Environmental Sciences

Bachelor of Science (BS)

The environmental sciences (ES) major is designed for students interested in studying environmental problems from a scientific perspective. The ES major prepares students to deal with issues arising from the impact of human interaction on natural systems. To address these problems, all ES students acquire strong backgrounds in math, biological sciences, and physical sciences. Students may choose to specialize further in a biological or physical science field such as ecology, conservation biology, toxicology, geology, hydrology, meteorology, engineering, or a social science field such as planning, policy analysis, economics, environmental justice, or education. Each ES student completes a year-long senior research project with the support of a mentor in a biological, physical, or interdisciplinary research area.

Graduates are well-prepared for careers in fields such as environmental consulting, education, health, or law as well as community, urban, or regional planning and other related areas of environmentalism in public agencies, non-profit conservation organizations, and private companies. Graduates are well-qualified for a variety of graduate programs, including environmental policy and management, law school, medical school (and other pre-health programs), and environmental engineering.

Admission to the Major

Advice on admission for freshmen and transfer students can be found on the CNR Admissions Guide (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/#admissionstext) page or the CNR Prospective Student website (https://nature.berkeley.edu/prospective-students). Freshman students may apply directly to the major, or they may select the College of Natural Resource's undeclared option and declare the major by the end of their fourth semester. Transfer students may apply directly to the major through the UC application.

Information for current Berkeley students who would like to declare the major after admission, including information on a change of major or change of college, please see chapter 6 of the College of Natural Resources Undergraduate Student Handbook (https://nature.berkeley.edu/handbook). (https://nature.berkeley.edu/handbook)

Honors Program

Students with a GPA of 3.6 or higher may enroll in the College of Natural Resources honors program once they have reached upper division standing. To fulfill the program requirements, students design, conduct, and report on an individual research project working with a faculty sponsor. Qualified ES students enroll in ESPM H175A and ESPM H175L fall of their senior year, and ESPM H175B and ESPM H175L spring of their senior year. For further information on the CNR Honors Program, please see the College of Natural Resources website (http://nature.berkeley.edu/site/honors_program.php).

Minor Program

There is no minor program in environmental sciences.

Other Majors Offered by the Department of Environmental Science, Policy, and Management (ESPM)

Conservation and Resource Studies (http://guide.berkeley.edu/undergraduate/degree-programs/conservation-resource-studies) (Major and Minor)
Ecosystem Management and Forestry (http://guide.berkeley.edu/undergraduate/degree-programs/ecosystem-management-forestry) (Major, Forestry Minor)
Molecular Environmental Biology (http://guide.berkeley.edu/undergraduate/degree-programs/molecular-environmental-biology) (Major only)
Society and Environment (http://guide.berkeley.edu/undergraduate/degree-programs/society-environment) (Major only)

Students in this major choose a concentration in biological, physical, or social sciences based on intended research area, or general area of interest. The specific requirements for each concentration are outlined below.

In addition to the University, campus, and college requirements listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a Pass/No Pass basis only. Other exceptions to this requirement are noted as applicable.
2. All courses taken to fulfill major requirements must be passed with a C- or better letter grade.
3. A minimum cumulative grade point average (GPA) of 2.0 is required.
4. A minimum GPA of 2.0 in upper division major requirements is required.
5. A minimum of 30 upper division units is required in the Environmental Sciences major. 15 of the required upper division units must be taken in the College of Natural Resources.
6. A maximum of 16 units of independent study (courses numbered 97, 98, 99, 197, 198, and 199) may count toward graduation, with a maximum of 4 units of independent study per semester.
7. No more than 1/3 of the total units attempted at UC Berkeley may be taken Pass/No Pass. This includes units in the Education Abroad Program and UC Intercampus Visitor or Exchange Programs.
8. A maximum of 4 units of physical education courses will count toward graduation.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

Lower Division Requirements for all ES Majors

**ESPM Environmental Science Core (select one):**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 2</td>
<td>The Biosphere [3]</td>
<td></td>
</tr>
<tr>
<td>ESPM 6</td>
<td>Environmental Biology [3]</td>
<td></td>
</tr>
</tbody>
</table>
## Environmental Sciences

**ESPM C10**  Environmental Issues [4]  
**ESPM 15**  Introduction to Environmental Sciences [3]  
**ESPM C46**  Climate Change and the Future of California [4]  

**ESPM Social Science Core (select one):**  
**ESPM C11**  Americans and the Global Forest [4]  
**ESPM C12/ENGLISH C77**  Introduction to Environmental Studies [4]  
**ESPM 50AC**  Introduction to Culture and Natural Resource Management [4]  
**ESPM 60**  Environmental Policy, Administration, and Law [4]  

