

## Environmental Science and Policy

ADVISORY COMMITTEE: **Swaddle** (Director, Biology), **Boone** (Business), **Chambers** (Biology), **A. Fisher** (History), **W. Fisher** (Anthropology), **Hancock** (Geology), **Ivanova** (Government), **Roberts** (Sociology), **Root** (Hispanic Studies), **Ryan** (Law), **Taylor** (VIMS)

The environmental problems that threaten the planet on which our society depends are complex, requiring us to integrate insights across the disciplines. Because of the interdisciplinary nature of these problems, students pursuing careers in the environment need significant breadth of training in natural and social sciences and the humanities. At the same time, students need to have an area of expertise, and so should develop effective skills based on depth of training in a specific area. In light of the need for an appropriate balance between breadth and depth of training, the Environmental Science and Policy (ENSP) program has been designed as a secondary major and a minor, each to be pursued in conjunction with a primary major in another complementary subject field. Every ENSP major/minor must major in another discipline.

The Environmental Science and Policy major provides breadth in basic course work as well as familiarization with the specific scientific and social considerations related to a wide range of environmental issues. Participation in the program requires an initial consultation with the Director, and a formal declaration of major no later than the second semester of the junior year. Students pursuing a primary major in Biology, Chemistry, Geology, Physics, or other natural science field will normally have their secondary major designated as Environmental Science and they will receive the Bachelor of Science (B.S.) degree. Others, often students pursuing a primary major in Economics, Global Studies, Government, International Relations, Public Policy, or Sociology, will receive a Bachelor of Arts (B.A.) with an Environmental Policy designation. There are two slightly different programs for the B.A. and B.S. majors: the "Science Track" and the "Policy Track."

There are no formal restrictions on the primary major pursued in conjunction with the Environmental Science and Policy major. However, the primary major is expected to both supplement and complement the student's environmental training, while providing the necessary additional depth. Therefore, students are expected to develop an overall program with an appropriate rationale based on interconnections among subjects as well as the student's long-term career interests. Two elective courses may be counted toward both majors; therefore, depending on the primary major, the number of additional courses required to complete the Environmental Science and Policy major may total less than 36 hours.

For both the B.A. and B.S., limited substitution of other courses for some of these requirements may be possible with the approval of the Director. In addition to the required work, various other courses as well as non-classroom training (such as internships, research projects with faculty, participation in study abroad programs, or off-campus study and research such as participation in an REU program) are strongly recommended.

For advice, further information, updates, and additional descriptive material, contact the Director (Prof. John Swaddle, Biology Dept., jpswad@wm.edu) and visit [www.wm.edu/environment](http://www.wm.edu/environment).

### Requirements for Major

#### Environmental Science (the Science Track)

##### Required Credit Hours: 36

**Major Computing Requirement:** The 400-level courses satisfy the Major Writing and Computer Proficiency Requirements by achieving a grade of at least C-.

**Major Writing Requirement:** The 400-level courses satisfy the Major Writing and Computer Proficiency Requirements by achieving a grade of at least C-.

#### Core Requirements:

1. ENSP 101 Introduction to Environmental Science and Policy (3 credits)
2. At least five credits of ENSP 200-250, including one ENSP 200-249 course and at least one ENSP 250 seminar
3. Four required courses in the Natural Sciences, at least one with lab: (at least 13 credits total). One from each category.
  - a. Biology/Ecology: BIOL 204 Principles of Biology: Organisms, Ecology and Evolution (4)
  - b. Geology: GEOL 110 Earth's Environmental Systems: Physical Geography (3) (preferred) or 101 The Dynamic Earth: Physical Geology (3)
  - c. Natural science course with field laboratory component: BIOL 416 Ornithology (4); BIOL 417 Population and Community Ecology; BIOL 426 Aquatic Ecology (4); BIO 427 Wetland Ecosystems (4); GEOL 314 Watershed Dynamics (4); GEOL 315 Hydrology (3); GEOL 316 Environmental Geochemistry (3); GEOL 320 Surface Processes: Landscapes & Water (4); or other approved course
  - d. Chemistry: CHEM 206 Organic Chemistry I or CHEM 308 General Chemistry II (3) [CHEM 103 General Chemistry I and 151 General Chemistry I Lab are prerequisites for these courses]
4. Three required courses in Social Sciences and Humanities (9 credits). One course from each category.
  - a. Social Sciences: ECON 322 Environmental and Natural Resources Economics (3) [ECON 101 and 102 are prerequisites for this course]; SOCL 308: Environmental Sociology (3); SOCL 427: Globalization and the Environment (3); ANTH 338: Native Cultures of Latin America (3); GOVT 322: Global Environmental Governance; GOVT 491: International Organizations and Environmental Governance; or other approved course
  - b. Ethics: ENSP 302 Philosophic History of American Environmentalism (3); ENSP 303 Topics in Environmental Ethics; KINE 393: Health Ethics (3); RELG 321 Ecology and Ethics (3); or other approved course
  - c. Other Humanities: ANTH 315 Environmental Archaeology (3); HISP 360: Cultural Constructions of the Environment in Latin America; HIST 226: American West Since 1890; HIST 490C: African Environmental History; ENGL 475: Novels of Eco-Catastrophe; or other approved course
5. A 3 credit course in statistics (available through several departments); MATH 106; MATH 351; BIOL 425; SOCL 353; ECON 307; PSYC 301; BUAD 231; KINE 394; or other approved course
6. Capstone experience: (3 credits)
  - a. ENSP 440 Special Topics in Environmental Science and Policy
  - b. ENSP 490 Independent Research
  - c. ENSP 495-496 Honors
  - d. ENSP 498-499 Internship
  - e. or other approved capstone experience with permission of the Director

