would be greatly appreciated.

Thank you

From: las100@longwood.edu
Subject: Environmental Studies
Date: November 18, 2007 9:34:58 PM EST
To: whitege@longwood.edu

Dr. White,

This is Lee Ann Spurzem. I came in on Monday to talk to you about my interest in picking up a minor in environmental studies.

I am currently taking Bio 101 and am enrolled in Chem 101 for the spring 2008 semester. They are not offering Health 310 or Econ 314 for the spring and I am going to see if they are planning on offering them next fall.

The classes that you said were going to be problems were the classes from Group E: Field ornithology, mammology, ecology, botany, and From Group B: Bio 364 man and the environment, and from Group D: Easc 354 and 355 hydrology and climatology.

Thank you,
Lee Ann Spurzem

Students Recently Enrolled in Environmental Studies Minor:

ENSB=Biology major, env. studies. minor

ENST=Env. studies minor

ENSC=Chemistry major, env. studies. minor

Hammock, Traci Carolyn	ENSB	10-May-97
Gruber, Terri Elena	ENST	10-May-97
Schwartz, Amy Elizabeth	ENSB	10-May-97
Blauert, Christopher Lee	ENSB	9-May-98
Brown, Todd Warren	ENSB	9-May-98
King, Michael Leon	ENST	19-Dec-98
Newnam, Emily Jean	ENSB	19-Dec-98
Poff, Amy Denise	ENSB	9-May-98
Edmonds, Douglas Gregory	ENSB	18-Dec-99
Vaughan, Angela Fay Barnard	ENSC	8-May-99
Slagle, Cassandra	ENSB	18-Dec-99
Hyten, Aimee Michele Sheer	ENSB	8-May-99
Harger, Laura Todd	ENSB	12-May-00
Haug, Leslie Katherine	ENSB	13-May-00
Klepec, Leslie Diane	ENST	10-Aug-01
Murray, Kimberly Jo	ENST	6-May-01
Scott, Thomas Aaron	ENSC	14-Dec-01
Edwards, Tiffany Renee	ENSB	11-May-02
Grammer, Lori	ENSB	11-May-02
Puccio, Maria Ann Switzer	ENSB	13-Dec-02
Batease, Sarah Walsh	ENST	12-Dec-03
Cobb, Rebecca Lee Snoddy	ENST	8-May-04
Hale, Amanda Lynn	ENST	8-May-04

- **Duplication**

As documented in the *Employment Demand* section, environmental science positions are projecting strong growth into the near future. State and Federal labor statistics show that Virginia is projected to add approximately 170 new environmental positions per year, while nationally approximately 4000 (2200 new growth and 1800 by replacement) environmental positions are projected per year. According to SCHEV statistics, environmental science and studies programs currently offered at four year institutions within the Virginia graduate only an average of 147 majors per year (see Five – Year Total Average in Appendix B). These statistics indicate a strong need for growth in the number of environmental degrees awarded annually within Virginia. Of the institutions offering these degrees currently within Virginia only three are public institutions. Furthermore, Longwood University is the only public institution that historically serves southside Virginia. Unlike other institutions offering environmental degrees within Virginia, the major proposed by Longwood University also emphasizes a geographical approach to studying the environment. This approach is possible because of the expertise present at Longwood University in Geography and will lead to courses that directly address the human component of environmental change through courses such as *Cultural Ecology*.

According to SCHEV statistics, 18 (20?) institutions currently offer degrees in either environmental science or environmental studies within Virginia. Over the past 5 years, the average number of students enrolled within environmental science or environmental studies programs has been 369 students and the average number of graduates has been 147 per year. The University of Virginia and Virginia Tech maintain the largest programs by graduates over this period.

• **Summary of Projected Enrollments in Proposed Program**

Complete and submit the form below.

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA

SUMMARY OF PROJECTED ENROLLMENTS IN PROPOSED PROGRAM

Instructions:

- Enter the appropriate dates at the top of each column.
- Provide **fall headcount enrollment (HDCT)** and **annual full-time equivalent student (FTE) enrollment**. Round the FTE to the nearest whole number.

Note: Target Year refers to the year the institution anticipates the program will have achieved full enrollment. The Council will review for possible closure any program that has not met SCHEV’s productivity standards within five years of the date of first program graduates. Programs that do not anticipate meeting SCHEV productivity standards should not be proposed (see Productivity Standards).

Projected enrollment:

Year 1		Year 2		Year 3		Year 4		Year 5 Target Year (4-year institutions)		
2009 - 2010		2010 - 2011		2011 - 2012		2012 - 2013		2013 - 2014		
HDCT	FTES	HDCT	FTES	HDCT	FTES	HDCT	FTES	HDCT	FTES	GRAD
__5__	__5__	__10__	__10__	__15__	__15__	__20__	__20__	__20__	__20__	__8__

Note: VCCS institutions should only complete **Years 1 through 4**. Graduation rates must be included in Year 4, Target year.

Definitions:

HDCT—fall headcount enrollment

FTES—annual full-time equated student enrollment

GRADS—annual number of graduates of the proposed program

• **Projected Resource Needs**

Estimate of additional staff requirements for this program:

New full-time faculty hire in atmospheric sciences.

Estimate of the amount and cost of equipment, library resources, computer hardware and software, and other resources that will be required to carry out this program:

\$1,500

PROJECTED RESOURCE NEEDS FOR PROPOSED PROGRAM

Part A: Answer the following questions about general budget information.

• Has or will the institution submit an addendum budget request

to cover one-time costs? Yes _____ No _____

• Has or will the institution submit an addendum budget request

to cover operating costs? Yes _____ No _____

• Will there be any operating budget requests for this program

that would exceed normal operating budget guidelines (for example, unusual faculty mix, faculty salaries, or resources)? Yes _____ No _____

• Will each type of space for the proposed program be within

projected guidelines? Yes _____ No _____

• Will a capital outlay request in support of this program be

forthcoming? Yes _____ No _____

Part B: Fill in the number of FTE positions needed for the program

	Program initiation year		Expected by target enrollment year	
	20__ ⁰⁹ 20__ ¹⁰		20__ ⁰⁹ 20__ ¹⁰	
	On-going and reallocated	Added (New)	Added (New)**	Total FTE positions
Full-time faculty*		1		1
Part-time faculty [faculty FTE split with other unit(s)]				
Adjunct faculty				
Graduate assistants				
Classified positions				
TOTAL				

* Faculty dedicated to the program

** Added after initiation year

Part C: Estimated resources to initiate and operate the program

	Program initiation year		Expected by target enrollment year	
	20__ ⁰⁹ - 20__ ¹⁰		20__ ⁹ - 20__ ¹⁰	
Full-time faculty				
salaries	50.000			50.000
fringe benefits	20.000			20.000
Part-time faculty [faculty FTE split with other unit(s)]				
salaries				
fringe benefits				
Adjunct faculty				
salaries				
fringe benefits				
Graduate assistants				
salaries				
fringe benefits				
Classified Positions				
salaries				
fringe benefits				
Total personnel cost				
salaries				
fringe benefits				
Total cost				
Equipment	500.00			500.00
Library	500.00			500.00
Telecommunication costs				
Other costs (specify)				
TOTAL	71.000			71.000

Part D: Certification Statement(s)

The institution will require additional state funding to initiate and sustain this program.

