Environmental Science and Policy

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Andrew Berke, Assistant Professor of Chemistry
Elliot Fratkin, Professor of Anthropology 12
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Leslie L. King, Associate Professor of Sociology
Robert Morgan Newton, Professor of Geosciences
Paulette M. Peckol, Professor of Biological Sciences
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Amy Larson Rhodes, Professor of Geosciences
Susan Stratton Sayre, Assistant Professor of Economics
L. David Smith, Professor of Biological Sciences
Camille Washington-Ottombre, Assistant Professor of Environmental Science and Policy 2
Gregory Whayne White, Professor of Government

The Major


The environmental science and policy (ES&P) major is designed for students with interests in the environment and sustainability and a commitment to scientifically based problem solving and policy analysis. The objectives of the major are to prepare students to transcend disciplinary boundaries, combine analytical and communication skills with a well-rounded understanding of the environment, and translate this knowledge into meaningful action and innovative solutions. Four integration courses form the intellectual and organizational core of the major. Each course brings together frameworks, proficiencies and knowledge from natural and social sciences in an explicitly integrative fashion to explore and analyze important environmental topics at local, regional, national and global levels. Additional introductory courses provide breadth in the natural and social sciences, humanities, and statistics, and introduce students to fundamental aspects of disciplines important to understanding human-environment interactions. Students gain depth of knowledge by choosing a coherent sequence of electives with a clear environmental focus. Students are strongly encouraged to engage in environmentally oriented internships, independent research or study-away opportunities.

Prospective majors should consult with an ES&P faculty adviser in choosing their courses. In their first semesters, students are encouraged to enroll in one of the introductory courses (see list) and an appropriate integration course (101), as well as statistics.

Requirements: The ES&P major requires 14 courses. These include the following:

- Four environmental integration courses (101, 201/202, 311, 312)
- Three introductory courses in the natural sciences from different areas (BIO, CHM, GEO, PHY/EGR), two of which must include labs (see list)
- Two introductory courses in the category of social sciences, humanities and policy from different departments (see list)
- One course in statistics (see list)
- Four electives that create a coherent sequence with a clear environmental focus. No more than one elective may be at the 100 level and at least one must be at the 300 level; ENX 100 may not be used as an elective. One semester of independent study (400) or credit toward an honor’s thesis (430d) may be substituted for one elective, but neither may count as the 300-level elective.

One course fulfilling the major requirements may be taken S/U; 201/202, 311, and 312 may not be taken S/U.

Environmental Integration Courses

All majors must complete the four environmental integration courses:

ENV 101 Sustainability and Social-Ecological Systems
ENV 201 Researching Environmental Problems
ENV 202 Researching Environmental Problems Laboratory
ENV 311 Interpreting and Communicating Environmental Information
ENV 312 Sustainable Solutions

Introductory Courses

Natural Sciences

All majors must take one course in three of the following four natural science areas: biological sciences, chemistry, geosciences, or physics and engineering. Two of these courses must include a laboratory or field component. BIO 131 and GEO 102 count only as lab courses. BIO 131 must accompany BIO 130. GEO 102 must accompany an introductory GEO lecture course. Students with Advanced Placement credit (4 or 5) in an area may substitute an appropriate upper-level course in consultation with an ES&P adviser and in accordance with guidelines of the home department.

Natural Science Lab or Field Courses

BIO 131 Biodiversity, Ecology and Conservation Laboratory
CHM 111 Chemistry I: General Chemistry
CHM 118 Advanced General Chemistry
FYS 103 Geology in the Field
GEO 102 Exploring the Local Geologic Landscape
GEO 108 Oceanography: An Introduction to the Marine Environment
PHY 117 Introductory Physics I
PHY 118 Introductory Physics II
Natural Science Lecture Courses

BIO 130  Biodiversity, Ecology and Conservation  
CHM 108  Environmental Chemistry  
EGR 100  Engineering for Everyone  
ENV 108  Environmental Chemistry  
GEO 101  Introduction to Earth Processes and History  
GEO 105  Natural Disasters: The Science Behind the Headlines  
GEO 106  Extraordinary Events in the History of Earth, Life and Climate

Social Sciences, Humanities and Policy

All majors must take two courses from the social science, humanities and policy category listed below. The courses must be from different departments. Students with Advanced Placement credit (4 or 5) in an area may substitute an appropriate upper-level course in consultation with an ES&P adviser and in accordance with guidelines of the home department.