#### Environmental Policy (The Policy Track)

##### Required Credit Hours: 36

**Major Computing Requirement:** The 400-level courses satisfy the Major Writing and Computer Proficiency Requirements by achieving a grade of at least C-.

**Major Writing Requirement:** The 400-level courses satisfy the Major Writing and Computer Proficiency Requirements by achieving a grade of at least C-.

#### Core Requirements:

1. ENSP 101 Introduction to Environmental Science and Policy (3 credits)
2. At least five credits of ENSP 200-250, including one ENSP 200-249 course and at least one ENSP 250 seminar.
3. Three required courses in the Natural Sciences, at least one with lab: (at least 10 credits total). One from each category.
  - a. Natural Science Proficiency: BIOL 204 Principles of Biology: Organisms, Ecology and Evolution (4), or GEOL 110

- Earth's Environmental Systems: Physical Geography (3), or 101 The Dynamic Earth: Physical Geology (3).
- b. A Natural Sciences course with field laboratory component: BIOL 416 Ornithology (4); BIOL 417 Population and Community Ecology; BIOL 426 Aquatic Ecology (4); BIOL 427 Wetland Ecosystems (4); GEOL 314 Watershed Dynamics (4); GEOL 315 Hydrology (3); GEOL 316 Environmental Geochemistry (3); GEOL 320 Surface Processes: Landscapes & Water (4); or other approved course
  - c. Chemistry: CHEM 101: Survey of Chemical Principles, or CHEM 103: General Chemistry (3 credits total).
4. Four required courses in Social Sciences and Humanities (12 credits). One from each category.
    - a. Economics: ECON 322 Environmental and Natural Resources Economics (3) [ECON 101 and 102 are prerequisites for this course]; or other approved course
    - b. Politics and Sociology: SOCL 308: Environmental Sociology (3); SOCL 427: Globalization and the Environment (3); ANTH 338: Native Cultures of Latin America (3); GOVT 322: Global Environmental Governance; GOVT 491: International Organizations and Environmental Governance; or other approved course
    - c. Ethics: ENSP 302: Philosophic History of American Environmentalism (3); ENSP 303: Issues in Environmental Ethics (3); KINE 393: Health Ethics (3); RELG 321 Ecology and Ethics (3); or other approved course
    - d. Other Humanities: ANTH 315 Environmental Archaeology (3); HISP 360: Cultural Constructions of the Environment in Latin America; HIST 226: American West Since 1890; HIST 490C: African Environmental History; ENGL 475: Novels of Eco-Catastrophe; or other approved course
  5. A 3 credit course in statistics (available through several departments); MATH 106; MATH 351; BIOL 425; SOCL 353; ECON 307; PSYC 301; BUAD 231; KINE 394; or other approved course
  6. Capstone experience: (3 credits)
    - a. ENSP 440 Special Topics in Environmental Science and Policy
    - b. ENSP 490 Independent Research
    - c. ENSP 495-496 Honors
    - d. ENSP 498-499 Internship
    - e. or other approved capstone experience with permission of the Director