_____ Yes _____
Signature of Chief Academic Officer

_____ No _____
Signature of Chief Academic Officer

If “no,” please complete Items 1, 2, and 3 below.

1. Estimated \$\$ and funding source to initiate and operate the program.

Funding Source	Program initiation year 20____ - 20____	Target enrollment year 20____ - 20____
Reallocation within the department or school <i>(Note below the impact this will have within the school or department.)</i>		
Reallocation within the <i>institution</i> <i>(Note below the impact this will have within the school or department.)</i>		
Other funding sources <i>(Please specify and note if these are currently available or anticipated.)</i>		

2. Statement of Impact/Other Funding Sources.

3. Secondary Certification.

If resources are reallocated from another unit to support this proposal, the institution will **not** subsequently request additional state funding to restore those resources for their original purpose.

_____ Agree _____
Signature of Chief Academic Officer

_____ Disagree _____
Signature of Chief Academic Officer

Appendix A. Survey Questionnaire and Summary of Survey Results

Environmental Science Major Development Undergraduate and Alumni Survey

Environmental science is the study of interrelationships between the biological and physical components of our world with an emphasis on their relationship to human actions. A major in environmental science prepares a student to pursue careers in environmental consulting and policy, education, scientific research, and natural resources management. Please respond to the following questions regarding the potential for a major in environmental science here at Longwood University. Your response to this survey is important to the development of this major and your cooperation is appreciated.

Instructions:

Use the scantron sheet provided to you to select the answer that best represents your choice. Please fill out the NAME section with your major and the GRADE OR EDUC section with your year (1 = Fr, 2 = So, 3 = Ju, 4 = Se and beyond).

Survey Questions:

- 1) If Longwood University offered an Environmental Science major, would you be interested in majoring in Environmental Science?
 - A. Yes
 - B. No
 - C. Uncertain

- 2) Would you have been interested in majoring in Environmental Science if Longwood University had offered an Environmental Science major before you arrived?
 - A. Yes
 - B. No
 - C. Uncertain

- 3) Would you be interested in more information about employment opportunities for Environmental Science majors?
 - A. Yes
 - B. No
 - C. Uncertain

- 4) If the Environmental Science program included a minor, would you be interested in that minor?
 - A. Yes
 - B. No
 - C. Uncertain

- 5) If the Environmental Science program included an Earth Science endorsement for secondary educators, would you be interested?
- A. Yes
 - B. No
 - C. Uncertain
- 6) Would you be interested in becoming a secondary education teacher?
- A. Yes
 - B. No
 - C. Uncertain
- 7) Would you be interested in becoming a forester?
- A. Yes
 - B. No
 - C. Uncertain
- 8) Would you be interested in becoming a wildlife/aquatic ecologist?
- A. Yes
 - B. No
 - C. Uncertain
- 9) Would you be interested in becoming a hydrologist?
- A. Yes
 - B. No
 - C. Uncertain
- 10) Would you be interested in becoming a geologist?
- A. Yes
 - B. No
 - C. Uncertain
- 11) Would you be interested in becoming a meteorologist?
- A. Yes
 - B. No
 - C. Uncertain
- 12) Would you be interested in becoming a public policy advocate?
- A. Yes
 - B. No
 - C. Uncertain
- 13) Would you be interested in becoming a GIS specialist?
- A. Yes
 - B. No
 - C. Uncertain
- 14) Would you be interested in becoming an environmental engineer/planner?
- A. Yes
 - B. No
 - C. Uncertain

Survey Results:

Survey Questions	Biology Majors				Nonmajors				Combined			
	Fresh				Fresh				Fresh			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1	20	63	18	40	7	78	15	67	12.15	71.96	15.89	107
2	28	53	20	40	13	73	13	67	18.69	65.42	15.89	107
3	48	45	8	40	24	66	10	67	32.71	57.94	9.35	107
4	50	25	25	40	19	63	18	67	30.84	48.60	20.56	107
5	18	60	23	40	13	72	15	67	11.21	67.29	21.50	107
6	18	70	13	40	15	73	12	67	15.89	71.96	12.15	107
7	10	78	13	40	4	88	7	67	6.54	84.11	9.35	107
8	40	45	15	40	16	70	13	67	25.23	60.75	14.02	107
9	15	75	10	40	6	79	15	67	9.35	77.57	13.08	107
10	15	70	15	40	6	84	10	67	9.35	78.50	12.15	107
11	18	73	10	40	21	73	6	67	19.63	72.90	7.48	107
12	13	80	8	40	9	81	10	67	10.28	80.37	9.35	107
13	13	73	15	40	3	87	10	67	6.54	81.31	12.15	107
14	18	68	13	38	12	73	15	67	14.29	71.43	14.29	105
	Soph				Soph				Soph			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1	24	57	19	21	3	78	19	32	11.32	69.91	18.87	53
2	19	43	38	21	9	78	13	32	13.21	64.15	22.64	53
3	52	33	14	21	25	72	3	32	35.85	56.60	7.55	53
4	33	24	43	21	19	56	25	32	24.53	43.40	32.08	53
5	19	62	19	21	10	81	10	31	13.46	73.08	13.46	52
6	19	81	0	21	3	94	3	31	9.62	88.46	1.92	52
7	0	95	5	21	13	81	6	31	7.69	86.54	5.77	52
8	43	29	29	21	29	65	6	31	34.62	50.00	15.38	52
9	0	81	19	21	3	94	3	31	1.92	88.46	9.62	52
10	5	81	14	21	6	94	0	31	5.77	88.46	5.77	52
11	10	71	19	21	16	68	16	31	13.46	69.23	17.31	52
12	5	86	10	21	10	74	16	31	7.69	78.85	13.46	52
13	0	86	14	21	3	84	13	31	1.92	84.62	13.46	52
14	24	62	14	21	10	81	10	31	15.38	73.08	11.54	52
	Jun				Jun				Jun			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1	29	52	19	21	27	73	0	11	28.13	59.38	12.50	32
2	43	33	24	21	9	73	18	11	31.25	46.88	21.88	32
3	57	33	10	21	18	82	0	11	43.75	50.00	6.25	32
4	57	24	19	21	27	64	9	11	46.88	37.50	15.63	32
5	20	55	25	20	9	73	18	11	16.13	61.29	22.58	31
6	15	65	20	20	9	73	18	11	12.90	67.74	19.35	31
7	20	60	20	20	9	73	18	11	16.13	64.52	19.35	31
8	45	50	5	20	36	55	9	11	41.94	51.61	6.45	31
9	10	65	25	20	9	64	27	11	9.68	64.52	25.81	31
10	10	75	15	20	9	73	18	11	9.68	74.19	16.13	31
11	25	70	5	20	20	70	10	10	23.33	70.00	6.67	30
12	15	70	15	20	10	80	10	10	13.33	73.33	13.33	30
13	5	60	35	20	10	70	20	10	6.67	63.33	30.00	30
14	30	60	10	20	30	70	0	10	30.00	63.33	6.67	30
	Sen				Sen				Sen			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1	25	45	30	20	17	50	33	6	23.08	46.15	30.77	26
2	45	20	35	20	17	50	33	6	38.46	26.92	34.62	26
3	85	10	5	20	50	50	0	6	76.92	19.23	3.85	26
4	80	5	15	20	50	17	33	6	73.08	7.69	19.23	26
5	20	60	20	20	33	50	17	6	23.08	57.69	19.23	26
6	15	70	15	20	17	67	17	6	15.38	69.23	15.38	26
7	20	65	15	20	0	83	17	6	15.38	69.23	15.38	26
8	70	25	5	20	67	17	17	6	69.23	23.08	7.69	26
9	10	75	15	20	17	83	0	6	11.54	76.92	11.54	26
10	30	55	15	20	33	50	17	6	30.77	53.85	15.38	26
11	35	65	0	20	33	50	17	6	34.62	61.54	3.85	26
12	25	60	15	20	33	67	0	6	26.92	61.54	11.54	26
13	15	55	30	20	33	50	17	6	19.23	53.85	26.92	26
14	10	60	30	20	17	83	0	6	11.54	65.38	23.08	26
	No class given				No class given				No class given			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1					14	64	22	36				
2					19	58	22	36				
3					31	58	11	36				
4					47	39	14	36				
5					25	47	28	36				
6					31	56	14	36				
7					6	81	14	36				
8					25	58	17	36				
9					3	83	14	36				
10					9	69	23	35				
11					11	83	6	36				
12					6	78	17	36				
13					3	78	19	36				
14					17	71	11	35				
	All classes combined				All classes combined				All classes combined			
	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)	Yes (%)	No (%)	Uncertain (%)	Total (n)
Q1	23.53	55.88	20.59	102	8.62	75.86	15.52	116	15.60	66.51	17.89	218
2	32.35	40.20	27.45	102	12.07	73.28	14.66	116	21.56	57.80	20.64	218
3	57.84	33.33	8.82	102	25.00	68.10	6.90	116	40.37	51.83	7.80	218
4	53.92	20.59	25.49	102	21.55	58.62	19.83	116	36.70	40.83	22.48	218
5	18.81	59.41	21.78	101	13.04	73.04	13.91	115	15.74	66.67	17.59	216
6	16.83	71.29	11.88	101	11.30	78.26	10.43	115	13.89	75.00	11.11	216
7	11.88	75.25	12.87	101	6.96	84.35	8.70	115	9.26	80.09	10.65	216
8	47.52	38.61	13.86	101	24.35	64.35	11.30	115	35.19	52.31	12.50	216
9	9.90	74.26	15.84	101	6.09	81.74	12.17	115	7.87	79.04	13.89	216
10	14.85	70.30	14.95	101	7.83	83.48	8.70	115	11.11	77.31	11.57	216
11	20.79	70.30	8.91	101	20.18	70.18	9.65	114	20.47	70.23	9.30	216
12	13.86	75.25	10.89	101	10.53	78.07	11.40	114	12.09	76.74	11.16	215
13	8.91	69.31	21.78	101	5.26	82.46	12.28	114	6.98	76.28	16.74	215
14	20.20	63.64	16.16	99	13.16	75.44	11.40	114	16.43	69.95	13.62	213