**Environmental Economics**  
**ENVECON**  Introduction to Environmental Economics and C1/ECON C3 Policy [4]  

**Breadth Requirements (two courses):**  
Select courses from the Seven Course Breadth listing on the College of Letters & Science website.  
- 1 course from the Arts & Literature, Historical Studies, or Philosophy & Values category (3-4 units)  
- 1 course from the Social & Behavioral Science or International Studies category (3-4 units)  

**Area of Concentration:** Choose a concentration in Biological, Physical, or Social Sciences (see below for requirements for each concentration)  

### Lower Division Requirements by Concentration

#### Biological Science Concentration

**Math (select one calculus sequence):**  
**MATH 16A**  Analytic Geometry and Calculus  
& **MATH 16B**  Analytic Geometry and Calculus  
**MATH 1A**  Calculus  
& **MATH 1B**  Calculus  

**Chemistry (two courses):**  
**CHEM 1A**  General Chemistry  
& **1AL**  General Chemistry Laboratory  
**CHEM 3A**  Chemical Structure and Reactivity  
& **3AL**  Organic Chemistry Laboratory  

**Biology (two courses):**  
**BIOLOGY 1A**  General Biology Lecture  
& **1AL**  General Biology Laboratory  
**BIOLOGY 1B**  General Biology Lecture and Laboratory  

**Physics (one course):**  
**PHYSICS 8A**  Introductory Physics [4]  

#### Physical Science Concentration

**Math (two courses):**  
**MATH 1A**  Calculus  
& **MATH 1B**  Calculus  

**Chemistry (two courses):**  
**CHEM 1A**  General Chemistry  
& **1AL**  General Chemistry Laboratory  
**CHEM 3A**  Chemical Structure and Reactivity  
& **3AL**  Organic Chemistry Laboratory  

**Biology (select one biology sequence):**  
**BIOLOGY 1A**  General Biology Lecture  
& **1AL**  General Biology Laboratory  

### Upper Division Requirements

**Statistics (must be completed before spring semester of student’s junior year):**  
Select one of the following:  
- **ESPM 173**  Introduction to Ecological Data Analysis [3]  
- **PB HLTH 141**  Introduction to Biostatistics [5]  
- **PB HLTH 142**  Introduction to Probability and Statistics in Biology and Public Health [4]  
- **STAT 131A**  Introduction to Probability and Statistics for Life Scientists [4]  

**Intro to Methods of Environmental Science:**  
**ESPM 100ES**  Introduction to the Methods of Environmental Science [4] (must be taken spring of junior year)  

#### Senior Research Seminar: First Half (select one):  
**ESPM 175A**  Senior Research Seminar in Environmental Sciences  
& **ESPM 175L**  Senior Research Laboratory in Environmental Sciences (must be taken fall of senior year)  

#### Senior Research Seminar: Second Half (select one):  
**ESPM H175A**  Senior Research Seminar in Environmental Sciences  
& **ESPM H175L**  Senior Research Laboratory in Environmental Sciences (must be taken fall of senior year)  

**Physics (one course):**  
**PHYSICS 7A**  Physics for Scientists and Engineers  
& **PHYSICS 7B**  Physics for Scientists and Engineers [Math 53 strongly recommended for Physics 7B]  

#### Social Science Concentration

**Math (select one calculus sequence):**  
**MATH 16A**  Analytic Geometry and Calculus  
& **MATH 16B**  Analytic Geometry and Calculus  
**MATH 1A**  Calculus  
& **MATH 1B**  Calculus  

**Chemistry (two courses):**  
**CHEM 1A**  General Chemistry  
& **1AL**  General Chemistry Laboratory  
**CHEM 3A**  Chemical Structure and Reactivity  
& **3AL**  Organic Chemistry Laboratory  

**Biology (select one biology sequence):**  
**BIOLOGY 1A**  General Biology Lecture  
& **1AL**  General Biology Laboratory  
& **BIOLOGY 1B**  General Biology Lecture and Laboratory  

**Physics (one course):**  
**PHYSICS 8A**  Introductory Physics [4]
ESPM 175B & ESPM 175L: Senior Research Seminar in Environmental Sciences and Senior Research Laboratory in Environmental Sciences (must be taken spring of senior year)

ESPM H175B & ESPM H175L: Senior Research Seminar in Environmental Sciences and Senior Research Laboratory in Environmental Sciences (must be taken spring of senior year)

Environmental Modeling (select one): ESPM C183/EEP C183 satisfies the modeling requirement only if taken Spring 2015 or earlier

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENE,RES 102: Quantitative Aspects of Global Environmental Problems</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 102C: Resource Management</td>
<td>4</td>
<td>Satisfies the modeling</td>
</tr>
<tr>
<td>ESPM C104: Modeling and Management of Biological Resources</td>
<td>4</td>
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</tbody>
</table>

Human Environment Interactions (select one):