## Requirements for Minor in Environmental Science and Policy

**Required Credit Hours: 20**

### Core Requirements:

1. ENSP 101 Introduction to Environmental Science and Policy (3 credits)
2. Five credits of ENSP 200-250, including one ENSP 200-249 course and at least one ENSP 250 seminar
3. Three courses, at least one from each group (at least 9 credits total):
  - a. Natural Sciences course with field laboratory component: BIOL 416 Ornithology (4); BIOL 417 Population and Community Ecology; BIOL 426 Aquatic Ecology (4); BIOL 427 Wetland Ecosystems (4); GEOL 314 Watershed Dynamics (4); GEOL 315 Hydrology (3); GEOL 316 Environmental Geochemistry (3); GEOL 320 Surface Processes: Landscapes & Water (4); or other approved course [all of the courses listed require some form of introductory biology or geology course as a prerequisite]
  - b. Environmental Policy/Sociology: ECON 322: Environmental and Natural Resources Economics (3) [ECON 101 and 102 are prerequisites for this course]; GOVT 322: Global Environmental Governance; GOVT 491: International Organizations and Environmental Governance or other approved course; SOCL 308: Environmental Sociology (3); SOCL 427: Globalization and the Environment

- (3); ANTH 315 Environmental Archaeology (3); ANTH 338: Native Cultures of Latin America (3); HISP 360: Cultural Constructions of the Environment in Latin America; HIST 226 American West Since 1890; HIST 490C: African Environmental History; or other approved course
- c. Ethics: ENSP 302 Philosophic History of American Environmentalism (3); ENSP 303: Issues in Environmental Ethics; KINE 393: Health Ethics (3); RELG 321 Ecology and Ethics (3); or other approved course
4. Capstone experience: (3 credits)
  - a. ENSP 440 Special Topics in Environmental Science and Policy
  - b. ENSP 490 Independent Research
  - c. ENSP 495-496 Honors
  - d. ENSP 498-499 Internship
  - e. or other approved capstone experience with permission of the Director

## Description of Core Courses

### 101. Introduction to Environmental Science and Policy.

*Fall (3) Hicks, Ivanova, Chambers, Taylor, Staff.*

This team-taught interdisciplinary course brings together perspectives and approaches to environmental problems from natural sciences, social sciences, and humanities. Examines key environmental concepts by exploring case studies such as pollution and contamination disputes, ecosystem management in the Chesapeake Bay, and biodiversity.

### 201. Watershed Dynamics.

*Spring of alternate years (4) Chambers, Hancock. Prerequisite: BIOL 203 or 204 OR GEOL 101, 110, or 150. (Next offered in 2009)*

This team-taught course will combine biologic and hydrologic approaches to explore the interactions between the physical, biological, and chemical processes active in watersheds. Emphasis will be placed on understanding how interactions between these processes control water quality and biologic diversity, and how anthropogenic activities modify these processes. Laboratory is required.

### 202. Global Environmental Challenges: Climate Change.

*Fall, Spring (3) Roberts, Taylor. Prerequisite: ENSP 101.*

This course introduces students to the state of scientific knowledge about climate and climate change, including natural cycles and human-induced changes. It explores potential impacts of climate change, national policies, the Kyoto Protocol, and other global efforts to address the problem.

### 203. Public Commons Project.

*Fall, Spring (1-3) Taylor. Prerequisites: ENSP 101.*

This workshop course will have students and faculty working as a team on community-based research, addressing important local and regional environmental issues in consultation with community organizations and local government agencies. Topics vary by semester and results are presented publicly.

### 204. GIS in Earth and Environmental Sciences.

*Fall, Spring (3) Staff. Prerequisites: ENSP 101 or GEOL 101, 110, or 150.*

This course will provide an introduction to using Geographic Information Systems (GIS) as a tool in environmental science and policy. Emphasis will be on hands-on application of GIS to create maps, to organize and visualize spatial data, and to query spatial data to elucidate answers to environmental questions. This course is cross-listed from the Geology department.

### 205. Marine and Environmental Science.

*Fall, Spring (3) Staff. Prerequisite: ENSP 101.*

This course introduces students to the science of marine and terrestrial environments. It ties marine science and policy to land use, watershed and coastal zone management, pollution, forests and agriculture, ocean fisheries, mineral resources, climate change, and biodiversity.

**210. The Ethics of Sustainability: Beyond Environmentalism?***(GER 7) Fall (3) Fowler. Pre or Corequisite: ENSP 101.*

The ethical implications of the sustainability revolution are examined with emphasis on its progress beyond environmentalism and its applicability to such issues as global warming, biodiversity, food production and world hunger, population growth, and HIV-AIDS.

**211. The Ethics of Globalization and Sustainability.***(GER 7) Spring (3) Fowler. Pre or Corequisite: ENSP 101.*

The ethical implications of globalization and the sustainability revolution are examined. Emphasized are the ethical controversies surrounding the social responsibility of trans-national corporations, consumerism, growing world thirst, and the challenges of protecting the environment, jobs and workers rights.