Appendix B. Environmental Science Programs Available in Virginia

Averett University: Ecology/Environmental Biology CIP Code: 3.0104

Core Requirements: Total 24-28

BIO 101 Introduction to Biology (4)	BIO 301 Microbiology (4)
BIO 102 General Botany (4) and/or* BIO 103, General Zoology (4)	CH 101, 102 General Chemistry (8)
BIO 203 Genetics (4)	

In addition to the core courses, the following courses are also required:

BIO 330 General Ecology (4)	ENS 330 Environmental Chemistry (4)	BIO 462/ENS 462 Topics in Environmental Biology (3)
CH 206 Biological Chemistry (4)		

The student will take an additional 8 hours from the following courses:

BIO 416 General Taxonomy (4)	ENS 215 Environmental Problems(4)	BIO 342/ENS 342/POS 342 Environmental Policy & Law (3)
BIO 335 Ornithology (4)	ENS 425 Field Study (1-4)	
BIO 340 Field Zoology (4)		

Bridgewater College: Environmental Science CIP Code: 3.0104

ENVIRONMENTAL SCIENCE Major REQUIREMENTS: A major in Environmental Science consists of a minimum of 34 credits in core courses in biology, chemistry, physics, and mathematics. The following courses are required:

BIOL 207 Organisms I	CHEM 250 Fundamental Organic Chemistry OR	MATH 200 Introduction to Statistics OR BIOL 330
BIOL 208 Organisms II	CHEM 306 Organic Chemistry II	Biostatistics
BIOL 350 Ecology	MATH 130 Survey of Calculus OR MATH 131	PHYS 218 College Physics I OR PHYS 221
CHEM 161 General Chemistry	Calculus I	General Physics I
CHEM 162 General Chemistry		

And a minimum of an additional 18 credit hours (at least 5 courses) including:

ENVR 300 Principles of Environmental Science	ENVR 320 Environmental Chemistry
--	----------------------------------

At least 3 additional ENVR, BIOL, or CHEM courses numbered above 300 from the following courses (one may be a 3-credit hour Interterm trip course):

BIOL/SOC 302 Socioecology in Zambia	BIOL 420 The Spring Flora	BIOL/CHEM 405 Biochemistry
BIOL 316 Ornithology: The Biology of Birds	GEOG 350 Physical Geography	ENVR/BIOL 440 Environmental Restoration & Management
BIOL 318 Biology of the Insects	ENVR/BIOL 312 Forest and Wildlife Resource Management	ENVR/CHEM 445 Instrumental Analysis
BIOL 352 Ecology of the African Savanna	ENVR/BIOL 401 Environmental Microbiology	
BIOL 353 Tropical Ecology in Costa Rica	ENVR/BIOL 435 Freshwater Biology	
BIOL 380 Biology of the Volcanic-Coral Islands		

Eastern Mennonite University: Environmental Science CIP Code: 3.0104

Core Courses: 38hours

BIOL 162 Food and Population (3)	*BIOL 242 Agroecology OR *BIOL 451 Advanced Ecology & Field Biology (4)	BIOL 482 Faith, Science and Ethics (2)
BIOL 171 Concepts in Biology: Unity & Diversity of Life (4)		CHEM 221 General Chemistry I (4)
BIOL 181 Environmental Science OR *SOC 241 Environment & Society (3)	*BIOL 342 Environmental Physiology OR *BIOL 371 Plant Physiology	CHEM 232 General Chemistry II (4)
BIOL 232 Ecology: Adaptation and Environment	BIOL 411/2 Environmental Science/ Agriculture Practicum (3)	MATH 242 Statistics for the Natural Sciences (3)

Concentrations: In addition to the core requirements, environmental science majors take 16 SH from one of three concentrations.