ANT 130  Introduction to Cultural Anthropology  
ANT 241  Anthropology of Development  
ECO 150  Introductory Microeconomics  
GOV 200  American Government  
GOV 207  Politics of Public Policy  
GOV 241  International Politics  
PHI 238  Environmental Ethics  
PPL 220  Public Policy Analysis  
SOC 101  Introduction to Sociology  
SWG 150  Introduction to the Study of Women and Gender

Statistics

Majors must take one course in statistics (ECO 220, GOV 190, MTH 220, PSY 201, SDS 220 or SOC 201). Students with Advanced Placement credit (4 or 5) in statistics may substitute an appropriate upper-level statistics course in consultation with an ES&P adviser and in accordance with guidelines of the home department.

Electives for the Environmental Focus

Majors should choose their elective courses in consultation with the major adviser to create a coherent sequence with a clear environmental focus; the focus may be specific to a discipline, topic or location. No more than one elective can be at the 100 level; at least one must be at the 300 level. Several colloquium and seminar courses have rotating themes; approval is granted for years when the focus is on environmental and sustainability topics. ENX 100 may not be used as an elective. Electives and the environmental focus can be identified at the time the major is declared but not later than the end of the add/drop period of the first semester of junior year. Subsequent changes require approval of the major adviser. Electives can include but are not limited to the following approved list.

Other relevant courses offered at Smith, within the Five College Consortium, or in study-away programs may be used to satisfy the electives requirement of the major with consultation and approval of the major adviser. One semester of independent study (400) or credit toward an honors’ thesis (430d) may be substituted for one elective, but neither may count as the 300-level elective. 400 must be taken for 3 or 4 credits to be used as an elective. Internships, study-abroad or Praxis experiences are encouraged.

Natural Science

Biological Sciences

BIO 103  Economic Botany: Plants and Human Affairs  
BIO 206  Plant Physiology  
BIO 207  Plant Physiology Laboratory  
BIO 260  Invertebrate Diversity  
BIO 261  Invertebrate Diversity Laboratory  
BIO 264  Plant Diversity and Evolution  
BIO 265  Plant Diversity and Evolution Laboratory  
BIO 268  Marine Ecology  
BIO 269  Marine Ecology Laboratory  
BIO 272  Vertebrate Biology  
BIO 273  Vertebrate Biology Laboratory  
BIO 355  Ecophysiology  
BIO 356  Ecophysiology Laboratory  
BIO 364  Plant Ecology  
BIO 365  Plant Ecology Laboratory  
BIO 366  Biogeography  
BIO 390  Seminar: Topics in Environmental Biology

Chemical Impacts of Global Change

Investigations in Conservation Biology

Chemistry

CHM 346 Environmental Analytical Chemistry

Environmental Science and Policy

ENV 150  Mapping Our World: An Introduction to Geographic Information Systems  
ENV 266  Landscapes of Northern Germany: Natural Environments and Human Influences

Environmental Concentration

ENX 301  Environmental Concentration Capstone

Geosciences

GEO 150  Mapping our World: An Introduction to Geographic Information Systems  
GEO 231  Invertebrate Paleontology and the History of Life  
GEO 232  Sedimentary Geology  
GEO 251  Geomorphology  
GEO 301  Aqueous Geochemistry  
GEO 309  Groundwater Geology

Physics and Engineering

EGR 312  Seminar: Atmospheric Processes  
EGR 315  Ecolhydrology  
EGR 325  Electric Power Systems  
EGR 326  Power Systems  
EGR 346  Hydrosystems Engineering  
EGR 388  Seminar: Photovoltaic and Fuel Cell System Design  
EGR 390  Advanced Topics in Engineering