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTHRO 137: Energy, Culture and Social Organization</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 102D: Climate and Energy Policy</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 151: Society, Environment, and Culture</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 155AC: Sociology and Political Ecology of Agro-Food Systems</td>
<td>4</td>
<td>formerly ESPM 155</td>
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<tr>
<td>ESPM 160AC: American Environmental and Cultural History</td>
<td>4</td>
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<tr>
<td>HISTORY 120A: American Environmental and Cultural History</td>
<td>4</td>
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<tr>
<td>ESPM 161: Environmental Philosophy and Ethics</td>
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<tr>
<td>ESPM 162: Bioethics and Society</td>
<td>4</td>
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<tr>
<td>ESPM 163AC: Environmental Justice: Race, Class, Equity, and Society</td>
<td>4</td>
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<tr>
<td>ESPM 166: Natural Resource Policy and Indigenous Peoples</td>
<td>4</td>
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<tr>
<td>ESPM 167C/PB HLTH C160: Environmental Health and Development</td>
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<tr>
<td>ESPM 168: Political Ecology</td>
<td>4</td>
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<tr>
<td>ESPM 169: International Environmental Politics</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 186: Management and Conservation of Rangeland Ecosystems</td>
<td>4</td>
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<tr>
<td>ENE,RES 175: Water and Development</td>
<td>4</td>
<td></td>
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<tr>
<td>ENE,RES 180: Ecological Economics in Historical Context</td>
<td>3</td>
<td></td>
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<tr>
<td>ENVECON C101/ECON C125: Environmental Economics</td>
<td>4</td>
<td></td>
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<tr>
<td>ENVECON 131: Globalization and the Natural Environment</td>
<td>3</td>
<td></td>
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<tr>
<td>ENVECON 140: Economics of Race, Agriculture, and the Environment</td>
<td>3</td>
<td></td>
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<tr>
<td>ENVECON 153: Population, Environment, and Development</td>
<td>3</td>
<td></td>
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<tr>
<td>ENVECON 162: Economics of Water Resources</td>
<td>3</td>
<td></td>
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<tr>
<td>GEOG 130: Food and the Environment</td>
<td>4</td>
<td></td>
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<tr>
<td>GEOG 138: Global Environmental Politics</td>
<td>4</td>
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</tr>
</tbody>
</table>

Area of Concentration Elective

Select one 3-5 unit elective from area of concentration (see list below)

Additional ES Elective

Select one 2-5 unit elective from any area of concentration (see list below)

1 These four courses must be completed in the sequence listed, beginning the fall semester of the student's junior year. Students who plan to study abroad or otherwise not continuously enroll at UC Berkeley for their junior and senior years should meet with the ES adviser.

2 The ESPM H175 sequence is for ES students who have an overall 3.6 or above GPA and will enroll in the CNR honors program.

# Upper Division Electives by Concentration

## Biological Sciences Concentration Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 103: Inorganic Chemistry in Living Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM 115: Organic Chemistry--Advanced Laboratory Methods</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM C130/MCELLBI C100A: Biophysical Chemistry: Physical Principles and the Molecules of Life</td>
<td>4</td>
<td></td>
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<tr>
<td>CIV ENG 101: Fluid Mechanics of Rivers, Streams, and Wetlands</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CIV ENG 107: Climate Change Mitigation</td>
<td>3</td>
<td></td>
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<tr>
<td>CIV ENG 113: Ecological Engineering for Water Quality Improvement</td>
<td>3</td>
<td></td>
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<tr>
<td>CIV ENG 114: Environmental Microbiology</td>
<td>3</td>
<td></td>
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<tr>
<td>EPS/INTEGBI C100: Communicating Ocean Science</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 105A: Sierra Nevada Ecology</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM C107/INTEGBI 158LF: Biology and Geomorphology of Tropical Islands</td>
<td>13</td>
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<tr>
<td>ESPM 108A: Trees: Taxonomy, Growth, and Structures</td>
<td>3</td>
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<tr>
<td>ESPM 108B: Environmental Change Genetics</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 110: Primate Ecology</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 111: Ecosystem Ecology</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 112: Microbial Ecology</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 113: Insect Ecology</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 114: Wildlife Ecology</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 115B: Biology of Aquatic Insects</td>
<td>2</td>
<td></td>
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<tr>
<td>ESPM C115C/INTEGBI C176L: Fish Ecology</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 116B: Rangeland Ecology</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 116C: Tropical Forest Ecology</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 117: Urban Garden Ecosystems</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 118: Agricultural Ecology</td>
<td>4</td>
<td></td>
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<tr>
<td>ESPM 119: Chemical Ecology</td>
<td>2</td>
<td></td>
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<tr>
<td>ESPM 120: Soil Characteristics</td>
<td>3</td>
<td></td>
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<tr>
<td>ESPM 121: Development and Classification of Soils</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ESPM C126/INTEGBI C144: Animal Behavior</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
Environmental Sciences