Environmental Monitoring and Analysis:

BIOL 201 Microbiology (4)	CHEM 282 Environmental Chemistry (4)	GEOL 302 Earth Science (3)
BIOL 222 Molecules, Genes and Cells (4)	CHEM 311 Organic Chemistry I (4)	PHYS 251 University Physics I (4)
*BIOL 402 Applied Ecology (4)	CHEM 322 Organic Chemistry II (4)	PHYS 262 University Physics II (4)
*BIOL 471 Soil Science (4)	*CHEM 331 Analytical Chemistry (4)	

Conservation Ecology:

BIOL 222 Molecules, Genes and Cells (4)	*BIOL 321 Conservation Biology (3)	ECON 221/2 Microeconomics. (3)
*BIOL 252 Botany (4)	*BIOL 402 Applied Ecology (4)	JPCS 372 Global Ethics of Peace & Justice (3)
*BIOL 262 Zoology. (4)	CHEM 282 Environmental Chemistry (4)	SOC 482 Conservation & Sustainable Development (3)
*BIOL 272 Ornithology (3)	CHEM 311 Organic Chemistry I (4)	

Sustainable Agriculture:

*BIOCH 431 Molecular Genetics (4)	*BIOL 471 Soil Science (4)	GEOL 302 Earth Science (3)
BIOL 222 Molecules, Genes & Cells (4)	CHEM 282 Environmental Chemistry (4)	JPCS 372 Global Ethics of Peace & Justice (3)
*BIOL 252 Botany (4)	CHEM 311 Organic Chemistry I (4)	SOC 482 Conservation & Sustainable Development (3)
*BIOL 291 Agricultural Animal Science (3)	ECON 221/2 Microeconomics (3)	

Emory and Henry College: Environmental Studies-Policy / Science CIP Code: 3.0103 & 3.0104

Environmental Studies - Policy (B.A.): Core courses are Environmental Studies 100, 450 (fulfills the college senior project requirement); Biology 117, 210 or 211; Chemistry 111, 112; Earth Science 201; Geography 311 or Environmental Studies 225; Geography 322, 332; Economics 151, 262; Political Science 103. Students also complete two courses chosen from the following: Environmental Studies 225, 460, 470 (at least three semester hours credit); Geography 200, 221, 355; History 323, 325; Political Science 203; Public Policy and Community Service 250, 345; Sociology 229; or a major or minor in another discipline. The college mathematics requirement is met by Mathematics 151 and Statistics 161.

Environmental Studies - Science (B.S.): Core courses are Environmental Studies 100, 200, 450 (fulfills the college senior project requirement); Biology 117, 210 or 211, 411; Environmental Studies 300 or Biology 360; Chemistry 111, 112; Earth Science 201; Geography 311 or Environmental Studies 225; Geography 322. Students also complete two courses chosen from the following: Biology 210 or 211 (if not taken as a core course), 225, 340; Chemistry 211, 221; Earth Science 202; Environmental Studies 460 or 470 (at least three semester hours credit); Geography 200; Physics 201; or a major or minor in another discipline. The college mathematics requirement is met by Mathematics 151 and Statistics 161.

Ferrum College: Environmental Science CIP Code: 3.0104

Required Environmental Science Courses (26 hours)

ESC 110 Introduction to Environmental Science (4)	ESC 216 Quantitative Methods & Stats. II (4)	LSC 498 Senior Seminar (1)
ESC 209 Geology and Hydrology (4)	LSC 307 Environmental Seminar (1)	LSC 499 Internship (3)
ESC 211 Fundamentals of Ecology (3)	LSC 399 Professional Preparations (1)	
ESC 215 Quantitative Methods & Stats. I (4)	LSC 497 Senior Seminar (1)	

Required Non-Environmental Science Courses (18 hours)

BIO 201 Vertebrate Zoology (4) Or BIO 301 Invertebrate Zoology (4)	BIO 202 Plant Science (4) CHM 105 Organic Chemistry (4 hours) or 301	ECO 315 Environmental & Natural Resource Econ (3) GEO 220 Physical Geography (3 hours)
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Required Distribution Courses

BIO 101 General Biology (4)
CHM 101 General Chemistry (4) or 103
MTH 111 Pre-Calculus I (3 hours)

Required Environmental Science Electives (13 hours)

ESC 302 – Conservation Biology (3)	ESC 321 – Aquatic Ecology (4)	ESC 424 - Environmental Toxicology (4)
ESC 310 – Env Planning & Assessment (3)	ESC 405 – Fish & Wildlife Ecology & Management (5)	ESC 425 – OSHA 40-Hour Certification (1)
ESC 313 – Natural Resource Management (3)	ESC 413 – Forest Science and Management (5)	
ESC 315 – Soil Science (4)	ESC 421 – Pollution Science (4)	

Travel Courses

ESC 205 – Tropical and Marine Ecology (4) ESC 206 – Community Ecology of the Southeast (4)

Hollins University: Environmental Studies CIP Code: 3.0103

Core courses:

ES 117: Environmental Science (4)	ES 210: World Geography, ES 230: Economics & the Environment, or ES 259: Environment & Society (4)	ES 357: Conservation Biology (4)
ES 207: Ecology (4)		ES 470: Seminar in Environmental Studies (2)
ES 207L: Ecology Lab (2)		

Six Additional Courses from the List of Environmental Studies or Affiliated Courses

Environmental studies courses:

ES 112: Environmental Analysis (4)	ES 250: Special Topic in env studies (2) (may be taken more than once for credit)	ES 305: Cultural Geog & Landscape Studies (4)
ES 182: Environmental Ethics (4)	ES 259: Environment and Society (4)	ES 352: Topics in Human Geography (4)
ES 197F: First-Year Sem - The Nature & Culture of Water (4)	ES 304: Geography of Global Environment (4)	ES 390: Independent Study (2 or 4)*
ES 210: World Geography (4)		ES 480: Senior Thesis *
ES 220: Global Systems (4)		ES 490: Senior Honors Thesis *
ES 230: Economics & the Environment (4)		

Four elective courses are also available through the Hollins affiliated School for Field Studies. *A student may apply up to two semesters of ES 390, ES 480, and ES 490 toward her elective courses.

Affiliated courses:

Division I

PHIL 181: Contemporary Moral Issues (4)	REL 109: Introduction to World Religions I (4)
PHIL 252: Ethics (4)	REL 110: Introduction to World Religions II (4)

Division II

ANTH 145: Intro to Anthropology (4)	ECON 241: Economics of Social Issues (4)	POLS 118: Controversial Issues in American Politics (4)
ANTH 312: Women & Soc Movements around the Globe (4)	ECON/INTL 259: Int Political Economy (4)	POLS 226: International Law (4)
BUS 224: Business Ethics (4)	ECON 265: International Trade (4)	POLS 363: Constitutional Law (4)
BUS 320: Managing Nonprofit Organizations (4)	ECON 312: Economics of the Third World (4)	SOC 133: Soc Problems In Global Perspectives (4)
COMM 231: Writing for the Print Media I (4)	INTL 120: Intro to International Studies (4)	WS/INTL 252: Gender and Globalization (4)
COMM 322: Public Relations Principles (4)	INTL 302: Comparative Urbanism (4)	WS/POLS 213: Globalization and Poverty (4)
ECON 157: Microeconomics (4)	INTL 303: Geopolitics (4)	