Contaminant Fate and Removal in Aquatic Systems
Environmental Science and Policy

Social Sciences, Humanities and Policy

ANT 236  Economy, Ecology and Society
ANT 241  Anthropology of Development
EAS 220  Colloquium: Environment and Society in Contemporary China
ECO 224  Environmental Economics
ECO 324  Seminar
  Economics of the Environment and Natural Resources
ENG 118  Colloquia in Writing
  Water: Science and Politics
ENG 135  Introduction to Writing Creative Nonfiction
  Writing About Place and Travel
  Writing About the Environment
ENV 220  Natural Resource Management and Environmental Justice
ENV 275  Decoding the Experts: Modeling the Impact of Climate Change
ENV 323  Climate and Energy Policy
GOV 241  International Politics
GOV 242  International Political Economy
GOV 254  Colloquium: Politics of the Global Environment
GOV 306  Seminar in American Government
  Politics and the Environment
GOV 347  Seminar in International Politics and Comparative Politics
  Environmental Security
HST 263 (C)  Continuity and Change in Spanish America and Brazil
  Natural Resources and the Environment in Latin American History
  The Environmental History of Latin America
JUD 229  Judaism and Environmentalism
LSS 250  Studio: Landscape and Narrative
PHI 238  Environmental Ethics
PHI 304  Colloquium in Applied Ethics
  Sustainability
SOC 232  World Population
SOC 335  Seminar: Social Justice, the Environment and the Corporation
SWG 230  Gender, Land and Food Movements

Special Studies

ENV 400 Special Studies
Admission by permission of the instructor. Special Studies are open to qualified juniors and seniors and, in appropriate cases, to sophomores. Students are encouraged to contact the instructor in advance of the semester they intend to take this course. Credits: 1 to 4

Members of the program
Offered Fall 2016, Spring 2017

Honors

Students with a strong academic background who wish to conduct independent and original work on an environmental topic are encouraged to pursue an honors project. Interested students should contact potential honors advisers by the beginning of February in the spring semester of their junior year.

Please consult the director of honors for specific requirements and application procedures.

Director: L. David Smith

ENV 430D Honors Project
Full-year course, 4 credits each semester. Offered every year. Please consult the director of honors, Professor L. David Smith, for specific requirements and application procedures. Credits: 8
Offered Fall 2016, Spring 2017

Study Abroad

Students may elect to take courses for the major outside Smith College by participating in an environmentally oriented, off-campus program. Relevant Smith-approved programs include but are not limited to Arava Institute for Environmental Studies, Danish Institute for Study Abroad, Duke University’s Organization for Tropical Studies, Frontiers Abroad Earth Systems New Zealand, the School for Field Studies, the School for International Training, SEA Semester, and the Maritime Studies Program of Williams College and Mystic Seaport. Courses from other study-away programs may also be eligible for credit with approval of the major adviser. Study-away courses will generally count as 200-level electives, but specific courses in specific programs may be authorized to count as 300-level electives with preapproval of the major adviser.

Study Abroad Adviser: Your major adviser for environmental science and policy

The Minor

Advisers: Advisers for the major also serve as advisers for the minor

The minor consists of six courses chosen with the guidance and approval of an ES&P adviser. Interested students are urged to meet with the director, program administrator or ES&P adviser early in their academic planning.

Requirements: Six courses: 101; two courses from the natural science category (must not be in the same area); one course from the social science, humanities and policy category; and two electives in consultation with the minor adviser. For three of the six courses, two must be 200 level or higher; the third should normally be above the 100 level. EGR 315 and GEO 301 may be used to fulfill a natural science requirement in either of two categories (see list below). EGR 100 has several rotating themes and may count toward the minor when the focus is on energy, natural resources or sustainability. ENX 100 may not be used as an elective; 201/202 and 311 may count as electives toward the minor but do not fulfill either the natural science or the social science, humanities and policy requirements. We recommend taking a course in geographic information systems (ENV 150/GEO 150) as an elective. Appropriate Smith courses not listed below, Five College courses, or courses taken at other institutions and through summer and semester-away programs may be counted toward the minor with preapproval of the adviser. Students must satisfy the prerequisites for all courses included in their minor program. No more than three of the six courses may be taken at other institutions. No more than one course may be taken S/U; 101 may not be taken S/U.

Natural Sciences

All minors must take one course in two of the following four natural science areas:

Biological Sciences

BIO 130  Biodiversity, Ecology and Conservation
BIO 268  Marine Ecology
BIO 269  Marine Ecology Laboratory
BIO 364  Plant Ecology
BIO 365  Plant Ecology Laboratory
BIO 390  Seminar: Topics in Environmental Biology
  Coral Reef Ecology and Conservation
  The Ecological Impacts of Global Change
  Investigations in Conservation Biology
**Chemistry**

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<tbody>
<tr>
<td>CHM 108</td>
<td>Environmental Chemistry</td>
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<td>CHM 346</td>
<td>Environmental Analytical Chemistry</td>
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<tr>
<td>ENV 108</td>
<td>Environmental Chemistry</td>
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<tr>
<td>GEO 301</td>
<td>Aqueous Geochemistry</td>
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**Geosciences**