**249. Environmental Challenges: Topics.***Fall, Spring (1-4) Staff. Prerequisite: ENSP 101.*

This course is an in-depth look at an important issue of environmental science and policy. The topics to be considered will be announced prior to the beginning of the semester. The course is primarily designed for sophomores and juniors who have taken Introduction to Environmental Science and Policy. ENSP 249 can be repeated for credit if the topic changes. Some topics will include a required weekly laboratory session. In past year it has been common for us to count GEOL 305 Environmental Geology as an ENSP 249 class.

**250. Seminar Topics in Environmental Science and Policy.***Spring (1-3) Staff.*

Key environmental topics will be addressed by top national and international environmental experts in three lectures and informal discussion sessions with students. Small groups of students will meet with faculty to discuss readings and the lectures, and a written assignment will integrate the topic.

**275W. University Seminar.***Fall and Spring (4) Staff.*

A reading-, writing-, and discussion-intensive seminar. Topics vary by semester and by instructor. Restricted to transfer students and co-enrolled students. Students receiving a grade of "C-" or better in the seminar will have satisfied the lower-division writing requirement. This course does not fulfill the Freshman Seminar requirement.

**302. Philosophic History of American Environmentalism.***(GER 4A, 7) Fall, Spring (3) Fowler.*

The Philosophic History of American Environmentalism. Examines basic ethical controversies surrounding modern American environmentalism, with special focus on: 1) our moral place in Darwinian nature, 2) the wilderness ideal, 3) Native American ecology, land ethic and deep ecology, 4) preserving biodiversity, and 5) environmentalism as social (in?) justice.

**303. Issues in Environmental Ethics.***(GER 7) Fall, Spring (3) Fowler.*

This course reviews core issues in environmental ethics and then takes an in-depth look at one area environmental ethics, such as the ethics of conserving biodiversity, Earth Rights, or key environmental cases which raise ethical concerns.

**440. Special Topics in Environmental Science and Policy. (varies by year)***Spring or Fall (1-4) Staff.*

This course provides students a hands-on, in-depth look at an issue of environmental science and policy. The topics to be considered will be announced prior to the beginning of the semester. The course is primarily designed for senior majors or minors. ENSP 440 can be repeated for credit if the topic changes.

**460. Seminar in Environmental Issues.***Spring (3) Staff.*

A topics course for seniors based on an extended review of an environmental issue by each student. In consultation with the professor, students will select a topic in advance of registration for the course, and will research the topic through all appropriate sources (literature, Internet, individuals, etc). An oral presentation and a paper are required.

**490. Independent Research.***Fall and Spring (1-3) Staff.*

This course is designed to permit the environmental science/studies concentrator to engage in independent research in their Junior or Senior years. Working closely with a faculty member as an advisor, each student will be expected to conduct original research and prepare a substantial research paper. This course may be repeated for credit.

**†495-496. Honors.***Fall, Spring (3,3). Staff.*

Environmental Science and Policy Honors students must meet the College's provisions on admissions to the program, see catalog section titled Honors and Special Programs. These students enroll for both semesters of their senior year, defending an Honors Proposal at the end of the first semester, and completing an Honors research project or essay and defending it in an oral exam by April 15th.

**498-499. Internship.***Fall and Spring (1-3) Staff. Prerequisite: Consent of instructor and director.*

This course is designed to allow students to gain knowledge through experience in the environmental area, through work with government agencies, nonprofits, or companies. Students will be supervised by faculty members, and students must complete an agreed-upon list of readings and write a paper tying their experience to existing theory and research. Requires written permission from the Director and a faculty advisor.

**Additional Courses for Major or Minor in Environmental Science and Policy.**

Following is a sample listing of courses that may be credited toward the major or minor. Not all of these courses are offered every semester, and additional courses may qualify for Environmental Science and Policy credit. Please consult with Prof. Swaddle, Director of Environmental Science and Policy, for information.

ANTH 420	Tropical Ecology
APSC 492	Global Changes
APSC 494	Climate: Science and Policy
BIOL 105	Plants, People, and Agriculture [can be considered for an ENSP 249 substitution]
GEOL 305	Environmental Geology [can be considered for an ENSP 249 substitution]
GEOL 306	Marine Geology [can be considered for an ENSP 249 substitution]
GEOL 312	Weather, Climate, and Change [can be considered for an ENSP 249 substitution]
GEOL 330	Introduction to Oceanography [can be considered for an ENSP 249 substitution]
GOVT 381	Human Geography
GOVT 384	The Geography of Latin America and the Caribbean
HIST 211	Early American Environmental History
LAW 424	Environmental Law
LAW 425	Land Use Control