Division III

BIOL 121: Plants and People (4)
 BIOL 236: Cell and Molecular Biology (4)
 BIOL 241: Plant Biology (4)
 BIOL 312: Microbiology (4)
 BIOL 322: Developmental Biology (4)

BIOL 323: Animal Behavior (4)
 BIOL 361: Physiological Ecology (4)
 CHEM 214: Analytical Chemistry (4)
 CHEM 221: Organic Chemistry I (4)
 CHEM 222: Organic Chemistry II (4)

STAT 251: Statistical Methods I (4)

Year 1

Fall
 ENVS 101/101L*
 MATH 101
 Gen. Ed. Electives
E. Year 2

Spring
 ENVS 102/102L*
 MATH 103
 Gen. Ed. Electives

Fall
 ENVS 380 (or senior year)
 ENVS 240 and/or 399*
 Major Electives

Year 3

Spring
 BIOL 321 (or senior year)
 ENVS 240 and/or 399*
 Major Electives
 Year 4

Fall
 MATH 222
 CHEM 103/105L
 Major Electives
 Gen. Ed. Electives

Spring
 BIOL 205, BIOL 210
 CHEM 104/106L or CHEM 206^f
 Major Electives
 Gen. Ed. Electives

Fall
 ENVS Modular Courses^f
 ENVS 380 (or junior year)
 ENVS 399 and/or 440*
 Electives

Spring
 ENVS Modular Courses^f
 BIOL 321 (or junior year)
 ENVS 399 and/or 440*
 ENVS 490

Lynchburg College: Environmental Science CIP Code: 3.0104

Marymount University: Environmental Science CIP Code: 3.0104

current web site does not mention environment science program

Randolph College: Environmental Science & Studies CIP Code: 3.0103 & 3.0104

Environmental Science Major BS

BIOL 103 Intro to Biology (4) or BIOL 118 Evolution (4)
 CHEM 105 Gen Chemistry I (4)
 CHEM 106 Gen Chemistry II (4)
 CHEM 225 Env Chemistry (4)
 EVST 101 Intro to Env Studies I (3)

EVST 102 Intro to Env Studies II (3)
 EVST Physical Geology (4)
 EVST 201 Quantitative Aspects of Global Env
 Prob (3)
 EVST 202 Env Policy (3)

EVST 205 Env Sci Methods (3)
 EVST 315 Energy and Society (3)
 EVST 325 Earth Interactions & Global Change (4)
 MATH 149 Calculus I (3)
 MATH 150 Calculus II (3)

One of the following:

BIOL 201 Zoology
 BIOL 202 Botany
 BIOL 319 Ecology
 BIOL 321 Animal Behavior

BIOL 324 Ornithology-Mammalogy
 BIOL 328 Plant Div, Evol
 EVST Env Geophysics
 MATH 227 Applied Statistics

MATH 250 Calculus III
 MATH 353 Mathematical Modeling

Either of the following:

PHYS 105 Into Physics

PHYS 115 General Physics

Senior Program:

EVST 495 Senior Seminar (3)

EVST 496 Senior Research (0-2)

Environmental Studies Major BA

EVST 101 Intro to Env Studies I (3)
 EVST 102 Intro to Env Studies II (3)

EVST 201 Quantitative Aspects of Global Env
 Prob (3)
 EVST 202 Env Policy (3)

ECON 102 Prin of Microeconomics (3)
 Experiential Learning in approved field (2)

Four of the following Natural Science courses (13-16 hours)

BIOL 103 Intro Biology
 BIOL 108 Human Biology
 BIOL 118 Evolution
 BIOL 201 Zoology
 BIOL 202 Botany
 BIOL 319 Ecology
 BIOL 321 Animal Behavior
 BIOL 324 Ornithology-Mammalogy
 BIOL 328 Plant Div, Evol

BIOL 329 Economic Botany
 CHEM 105 Gen Chemistry I (4)
 CHEM 106 Gen Chemistry II (4)
 CHEM 205 Organic Chemistry I
 CHEM 206 Organic Chemistry II
 CHEM 210 Analytical Chemistry
 CHEM 225 Env Chemistry
 CHEM 307 Physical Chemistry
 CHEM 335 Biochemistry

EVST 176 Physical Geology
 EVST 205 Env Science Methods
 EVST 315 Energy and Society
 EVST 325 Earth Interactions and Global Change
 PHYS Intro Physics I
 PHYS Intro Physics II
 PHYS 251 Modern Physics
 PHYS Electronics
 PHYS 332 Advanced Lab

Two of the following Social Science courses:

ECON 101 Prin of Macroeconomics
ECON 220 Env Economics
EVST 203 Psychology & Env Change
POL 113 World Politics

POL 231 Political Research
POL 251 Intro to Public Policy
POL 254 Intro to Public Administration
POL 330 International Law

PSYC 220 Env Psychology
SOC 216 Contemporary Social Problems
SOC 295 Intro to Social Research
SOC 310 Community

Two of the following Humanities courses:

AMC 202 U.S. Cultural Env
EVST 305 Env Literature

EVST 306 Env Writing
EVST 326 Env Problems: History & Culture

PHIL 361 Env Philosophy

Senior Program:

EVST 495 Senior Seminar (3)

Randolph-Macon College: Environmental Studies CIP Code: 3.0103

Core courses:

EVST 105 Env Problem Solving I (4)
EVST 106 ENV Success Strategies (1)

EVST 305 Env Problem Solving II (4)
EVST 405 Env Problem Solving III (4)

EVST 450 Field Studies in Env Studies or EVST
451 Internship in Env Studies(3)

One course from:

BIOL 121 Integrative Biology I (4)
BIOL 122 Integrative Biology II (4)
CHEM 121 General Chemistry I (4)
CHEM 122 General Chemistry II (4)

EVST 300 Alternative Energy Sources (3)
EVST 245 Water Resources & Politics in Middle
East (4)
GEOL 101 Intro to Geology & Environment (4)

PHYS 151 Intro Physics I (6)
PHYS 152 Intro Physics II (6)

Once course from:

ECON 201 Principles of Econ Micro (3)
ECON 202 Principles of Econ Macro (3)
ECON 203 Principles of Econ Micro Env (3)

EVST 319 Env Policy (3)
PSCI 201 Intro to Politics (3)
PSCI 202 American Govt (3)

SOCI 210 Population, Poverty & Env (4)

One course from:

PHIL 212 Ethics (3)
PHIL 213 Env Ethics (3)

PHIL 280 Philosophy of Sci (3)
RELS 235 Issues in Ethics (3)

Electives at the 200 or 300 level (15 hours)

Roanoke College: Environmental Studies CIP Code: 3.0103

Major in Environmental Policy requires 16 units:

BIOL 125 Biodiversity
CHEM 101 Chem Science **or** CHEM 111 Gen Chem I
PHYS 101 Concepts **or** PHYS 103 Fundamental Physics I
STAT 101 Introductory Statistics
ENVI 200 Environmental Science
ENVI 305 Environmental Impact Assessment

ECON 120 Introduction to Economics **or**
ECON 121 Microeconomics
POLI 102 American National Government
POLI 201 State and Local Government
ENVI 400 Environment Clinic