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<td>Introduction to Earth Processes and History</td>
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<td>GEO 105</td>
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<td>Extraordinary Events in the History of Earth, Life and Climate</td>
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<td>GEO 108</td>
<td>Oceanography: An Introduction to the Marine Environment</td>
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<td>GEO 301</td>
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<td>GEO 309</td>
<td>Groundwater Geology</td>
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<td>EGR 315</td>
<td>Ecohydrology</td>
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**Physics and Engineering**

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<td>EGR 100</td>
<td>Engineering for Everyone</td>
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<td>EGR 312</td>
<td>Seminar: Atmospheric Processes</td>
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<td>EGR 315</td>
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**Social Sciences, Humanities and Policy**

All minors must take one course in the social sciences, humanities and policy category.

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<tr>
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<td>HST 263</td>
<td>Continuity and Change in Spanish America and Brazil</td>
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**Electives**

All minors must take two elective courses. Electives may include 201/202; 311; courses listed above for the minor in the natural sciences and social sciences, humanities and policy categories; and courses listed under electives for the environmental focus for the major. Other relevant courses offered at Smith, within the Five College Consortium, or in study-away programs may be used to satisfy the electives requirement of the minor with consultation and approval of the major adviser.

**ENV 101 Sustainability and Social-Ecological Systems**

We have entered a new geological epoch, the Anthropocene, characterized by the accelerating impact of human activities on the Earth’s ecosystems. All over the globe, humans have transformed the environment and have sometimes created catastrophic dynamics within social-ecological systems. Scientists have studied these phenomena for decades, alerting both the general public and policy-makers of the consequences of our actions. However, despite convincing evidence of environmental degradation, humans continue to radically transform their environment. This course explores this puzzle and asks how we can remodel our social-ecological systems to build a more sustainable and resilient future. Enrollment limited to 60. (H) {N} {S} Credits: 4  
*Camille Washington-Ottombre*

**Offered Fall 2016**

**ENV 108 Environmental Chemistry**

Same as CHM 108. An introduction to environmental chemistry, applying chemical concepts to topics such as acid rain, greenhouse gases, air quality, pesticides and waste treatment. Chemical concepts are developed as needed.  
{N} Credits: 4  
*Andrew Berke, Members of the department*

**Offered Spring 2017, Spring 2018**

**ENV 150 Mapping Our World: An Introduction to Geographic Information Systems**

Same as GEO 150. A geographic information system (GIS) enables data and maps to be overlain, queried and visualized in order to solve problems in many diverse fields. This course provides an introduction to the fundamental elements of GIS and applies the analysis of spatial data to issues in geoscience, environmental science and public policy. Students gain expertise in ArcGIS—the industry standard GIS software—and online mapping platforms, and carry out semester-long projects in partnership with local conservation organizations. Enrollment limited to 20. {N} Credits: 4  
*John Loveless*

**Offered Fall 2016**

**ENV 201 Researching Environmental Problems**

While focusing on topical environmental issues, students learn how to gather, analyze and present data using methods from the natural and social sciences. Data are drawn from multiple sources, including laboratory experiments, fieldwork, databases, archival sources, surveys and interviews. Emphasis is on quantitative analysis. Environmental topics vary in scale from the local to the global. Note: 202 must be taken concurrently. Prerequisite: 101. Enrollment limited to 18. Q {N} {S} Credits: 4  
*Alexander Barron, Camille Washington-Ottombre*

**Offered Fall 2016, Spring 2017**

**ENV 202 Researching Environmental Problems Laboratory**

In this laboratory complement to 201, students use a variety of methods to gather and analyze different types of environmental data (quantitative, qualitative, spatial). Enrollment limited to 18. Q {N} {S} Credits: 1  
*Alexander Barron, Camille Washington-Ottombre*

**Offered Fall 2016, Spring 2017**

**ENV 220 Natural Resource Management and Environmental Justice**

This course examines the connections between natural resource management and environmental justice in the U.S. and the Global South. We study the benefits and limits of traditional top-down approaches to the management of forests, land, fisheries, biodiversity, underground resources, water, food and genomes in different parts of the world. By discussing case studies of environmental justice issues from mountaintop removal mining and hydraulic fracturing in West Virginia to the impact of biofuels and GMOS on local populations in Mexico, students question and rethink the management of natural resources. Enrollment limit of 20. {N} {S} Credits: 4  
*Camille Washington-Ottombre*