ESPM/EPS C129 Biometeorology 3
ESPM 131 Soil Microbial Ecology 3
ESPM 134 Fire, Insects, and Diseases in Forest Ecosystems 3
ESPM C138/ MCELLBI C114/ PLANTBI C114 Introduction to Comparative Virology 4
ESPM 140 General Entomology 4
ESPM 144 Insect Physiology 3
ESPM 146L Medical and Veterinary Entomology Laboratory 1
ESPM 147 Field Entomology 1
ESPM C148/ NUSCTX C114 Pesticide Chemistry and Toxicology 3
ESPM/EINTGBI C149 Molecular Ecology 4
ESPM 152 Global Change Biology 3
ESPM 157 Data Science in Global Change Ecology 4
ESPM 158 Biodiversity Conservation in Working Landscapes 4
ESPM 162 Bioethics and Society 4
ESPM C170 Carbon Cycle Dynamics 3
ESPM 172 Photogrammetry and Remote Sensing 3
ESPM 173 Introduction to Ecological Data Analysis 3
ESPM 174 Design and Analysis of Ecological Research 4
ESPM 181A Fire Ecology 3
ESPM 184 Agroforestry Systems 3
ESPM 185 Applied Forest Ecology 4
ESPM 186 Management and Conservation of Rangeland Ecosystems 4
ESPM 187 Restoration Ecology 4
ESPM 188 Case Histories in Wildlife Management 2
GEOG C146 Communicating Ocean Science 4
GEOG C148 Biogeography 4
GEOG/LD ARCH C188 Geographic Information Systems 4
INTEGBI C100 Communicating Ocean Science 4
INTEGBI 102LF Introduction to California Plant Life with Laboratory 4
INTEGBI 103LF Invertebrate Zoology with Laboratory 5
INTEGBI 104LF Natural History of the Vertebrates with Laboratory 5
INTEGBI 106A Physical and Chemical Environment of the Ocean 4
INTEGBI 117LF Medical Ethnobotany Laboratory 2
INTEGBI C144 Animal Behavior 4
INTEGBI 146LF Behavioral Ecology with Laboratory 5
INTEGBI C149 Molecular Ecology 4
INTEGBI 151 Plant Physiological Ecology 6
& 151L Plant Physiological Ecology Laboratory 6
INTEGBI 152 Environmental Toxicology 4
INTEGBI 153 Ecology 3
INTEGBI 154 Plant Ecology 5
& 154L Plant Ecology Laboratory 5
INTEGBI C156 Principles of Conservation Biology 4
INTEGBI 157LF Ecosystems of California 4
INTEGBI 158LF Biogeography and Biogeography of Tropical Islands 13
INTEGBI 162 Ecological Genetics 4
INTEGBI 163 Molecular and Genomic Evolution 3
INTEGBI 168 & 168L Systematics of Vascular Plants and Systematics of Vascular Plants with Laboratory 6
INTEGBI 173LF Mammalogy with Laboratory 5
INTEGBI 174LF Ornithology with Laboratory 4
INTEGBI 175LF Herpetology with Laboratory 4
LD ARCH 110 Ecological Analysis 3
LD ARCH C188 Geographic Information Systems 4
MCELLBI 102 Survey of the Principles of Biochemistry and Molecular Biology 4
MCELLBI C112 General Microbiology 6
& C112L and General Microbiology Laboratory 4
MCELLBI C114 Introduction to Comparative Virology 4
MCELLBI C116 Microbial Diversity 3
NUSCTX 110 Toxicology 4
PLANTBI C110L Biology of Fungi with Laboratory 4
PLANTBI C112 General Microbiology 6
& C112L and General Microbiology Laboratory 6
PLANTBI C114 Introduction to Comparative Virology 4
PLANTBI/ MCELLBI C116 Microbial Diversity 3
PLANTBI 120 & 120L Biology of Algae and Laboratory for Biology of Algae 2
PLANTBI 122 Bioenergy 2
PLANTBI 180 Environmental Plant Biology 2
PB HLTH 150A Introduction to Epidemiology and Human Disease 4
PB HLTH 150B Introduction to Environmental Health Sciences 3
PB HLTH 162A Public Health Microbiology 5
& PB HLTH 162L and Public Health Microbiology Laboratory 5