POLI 251 Environmental Public Policy
POLI 245 Public Affairs Inquiry
SOCI 101 Introduction to Sociology
SOCI 337 Environmental Sociology

One unit of internship or independent study chosen from ENVI 416 Internship, ENVI 405, 406, 407 Independent Study, or ENVI 495, 496, 497 Honors Project

Electives - One required unit

ENVI 260 Special Topics
SOCI 335 Population and Society

HIST 210 Environmental History
One unit chosen from POLI 221, 222, 224, or 225 Comparative Political Systems

Major in Environmental Science B.S. requires 18 units:

BIOL 120 Principles of Biology
BIOL 125 Biodiversity
BIOL 215 Components of Life
CHEM 111 Gen Chemistry I
CHEM 112 Gen Chemistry II
PHYS 103 Fundamental Physics I **or** PHYS 201 Gen Physics I
STAT 101 Intro Statistics
MATH 112 Concepts & Techniques of Calculus **or** MATH 121 Calculus I
ECON 120 Intro to Economics **or** ECON 121 Microeconomics
POLI 102 American National Government
POLI 251 Environmental Public Policy
SOCI 337 Environmental Sociology
ENVI 200 Environmental Science
ENVI 305 Environmental Impact Assessment
ENVI 400 Environment Clinic

One unit of internship or independent study chosen from ENVI 416 Internship, ENVI 405, 406, 407 Independent Study, or ENVI 495, 496, 497 Honors Project

Electives - Two required units chosen from:

CHEM 250 Environmental Analytical Chemistry
CHEM 370 Environmental Chemistry

BIOL 360 Terrestrial Ecology

Shenandoah University: Environmental Studies CIP Code: 3.0103

Requirements for all Environmental Studies Majors

BIO 121 General Biology I (4)	CHEM 122 General Chemistry II (4)	ES 492 Research Seminar in Environmental Studies (2)
BIO 122 General Biology II (4)	EC 211 Prin of Macroeconomics or approved soc sci elective	ES 419 Community & Regional Studies (4)
BIO 321 Ecology (4)	ES 101 Intro. to Environmental Studies (3)	GEO 201 Econ Geog (3) or GEO 301 Human Geog (3)
CHEM 121 General Chemistry I (4)	ES 319 Env. Policy & Programs (3)	GEO 201 Geology (4)
	ES 491 Research Seminar in Environmental Studies (2)	MATH 207 Intro. to Statistics (3)

Approved Biology, Chemistry, or Environmental Studies elective at the 200-level or above Approved elective in writing or public speaking, 3 hours

Total 53

Courses Required for the Environmental Analysis Concentration (21 hours)

BIO 260 Microbiology (4)	CHEM 311 Instrumental Analysis (4)
BA 312 Genetics (4) or CHEM 312 Introduction to Biochemistry (4)	ES 401 Environmental Studies Internship (2)
CHEM 211 Analytical Chemistry (4)	MATH 102 Introductory College Mathematics II (3)

Course Required for the Environmental Education Concentration (20 hours)

BIO 325 Animal Behavior (4) or BIO 351 Vertebrate Zoology (4)	PSY 220 Human Growth and Development (3)
BIO 344 Plant Morphology (4) or BIO 342 Plant Taxonomy (4)	PSY 340 Educational Psychology (3) or PSY 350 Group Dynamics (3)
ES 340 Environmental Education (4)	
ES 401 Environmental Studies Internship (2)	

Courses Required for the Environmental Policy Concentration (20 hours)

BA 207 Principles of Management (3) or BA 260 Principles of Marketing (3)	PSCI 202 State & Local Government (3)
ES 401 Environmental Studies Internship (2)	PSCI 251 Introduction to Public Administration (3)
PSCI 201 U.S. Federal Government (3)	PSY 101 General Psychology (3)
PSY 350 Group Dynamics (3) or PSY 355 Social Psychology (3)	

Sweet Briar College: Environmental Science & Studies CIP Code: 3.0103 & 3.0104

Environmental Studies

Core Requirements

ECON 342 (3) - Ecological Economics	ENVR 215 (3) - Environmental Policy Analysis	ENVR 446 (3) - Evaluation of Environmental Issues
ENVR 101 (3) - Introduction to Environmental Issues	ENVR 220 (3) - Applied Environmental Analysis	MATH 123 (4) - Calculus I
ENVR 202 (1) - Environmental Sciences Laboratory	ENVR 309 (3) - Energy and Atmospheric Pollution	
ENVR 208 (3) - Surface Waters	ENVR 316 (3) - Introduction to GIS	

Choose 1 of the following:

ANTH 112 (3) - Cultural Anthropology	SOCI 100 (3) - Intro to Sociology: The Sociological Perspective	SOCI 110 (3) - Introduction to Sociology: Social Research
ANTH 221 (3) - Culture, Society & the Individual		

Senior Exercise: Choose 1 of the following:

ENVR 377 (3) - Internship	ENVR 450 (3) - Senior Research in Environmental Studies
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Choose 3 additional courses from the following options, at least one of which must be at the 300 level or above:

ANTH 317 (3) - Ecological Anthropology	ENVR 223 (3) - The Global Environment	GOVT 348 (3) - Environmental Law & Policymaking
BIOL 218 (4) - Field Natural History	ENVR 228 (3) - Oceanography	MATH 320 (3) - Topics in Biomathematics
BIOL 316 (3) - Seminar in Conservation Biology	ENVR 322 (3) - Ecological Modeling	SOCI 220 (3) - The Community
ECON 256 (3) - Development Economics	ENVR 329 (3) - Global Biodiversity Conservation	SOCI 370 (3) - Environmental Sociology
ENVR 131 (3) - Physical Geography: Landscapes	ENVR 393 (3) - Topics in Environmental Studies	
ENVR 210 (3) - Humans and Wildlife	ENVR 416 (3) - Advanced GIS	

B.S. in Environmental Science (62 semester hours)

Core Requirements

BIOL 224 (4) - General Ecology	ENVR 133 (1) - Environmental Geology Lab	ENVR 316 (3) - Introduction to GIS
CHEM 131 (3) - General Chemistry	ENVR 202 (1) - Environmental Sciences Lab	ENVR 433 (3) - Advanced Lab in Environmental Science
CHEM 141 (1) - General Chemistry Laboratory	ENVR 208 (3) - Surface Waters	ENVR 446 (3) - Evaluation of Environmental Issues
CHEM 226 (1) - Environmental Analytical Chemistry Lab	ENVR 215 (3) - Environmental Policy Analysis	MATH 123 (4) - Calculus I
ECON 101 (4) - Principles of Macroeconomics	ENVR 220 (3) - Applied Environmental Analysis	
ENVR 101 (3) - Introduction to Environmental Issues	ENVR 244 (3) - Environmental Chemistry	
ENVR 131 (3) - Environmental Geology	ENVR 309 (3) - Energy & Atmospheric Pollution	

Choose 1 of the following:

MATH 124 (3) - Calculus II	MATH 205 (3) - Applied Statistics
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Senior Exercise: Choose 1 of the following:

ENVR 377 (3) - Internship	ENVR 451 (3) - Senior Research in Environmental Science
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Choose 2 of the following courses, at least one of which must be at the 300-level or above:

BIOL 316 (3) - Seminar in Conservation Biology	ENVR 210 (3) - Humans & Wildlife	ENVR 393 (3) - Topics in Environmental Studies
ECON 342 (3) - Ecological Economics	ENVR 228 (3) - Oceanography	ENVR 416 (3) - Advanced GIS
ENGR 120 (3) - Analyzing our World: Foundations of Engineering Analysis	ENVR 322 (3) - Ecological Modeling	MATH 315 (3) - Biostatistics
	ENVR 329 (3) - Global Biodiversity Conservation	

MATH 320 (3) - Topics in Biomathematics

University of Richmond: Environmental Studies CIP Code: 3.0103

For the BA degree: 11.5 units

ENVR 201 Introduction to Environmental Studies
ENVR 230 Environmental Economics

ENVR 269 Environmental Ethics
ENVR 362 Environmental Law and Policy

ENVR 391 Environmental Senior Seminar

One course in environmental life science chosen from

BIOL 109* Introduction to Ecology
BIOL 210 Integrative Biology I

One course in physical environmental science chosen from

CHEM 110* Pollutants in the Environment
CHEM 316* Environmental Chemistry
ENVR 250 Introduction to Earth Systems & Physical Geography

One course in environmental research methods, chosen from

ANTH 211 Introduction to Ethnographic Field Methods
CHEM 301 Quantitative Chemical Analysis
CHEM 302 Instrumentation and Spectroscopy
CHEM 303 Chemical Separations
ECON 340 Econometrics
ENVR 260 Introduction to GIS
MATH 219 Intro to the Design of Experiments
MATH 324 Continuous Math Methods
PLSC 373 Methods for Public Policy Research
SOC 211 Sociological Research Methods & Data Analysis

One-half unit of experiential learning chosen from ENVR 320 or ENVR 388

Three units of electives approved for environmental studies

*Credit toward the environmental studies major will be given for either CHEM 110 or CHEM 316, but not both and for either BIOL 109 or BIOL 330, but not both

For the Bachelor of Science degree: 14.5 units, including

ENVR 201 Intro to Environmental Studies
ENVR 230 Environmental Economics

ENVR 269 Environmental Ethics
ENVR 362 Environmental Law and Policy

ENVR 391 Environmental Senior Sem

One course in environmental life science chosen from

BIOL 109* Introduction to Ecology
BIOL 210 Integrative Biology I

One course in physical environmental science chosen from

CHEM 110* Pollutants in the Environment
CHEM 316* Environmental Chemistry
ENVR 250 Intro to Earth Systems & Physical Geography

One course in environmental research methods, chosen from

ANTH 211 Intro to Ethnographic Field Methods
CHEM 301 Quantitative Chemical Analysis
CHEM 302 Instrumentation and Spectroscopy
CHEM 303 Chemical Separations
ECON 340 Econometrics
ENVR 260 Introduction to GIS
MATH 219 Intro to the Design of Experiments
MATH 324 Continuous Math Methods
PLSC 373 Methods for Public Policy Research
SOC 211 Sociological Research Methods & Data Analysis

One-half unit of experiential learning chosen from ENVR 320 or ENVR 388

Three units of electives approved for environmental studies

MATH 212 or 232 Calculus II

Two units in biology, chemistry or physics at or above the 300 level

University of Virginia: Environmental Science CIP Code: 3.0104

Degree Requirements (BA) A total of 30 hours of graded coursework in the Department is required, with at least a 2.000 cumulative GPA. Each of the core courses EVSC 280, 320, 340, and 350, and their associated laboratories EVSC 280L, 320L, 340L, and 350L, must be taken for a total of 16 core credits. For each core class, the lecture and lab must be taken concurrently. An additional 14 hours of EVSC courses are required. Three of these credit hours may be taken below the 300 level (i.e., at the 100 or 200 level; excepting EVSC280 and 280L), if they are completed prior to declaration of the major. The remainder must be taken at or above the 300 level.

EVSC 280+280 L Physical Geology (3) (1)

EVSC 320+320 L Fundamentals of Ecology (3) (1)

EVSC 340+340 L Physical Hydrology (3) (1)

EVSC 350+350 L Atmosphere and Weather (3) (1)

Related Work The Department also requires related work in math and science. The required related work includes one semester of calculus and two semesters of college-level chemistry, biology, or physics with laboratories. (Note that the two semesters need not be from the same department.) The courses recommended to fulfill this requirement include: MATH 121 or MATH 131; and any two of the following: CHEM 141, CHEM 142, BIOL 201, BIOL 202, PHYS 151 or PHYS 152, PHYS 231 or PHYS 232 with their labs (note that the appropriate labs in physics are the PHYS 203 [Basic Physics Lab I] and PHYS 204 [Basic Physics Lab II] sequence). Calculus is a prerequisite for 3 core courses for the major. Ecology depends on a basic understanding of chemistry and biology. Geosciences, hydrology, and atmospheric sciences depend more on chemistry and physics. Additional skills, recommended but not required, include: Computing (CS 101); Statistics (STAT 112).

Degree Requirements (BS) A total of 40 hours of graded coursework in the Department is required, with at least a 2.000 cumulative GPA. Each of the core courses EVSC 280, 320, 340, and 350, and their associated laboratories EVSC 280L, 320L, 340L, and 350L, must be taken for a total of 16 core credits. An

additional 24 hours of EVSC courses are required. Three of these credit hours may be taken below the 300 level (i.e., at the 100 or 200 level), if they are completed prior to declaration of the major. The remainder must be taken at or above the 300 level.

EVSC 280+280 L *Physical Geology* (3) (1)
EVSC 320+320 L *Fundamentals of Ecology* (3) (1)

EVSC 340+340 L *Physical Hydrology* (3) (1)
EVSC 350+350 L *Atmosphere and Weather* (3) (1)

Related Work The required related work includes MATH 131 and 132 and at least one semester from each of the three basic sciences, chemistry, biology, or physics with laboratories. The courses that may be used to fulfill this requirement include the following: CHEM 141, CHEM 142, BIOL 201, BIOL 202, PHYS 151 or PHYS 152, PHYS 231 or PHYS 232 with their labs (note that the appropriate labs in physics are the PHYS 203 [Basic Physics Lab I] and PHYS 204 [Basic Physics Lab II] sequence). In addition, two more semesters from this sequence must be completed (WITH THE LAB), except that a student may substitute one semester of MATH beyond MATH 132 for one of the second semester of laboratory science.