**Offered Fall 2017**
ENV 266 Landscapes of Northern Germany: Natural Environments and Human Influences
This course is part of the Smith Study Abroad Program in Hamburg, Germany, and limited to students enrolled in this program. The course includes lectures, field trips to locations in Northern Germany, and seminars with student presentations and discussion. The lectures cover a general introduction to different landscape types of Northern Germany: their geology, characteristic plant and animal life, and development through time; and focus on the effects of humans on landscape development for the last 6,000 years. Discussions explore possibilities and constraints of sustainable development based on the natural resources of the region. Visits to different landscapes of Northern Germany over five days of field trips provide a good overview of the landscape types present. [N] [S] Credits: 4

Kai Jensen
Offered Spring 2017, Spring 2018

ENV 275 Decoding the Experts: Modeling the Impact of Climate Change
The U.S. estimates the cost of carbon is $37/ton. Is this estimate too low? Too high? What will emission reductions cost? This course is a cooperative research effort to understand and evaluate the Integrated Assessment Models used to estimate the costs and benefits of carbon emission reductions. We begin with the IPCC predictions of the physical impacts of climate change and then turn to the economic models that translate physical predictions into cost estimates. Emphasis on understanding and critiquing the logic of the models and learning how differing assumptions translate into a wide range of reported estimates. Enrollment limit of 20. [E] [S] Credits: 4

Susan Sayre
Offered Fall 2016

ENV 311 Interpreting and Communicating Environmental Information
This course focuses on the interpretation and communication of environmental issues and solutions from multi- and interdisciplinary perspectives. Using contemporary environmental topics as a foundation, this course introduces students to written, oral, visual and quantitative communication for a variety of audiences and intents. Students develop the ability to interpret environmental information from multiple sources, to synthesize that information for their own understanding, and to communicate that knowledge in ways appropriate to the particular objective and audience. A series of projects enable students to communicate an environmental issue of their own choosing to a diversity of audiences and intents. Students develop the ability to interpret environmental information from multiple sources, to synthesize that information for their own understanding, and to communicate that knowledge in ways appropriate to the particular objective and audience. A series of projects enable students to communicate an environmental issue of their own choosing to a diversity of audiences. Prerequisite: one semester of statistics. 101 and 201/202 are strongly recommended. Enrollment limited to 25. [N] [S] Credits: 4

Leslie King
Offered Fall 2016

ENV 312 Sustainable Solutions
This course is designed to develop a student’s abilities as an environmental problem solver through practice. The problems come in two forms: a campus or local problem related to environmental sustainability or resilience, and the problem of what to do with one’s life. To address each, students engage in a semester-long group project that addresses a real-world environmental issue or question (projects vary from year to year) and a more individualized examination of the student’s own values, career aspirations and skills. Student work is assessed via progress reports, exercises, class participation, an oral presentation and a final written report. Prerequisites: 101, a statistics course, 201/202 and 311 (311 may be taken concurrently). Enrollment limited to 16. [N] [S] Credits: 4

Alexander Barron, L. David Smith
Offered Fall 2016, Spring 2017

ENV 323 Climate and Energy Policy
This course examines climate change and energy policy from several perspectives including scientific, economic, equity, political and practical considerations. We examine sources and trends of greenhouse gas emissions and climate impacts and then focus on a specific sector (e.g., electric power) to consider existing policies, market structures and the spectrum of approaches to reduce emissions. Students work in small groups on projects in an active policy area and prepare a briefing and paper. Prerequisite: ENV 101, 201/202 or permission of the instructor. [E] [N] [S] Credits: 4

Alexander Barron
Offered Spring 2018

ENV 400 Special Studies
Admission by permission of the instructor. Special Studies are open to qualified juniors and seniors and, in appropriate cases, to sophomores. Students are encouraged to contact the instructor in advance of the semester they intend to take this course. Credits: 1 to 4

Members of the program
Offered Fall 2016, Spring 2017

ENV 430D Honors Project
Full-year course, 4 credits each semester. Offered every year. Please consult the director of honors, Professor L. David Smith, for specific requirements and application procedures. Credits: 8

Members of the program
Offered Fall 2016, Spring 2017

Cross-Listed Courses
ECO 220 Introduction to Statistics and Econometrics
SOC 201 Statistics for Sociology
GOV 241 International Politics
ECO 150 Introductory Microeconomics
PSY 201 Statistical Methods for Undergraduate Research
BIO 131 Biodiversity, Ecology and Conservation Laboratory
MTH 220 Introduction to Probability and Statistics