Physical Sciences Concentration Electives

ARCH 140 Energy and Environment 4
ARCH 149 Special Topics in Energy and Environment 1-4
CHM ENG 140 Introduction to Chemical Process Analysis 4
CHM ENG 141 Chemical Engineering Thermodynamics 4
CHM ENG 142 Chemical Kinetics and Reaction Engineering 4
CHM ENG 150A Transport Processes 4
CHM ENG 150B Transport and Separation Processes 4
CHEM 103 Inorganic Chemistry in Living Systems 3
CHEM 104A Advanced Inorganic Chemistry 3
CHEM 104B Advanced Inorganic Chemistry 3
CHEM 105 Instrumental Methods in Analytical Chemistry 4
CHEM 120A Physical Chemistry 3
CHEM 120B Physical Chemistry 3
CHEM 125 Physical Chemistry Laboratory 3
CHEM C130/ MCELLBI C100A Biophysical Chemistry: Physical Principles and Molecules of Life 4
CHEM 130B Biophysical Chemistry 3
CHEM 135 Chemical Biology 3
CHEM/EPS C182 Atmospheric Chemistry and Physics Laboratory 3
CIV ENG 100 Elementary Fluid Mechanics 4
CIV ENG 101 Fluid Mechanics of Rivers, Streams, and Wetlands 3
CIV ENG 103 Introduction to Hydrology 3
CIV ENG C106 Air Pollution 3
CIV ENG 107 Climate Change Mitigation 3
CIV ENG 111 Environmental Engineering 3
CIV ENG 113 Ecological Engineering for Water Quality Improvement 3
CIV ENG 115 Water Chemistry 3
CIV ENG C116 Chemistry of Soils 3
CIV ENG 171 Rock Mechanics 3
CIV ENG 173 Groundwater and Seepage 3
EPS/INTEGBI Communicating Ocean Science 4
C100/ GEOG C146
EPS 100A Minerals: Their Constitution and Origin 4
EPS 100B Genesis and Interpretation of Rocks 4
EPS 101 Field Geology and Digital Mapping 4
EPS 117 Geomorphology 4
EPS 119 Geologic Field Studies 2
EPS 131 Geochemistry 4
EPS C146/ GEOG C145
EPS C180 Air Pollution 3
EPS C181/ Atmospheric Physics and Dynamics 3
GEOG C139
EPS C182 Atmospheric Chemistry and Physics Laboratory 3
ENE,RES C100/ Energy and Society 4
PUB POL C184
ENE,RES 102 Quantitative Aspects of Global Environmental Problems 4
ENG 115 Engineering Thermodynamics 4
ESPM 102B Natural Resource Sampling 4
& 102BL and Laboratory in Natural Resource Sampling 4
ESPM 120 Soil Characteristics 3
ESPM 121 Development and Classification of Soils 3
ESPM 122 Field Study of Soil Development 1
ESPM C128/ Chemistry of Soils 3
CIV ENG C116
ESPM/EPSC129 Biometeorology 3
ESPM C130/ Terrestrial Hydrology 4
GEOG C136
ESPM 131 Soil Microbial Ecology 3
ESPM C148/ Pesticide Chemistry and Toxicology 3
NUSCTX C114
ESPM 157 Data Science in Global Change Ecology 4
ESPM 164 GIS and Environmental Science 3
ESPM C170 Carbon Cycle Dynamics 3
ESPM 172 Photogrammetry and Remote Sensing 3
ESPM 173 Introduction to Ecological Data Analysis 3
ESPM 174 Design and Analysis of Ecological Research 4
ESPM/ EPS C180/ Air Pollution 3
CIV ENG C106
ESPM 181A Fire Ecology 3
GEOG C139 Atmospheric Physics and Dynamics 3
GEOG 140A Physical Landscapes: Process and Form 4
GEOG 142 Climate Dynamics 4
GEOG 143 Global Change Biogeochemistry 3
GEOG 144 Principles of Meteorology 3
GEOG C145 Geological Oceanography 4
GEOG C146 Communicating Ocean Science 4
GEOG 180 Field Methods for Physical Geography 5
GEOG 183 Cartographic Representation 5
GEOG/LD ARCH Geographic Information Systems 4
C188
INTEGBI 106A Physical and Chemical Environment of the Ocean 4
LD ARCH 120 Topographic Form and Design Technology 3
LD ARCH C188 Geographic Information Systems 4
MATH 121A Mathematical Tools for the Physical Sciences 4
MATH 121B Mathematical Tools for the Physical Sciences 4
MEC ENG 106 Fluid Mechanics 3