Virginia Commonwealth University: Environmental Studies CIP Code: 3.0103

Core science and mathematics requirements (32-33 credits)

BIOL 151 Intro to Biological Science I	PHYS 201 Gen Physics or PHYS 207 Univ Physics I	ENVS/GEOG 401 Meteorology & Climatology
BIOZ 151 Intro to Biological Science I Lab	GEOG 105 Physical Geology & GEOZ 105 Physical Geology Lab or GEOG 204 Physical Geology & GEOZ 240 Physical Geology Lab	ENVS/GEOG 411 Oceanography
CHEM 101 Gen Chemistry I		MATH 151 Precalculus Mathematics
CHEZ 101 Gen Chemistry I Lab		STAT 210 Basic Practices of Statistics
		STAT 314 Applications of Statistics

Core environmental studies requirements (37-38 credits)

BIOL 152 Intro to Biological Science II	CHEZ 102 General Chemistry Lab	Physics I & PHYZ 208 University Physics Lab
BIOZ 152 Intro to Biological Science II Lab	ECON 325 Environmental Economics	POLI/ENVS 311 Politics of the Environment
BIOL 152 Intro to Biological Science II	ENVS/GEOG 335 Env Geology & ENVZ/GEOG 335 Env Geology Lab	SOCY/POLI 320 Research Methods in the Soc Sci
BIOL 317 Ecology	ENVS 490 Research Sem in Env Studies	
BIOL 322/ENVS 330 Environmental Pollution or BIOL 432 Biology of Polluted Waters	PHYS 202 General Physics and PHYZ 202 General Physics Lab or PHYS 208 Univ	
CHEM 102 General Chemistry		

One additional environmental studies course chosen with adviser's approval

Virginia Tech: Environmental Science & Studies CIP Code: 3.0103 & 3.0104

Requirements for a Major Environmental Science: Students must complete all of the core requirements listed below plus the additional requirements for at least one of the four options.

Math, Technology, and Natural Sciences Core

BIOL 1105,1106,1115,1116: Principles of Biology, Lab (8)
CEE 3104: Intro to Environmental Engineering (3)
CHEM 1035, 1036, 1045, 1046: General Chemistry, Lab (8)
CHEM 3114, 3124: Analytical Chem. for Life Sciences, Lab (4)
CHEM 2535, 2545: Organic Chemistry, Lab (4)
CSES 1004: Introduction to Crop and Soil Environmental Sciences (1)
CSES 3114, 3124: Soils, Lab (4)
ENSC 3604: Fundamentals of Environmental Science (3)
ENSC 3634: Physics of Pollution (3)
ENSC 4004: Senior Seminar (1)
GEOS 4804: Groundwater Hydrology (3)
MATH 1016,2015,2016: Elementary Calculus with Trig. I/II (9)
PHYS 2205: General Physics (3)
STAT 3615: Biological Statistics (3)

Humanities, Writing, and Social Sciences Core

AAEC 1005,1006: Economics of Food & Fiber Sys. (6)
ENGL 1105,1106: Freshman English (6)
ENGL 3764: Technical Writing (3)
Core Area 6 elective (1/3)
Core Area 2 electives (6)

Additional Requirements for the Aquatic Resources Option

BIOL 2604, 2614: General Microbiology, Lab (4)
BIOL 2804: Ecology (3)
BIOL 4004: Freshwater Ecology (4)
BIOL/CEE/CSES/ENSC 4164: Environmental Microbiology (3)
CSES 4594: Soil/Groundwater Pollution (3)
Technical Electives (40+ courses from which to choose) (18)

Additional Requirements for the Land Resources Option

CSES 4124: Soil Survey and Taxonomy (3)
CSES/CEE 4594: Soil and Groundwater Pollution (3)
CSES 4734: Environmental Soil Chemistry (3)
CSES/ENSC/GEOG 4844: Soil Interpretation Using GIS and DSS (3)
GEOG 4084: Introduction to GIS (3)
GEOS 1004, 1104: Physical Geology, Lab (4)
UAP 4374: Land Use & Environment: Planning & Policy (3)
Technical Electives (40+ courses from which to choose) (13)

Additional Requirements for the Plant Resources Option

BIOL 2304: Plant Biology (3)
BIOL 2604, 2614: General Microbiology, Lab (4)
BIOL 2804, 3114: Ecology, Lab (4)
BIOL 3204: Plant Taxonomy (3)
ENSC 3644: Plant Materials for Environmental Restoration (3)
PPWS 3505,3506,3514: Plant Physiology & Environment (7)
Technical Electives (40+ courses from which to choose) (11)

Additional Requirements for the Waste Management Option

BIOL 2604,2614: General Microbiology, Lab (4)
BIOL/CEE/CSES/ENSC 4164: Environmental Microbiology (3)
CEE 4174: Solid & Hazardous Waste Management (3)
CEE/CSES 4594: Soil/Groundwater Pollution (3)
CSES/ENSC 4734: Environmental Soil Chemistry (3)
GEOS 1004, 1104: Physical Geology, Lab (3)
Technical Electives (40+ courses from which to choose) (15)

B.S. in Environmental Policy and Planning:

Curriculum for Liberal Education (a.k.a. University Core) Requirements (36 hours)

ENGL 1105-1106 Freshman English

3 hours from approved list, and either LAR 4034 Evolution of the American Landscape or FOR 2554 Nature and American Values or UAP 4264 Environmental Ethics and Policy

ECON 2005-2006 Principles of Economics or AAEC 1005-1006 Economics of Food and Fiber

BIOL 1005-1006/1015-1016 General Biology and Lab or BIOL 1105-1106/1115-1116 Principles of Biology and Lab

MATH 1015-1016 Elementary Calculus with Trigonometry

LAR 1144 Introduction to Landscape Architecture

UAP 3344 Global Environmental Issues

Environmental Policy and Planning Requirements (61 hours)

PSCI 1014 Introduction to US Government & Politics

UAP 3714 US Policy Process

UAP 3744 Public Policy Analysis

AAEC 3314 Environmental Law

UAP 3354 Introduction to Environmental Policy and Planning

UAP 4354 Environmental Problem Solving Studio

UAP 4364 Seminar in Environmental Policy and Planning

UAP 4184 Community Involvement

UAP 4374 Land Use and Environment

UAP 4384 Pollution Control Planning and Policy

UAP 3024 The Personal Computer in Urban Analysis or GEOG 4084 Intro to GIS or SPIA 2004 Computer Applications in Social Science Research

STAT 3604 Statistics for the Social Sciences

COMM 2004 Public Speaking or ENGL 3764 Technical Writing

ECON 4014 Environmental Economics OR AAEC 4304 Environmental and Sustainable Development Economics

CHEM 1015/1025 Intro to Chemistry and Lab OR CHEM 1035/1045 General Chemistry and Lab

ENSC 3604/CSES 3604 Fundamentals of Environmental Science

One of the following: ENGR 3054 Engineering Our Environment OR ENGR 3124 Intro to Green Engineering OR UAP 4394 Community Renewable Energy Systems

One of the following: BIOL 2804 Ecology OR BSE 2384 Soil and Water Resources Management OR GEOG 1104 Intro to Physical Geography OR GEOL 1004 Physical Geology OR

FOR 2314/2324 Dendrology and Lab OR FIW 2114 Principles of Fisheries and Wildlife Management OR CSES 3114 Soils

Two of the following: UAP 4214 Women, Environment, Development OR UAP 4344 Law of Critical Environmental Areas OR AAEC 4314 Environmental Economic Analysis and

Management OR AAEC 4344 Sustainable Development Economics OR HIST 3144 American Environmental History OR LAR 4444 Environmental Impact Assessment

Free Electives (23 hours)