Social Sciences Concentration Electives

CIV ENG 107 Climate Change Mitigation 3
DEMOG/SOCIOLEM Sex, Death, and Data 4
C126
DEMOG/ECON Economic Demography 4
C175
ECON/ Natural Resource Economics 4
ENVECON C102
ECON C125/ Environmental Economics 4
ENVECON C101
ECON C171/ Economic Development 4
ENVECON C151
ECON/DIMOG Economic Demography 4
C175
ENE,RES C100 Energy and Society 4
ENE,RES 101 Ecology and Society 3
ENE,RES 102 Quantitative Aspects of Global Environmental Problems 4
ENE,RES 175 Water and Development 4
ENE,RES 180 Ecological Economics in Historical Context 3
ENG 125 Ethics, Engineering, and Society 3
ENG 157AC Engineering, The Environment, and Society 4
ENVECON 100 Microeconomic Theory with Application to Natural Resources 4
ENVECON C101/ Environmental Economics 4
ENVECON 102 C125
ENVECON/ Natural Resource Economics 4
ECON C102
ENVECON C115/ Modeling and Management of Biological Resources 4
ESPM C104
ENVECON 131 Globalization and the Natural Environment 3
ENVECON 147 Regulation of Energy and the Environment 4
ENVECON C151/ Economic Development 4
C171
ENVECON 153 Population, Environment, and Development 3
ENVECON 161 Advanced Topics in Environmental and Resource Economics 4
ENVECON 162 Economics of Water Resources 3
ENVECON 102C Resource Management 4
The Quantitative Reasoning requirement is only required by Environmental Economics and Policy (EEP) majors. The requirement may be satisfied by exam or by taking an approved course.

**Undergraduate Breadth**

Undergraduate breadth provide Berkeley students with a rich and varied educational experience outside of their major program and many students complete their breadth courses in their first two years. Breadth courses are built into CNR major requirements and each major requires a different number of breadth courses and categories. The EEP major is the only CNR major that requires the entire 7 course breadth. Refer to the major snapshots on each CNR major page (https://nature.berkeley.edu/advising/majors-minors) for additional information.

**High School Exam Credit**

CNR students may apply high school exam credit (Advanced Placement, International Baccalaureate, A-Level Exam) towards many College and Major Requirements. See AP Exam Equivalency Chart and Higher Level IB Exam Equivalency Chart (https://nature.berkeley.edu/advising/courses-grades/#AP%20Exam%20Equivalency%20Chart) in the CNR Student Handbook (https://nature.berkeley.edu/handbook) for more information.

**Units Requirements**

Students must complete at least 120 semester units of courses subject to certain guidelines:

- At least 36 units must be upper division courses, including a minimum of 15 units of upper division courses in the College of Natural Resources.
- A maximum of 16 units of Special Studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of Physical Education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/ NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation.

**Semester Unit Minimum**

All CNR students must enroll in at least 13 units each fall and spring semester.

**Semester Unit Maximum**

To request permission to take more than 19.5 units in a semester, please see the major adviser.

**Semester Limit**

Students admitted as freshmen must graduate within 8 fall/spring semesters at UC Berkeley. Students admitted as transfer students must graduate within 4 fall/spring semesters at UC Berkeley. Students who go on EAP and UCDC can petition for additional semesters. Summer session, UC Extension and non-UC study abroad programs do not count towards this semester limit. Students approved for double majors or simultaneous degrees in two colleges may be granted an additional semester. CNR does not limit the number of total units a student can accrue.

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The Foreign Language requirement is only required by Environmental Economics and Policy (EEP) majors. It may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Quantitative Reasoning (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/quantitative-reasoning-requirement): EEP Majors only

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Reading and Composition (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/reading-composition-requirement)

In order to provide a solid foundation in reading, writing and critical thinking all majors in the College require two semesters of lower division work in composition. Students must complete a first-level reading and composition course by the end of their second semester and a second-level course by the end of their fourth semester.

Foreign Language (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/foreign-language-requirement): EEP Majors only

The Foreign Language requirement is only required by Environmental Economics and Policy (EEP) majors. It may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Quantitative Reasoning (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/quantitative-reasoning-requirement): EEP Majors only

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**Course List**

- **ESPM 102D** Climate and Energy Policy 4
- **ESPM C104** Modeling and Management of Biological Resources 4
- **ENVECON C115** Urban Garden Ecosystems 4
- **ESPM 151** Society, Environment, and Culture 4
- **ESPM 155AC** Sociology and Political Ecology of Agro-Food Systems (formerly ESPM 155) 4
- **ESPM/NUSCTX C159** Human Diet 4
- **ESPM 160AC** American Environmental and Cultural History 4
- **HISTORY 120AC** Environmental Philosophy and Ethics 4
- **ESPM 162** Bioethics and Society 4
- **ESPM 163AC** Environmental Justice: Race, Class, Equity, and the Environment 4
- **SOCIOL 137AC** International Rural Development Policy 4
- **ESPM 166** Natural Resource Policy and Indigenous Peoples 4
- **ESPM C167** Environmental Health and Development 4
- **PB HLTH C160** Forest Ecosystem Management and Planning 4
- **ESPM 168** Political Ecology 4
- **ESPM 169** International Environmental Politics 4
- **ESPM 183** Forest Ecosystem Management and Planning 4
- **GEOG 130** Food and the Environment 4
- **GEOG/LD ARCH C188** Geographic Information Systems 4
- **INTEGBI 117 & 117LF** Medical Ethnobotany and Medical Ethnobotany Laboratory 4
- **LD ARCH 110** Ecological Analysis 3
- **LD ARCH 130** Sustainable Landscapes and Cities 4
- **LD ARCH C188** Geographic Information Systems 4
- **PB HLTH 140** Course Not Available 4
- **SOCIOL C126** Sex, Death, and Data 4
- **SOCIOL 137AC** Environmental Justice: Race, Class, Equity, and the Environment 4
Senior Residence Requirement

After the term in which you achieve and exceed 90 units (senior status), you must complete at least 24 of the remaining 30 units in residence at the College of Natural Resources over at least 2 semesters. To count as residence, a semester must consist of at least 6 passed units taken while the student is a member of CNR. At least one of the two terms must be a fall or spring semester. Senior residence terms do not need to be completed consecutively. All courses offered on campus for the fall, spring, and summer terms by Berkeley departments and programs and all Berkeley online (“W”) courses count. Inter-campus Visitor, Education Abroad Program, UC Berkeley Washington Program, and UC Berkeley Extension units do not count toward this requirement.

Students may use Summer Session to satisfy one semester of the Senior Residence Requirement, provided that four units of coursework are completed.

Modified Senior Residence Requirement

Participants in a fall, spring or summer UC Education Abroad Program (UCEAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program may meet a modified Senior Residence Requirement by completing 24 of their final 60 semester units in residence (excluding UCEAP). At least 12 of these 24 units must be completed after senior status is reached. International travel study programs sponsored by Summer Sessions and education abroad programs offered outside of the UC system do not qualify for modified senior residence.

Most students automatically satisfy the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless students go abroad for a semester or year or want to take courses at another institution or through University Extension during their senior year. In these cases, students should make an appointment to see an adviser to determine how they can meet the Senior Residence Requirement.

Grade Requirements

• A 2.0 UC GPA is required for graduation.
• A 2.0 average in all upper division courses required of the major program is required for graduation.
• A grade of at least C- is required in all courses for the major.

Learning Goals for the Major

1. Develop a broad, interdisciplinary framework for approaching complex, interconnected environmental problems facing our world at multiple scales.
2. Develop strong analytic and quantitative skills needed to identify problems, develop a program to address the problem, execute a rigorous analysis of the issue, and reach independent conclusions.
3. Develop a rigorous scientific base across multiple disciplines (social, biological, and physical sciences) but with a strong concentration in one area so as to develop depth of expertise in that field.
4. Learn how to communicate findings effectively to the scientific community, government agencies, non-government environmental organizations, and the public.

Skills

1. Recognition of and knowledge about environmental problems and areas of research.
2. Comprehensive training in basic mathematics and the biological and physical sciences (calculus, biology, chemistry, and physics).
3. Introduction to the social science concepts and methods (environmental economics, a course in human environment interactions).
4. Training in sampling and experimental design, and quantitative methods of data analysis and interpretation (statistics, introduction to estimation and modeling techniques).
5. Development of critical thinking and evaluation skills.
6. Training in general research methods.
7. Training in written communication, especially scientific writing.
8. Training in oral and visual communication skills.
9. Additional training in specialized research methods in the student’s area of concentration.

In the College of Natural Resources, we provide holistic, individual advising services to prospective and current students who are pursuing major and minors in our college. We assist with a range of issues including course selection, academic decision-making, achieving personal and academic goals, and maximizing the Berkeley experience.

If you are looking to explore your options, or you are ready to declare a major, double major, or minor, contact the undergraduate adviser for your intended major. Visit our website (https://nature.berkeley.edu/advising/meet-cnr-advisors) to explore all of our advising services.

Undergraduate Adviser, Environmental Sciences
Ginnie Sadil
gsadil@berkeley.edu
260 Mulford Hall
510-642-7895
Contact Ginnie via email or visit 260 Mulford Hall to schedule an appointment.
Advising hours: Monday to Friday, 9 to noon and 1 to 4 p.m. Our office is closed from noon to 1 p.m.

Career Services Overview

The UC Berkeley Career Center (https://career.berkeley.edu) prepares undergraduates, graduate students, and alumni to make informed decisions about their futures by providing comprehensive resources, programs, and counseling on career development, internships, employment, and graduate school. Whether it be through a resume critique, an alumni networking event, or an interviewing skills workshop, the Career Center is committed to helping all students achieve:

• Career Clarity: Providing students the opportunity to identify their career direction
• Career Competitiveness: Providing students the opportunities to enhance their marketability via real world experiences
• Career Connections: Providing students opportunities to engage with alumni and employers

Common Career Paths for Environmental Sciences Majors

Career Destinations Survey

Every year the Career Center surveys graduating seniors (https://career.berkeley.edu/Survey/Survey) about their post-graduation plans to better understand the career outcomes of our alumni including: career fields, job titles, specific employers, entry-level salaries, and graduate/professional school destinations. The data profiles by major provide
an impressive overview of the diverse interests and achievements of recent graduates from UC Berkeley, including specific data for the Environmental Sciences (https://career.berkeley.edu/sites/default/files/pdf/Survey/2015EnvSci.pdf) major within the College of Natural Resources. Each annual dataset includes the August, December, and May graduating cohorts for that survey year. This data is designed to provide students, alumni, and employers with critical information about where Cal students go after graduation. As expected, college major does not restrict the employment or graduate school options that Cal students pursue. With careful planning (https://career.berkeley.edu/Plan/Plan), you can develop career-related skills and experiences that can prepare you for almost any job or graduate school field.

Sample Career Pathways

Environmental Sciences majors go on to pursue a wide variety of career options including, but not limited to:

- Federal Government Agencies (e.g. Environmental Protection Agency; Department of Agriculture) environmental remediation & compliance: soil, water, air & sediments
- Nonprofit Organizations (Environmental & Sustainability focused): Administration, management, public relations, fundraising/development, program coordination, grant writing, volunteer management
- Business: Sales (e.g. solar), regulatory/compliance; corporate social responsibility (CSR), environmental consulting
- Waste Management: Risk assessment, quality control, logistics, planning, recycling, transportation, public health
- Air & Water Quality Management: Testing/analysis, watershed management, stream restoration, sustainable infrastructure, risk assessment, compliance/permitting
- Soil Science: Waste disposal, environmental compliance, landfill operation and monitoring, fertilizer technology, agricultural production, research, organic farming
- Planning and Conservation: Natural resource management, sustainability programs, water resources, transportation and aviation planning, building/zoning, land use/acquisition, recreation and parks management, mining
- Education/Environmental Education: Teaching (elementary, secondary, post-secondary, research); public/community education, public health, outdoor education
- Communications: Technical writing, editing, illustrating, photography, public relations
- Health/Medical: Physician, allied health professions, nutrition, alternative medicine
- Environmental Law: Political action/lobbying, regulatory affairs, science policy, patent law, public interest, environmental law, mediation

Visit our Connecting Majors to Careers (https://career.berkeley.edu/InfoLab/Majors2Careers) resource to explore additional career paths most commonly associated with over 80 majors, including Environmental Sciences (http://whatcanidowiththismajor.com/major/wp-content/uploads/2011/05/environmentalstudies-science3.pdf).

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- Career Connections: providing students opportunities to engage with alumni and employers.

Career and Internship Resources

The UC Berkeley Career Center (https://career.berkeley.edu) offers a wide variety of programs and resources to support students of all majors and class levels.

- Job Search Tools (https://career.berkeley.edu/Tools/Tools): Resume and cover letter writing, job search strategies, networking tools, interviewing skills, and more.
- Career Counseling (https://career.berkeley.edu/Info/MakeApppt): A wide variety of scheduled and drop-in appointment options based on major and topic.
- Internships (https://career.berkeley.edu/Internships/Internships): Internship listings, search strategies, FAQs, and more.
- Career Exploration (https://career.berkeley.edu/Info/CareerExp): Resources to explore career options, identify career goals, and develop effective career plans.
- Events and Workshops (https://career.berkeley.edu/Info/Events): Over 70 events each semester including workshops, alumni networking events, career panels, conferences, and on-campus Career Chats.
- Career Fairs and Employer Information Sessions (https://career.berkeley.edu/Callisto/Infosession): We offer 14 career fairs each year across a variety of career fields and partner with numerous employers for on-campus information sessions.
- Graduate and Professional School (https://career.berkeley.edu/Info/GradProf): Counseling and resources to help students research and apply for graduate and professional school including medical school (https://career.berkeley.edu/Medical/Medical) and law school (https://career.berkeley.edu/Law/Law).

*The above services are available to all currently enrolled UC Berkeley students and members of the Career Center’s Alumni Advantage (https://career.berkeley.edu/Alumni/AlumniAdv) program.

Expand all course descriptions [+]Collapse all course descriptions [-]
ENV SCI 84 Sophomore Seminar 1 or 2 Units
Terms offered: Spring 2011, Fall 2010, Spring 2010
Sophomore seminars are small interactive courses offered by faculty members in departments all across the campus. Sophomore seminars offer opportunity for close, regular intellectual contact between faculty members and students in the crucial second year. The topics vary from department to department and semester to semester. Enrollment limited to 15 sophomores.

Rules & Requirements

Prerequisites: At discretion of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
5 weeks - 3-6 hours of seminar per week
10 weeks - 1.5-3 hours of seminar per week
15 weeks - 1-2 hours of seminar per week

Summer:
6 weeks - 2.5-5 hours of seminar per week
8 weeks - 1.5-3.5 hours of seminar and 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Environmental Sciences/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.