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/#admission) 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

<table>
<thead>
<tr>
<th>ESPM Environmental Science Core (select one):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 2</td>
<td>The Biosphere [3]</td>
</tr>
<tr>
<td>ESPM 6</td>
<td>Environmental Biology [3]</td>
</tr>
</tbody>
</table>
Lower Division Requirements by Concentration

Biological Science Concentration

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

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

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

Social Science Concentration

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

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

Biology (select one biology sequence):
- BIOLOGY 1A General Biology Lecture
- & 1AL and General Biology Laboratory
- BIOLOGY 1B General Biology Lecture and Laboratory
- & BIOLOGY 1Band General Biology Lecture and Laboratory
- BIOLOGY 1B, plus one of the following: INTEGBI 153, INTEGBI 154, ESPM C103, ESPM 111, ESPM 113, ESPM 114, ESPM 115B, or ESPM 116B

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

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]

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 Science
- & ESPM 175L Sciences
- and Senior Research Laboratory in Environmental Sciences (must be taken fall of senior year)
- ESPM H175A Senior Research Seminar in Environmental Science
- & ESPM H175LSciences
- and Senior Research Laboratory in Environmental Sciences (must be taken fall of senior year)

Senior Research Seminar: Second Half (select one)
Additional ES Elective

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

Area of Concentration Elective

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

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

ENE,RES 102 Quantitative Aspects of Global Environmental Problems [4]


ESPM C104/ENVECON C104 Modeling and Management of Biological Resources [4]

Human Environment Interactions (select one):

ANTHRO 137 Energy, Culture and Social Organization [4]

ESPM 151 Society, Environment, and Culture [4]


ESPM 160AC/HISTORY 120A American Environmental and Cultural History [4]

ESPM 161 Environmental Philosophy and Ethics [4]

ESPM 162 Bioethics and Society [4]

ESPM 163AC/ESPM 137A Environmental Justice: Race, Class, Equity, and Environment [4]

ESPM 166 Natural Resource Policy and Indigenous Peoples [4]

ESPM C167/ENVECON C167 Environmental Health and Development [4]

ESPM 168 Political Ecology [4]

ESPM 169 International Environmental Politics [4]


ENE,RES 175 Water and Development [4]

ENE,RES 180 Ecological Economics in Historical Context [3]

ENVECON C101/ENVIRONMENTAL ECONOMICS Environmental Economics [4]

ENVECON 131 Globalization and the Natural Environment [3]

ENVECON 140 Economics of Race, Agriculture, and the Environment [3]

ENVECON 153 Population, Environment, and Development [3]

ENVECON 162 Economics of Water Resources [3]

GEOG 130 Food and the Environment [4]

GEOG 138 Global Environmental Politics [4]

Upper Division Electives by Concentration

Biological Sciences Concentration Electives

CHEM 103 Inorganic Chemistry in Living Systems 3

CHEM 115 Organic Chemistry--Advanced Laboratory Methods 4

CHEM C130/MCHEM C130A Biophysical Chemistry: Physical Principles and the Molecules of Life 4

CIV ENG 101 Fluid Mechanics of Rivers, Streams, and Wetlands 3

CIV ENG 107 Climate Change Mitigation 3

CIV ENG 113 Ecological Engineering for Water Quality Improvement 3

CIV ENG 114 Environmental Microbiology 3

EPS/INTEGBI C100/ENVIRONMENTAL ECONOMICS Communicating Ocean Science 4

ENVECON C115 Resources

ESPM 105A Sierra Nevada Ecology 4


ESPM C107/INTEGBI 158LF Biology and Geomorphology of Tropical Islands 13

ESPM 108A Trees: Taxonomy, Growth, and Structures 3

ESPM 108B Environmental Change Genetics 3

ESPM 110 Primate Ecology 4

ESPM 111 Ecosystem Ecology 4

ESPM 112 Microbial Ecology 3

ESPM 113 Insect Ecology 3

ESPM 114 Wildlife Ecology 3

ESPM 115B Biology of Aquatic Insects 2

ESPM C115C/INTEGBI C176L Fish Ecology 3

ESPM 116B Rangeland Ecology 4

ESPM 116C Tropical Forest Ecology 3

ESPM 117 Urban Garden Ecosystems 4

ESPM 118 Agricultural Ecology 4

ESPM 119 Chemical Ecology 2

ESPM 120 Soil Characteristics 3

ESPM 121 Development and Classification of Soils 3

ESPM C126/INTEGBI C144 Animal Behavior 4
### Environmental Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM/EPS C129</td>
<td>Biometeorology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 131</td>
<td>Soil Microbial Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 134</td>
<td>Fire, Insects, and Diseases in Forest Ecosystems</td>
<td>3</td>
</tr>
<tr>
<td>ESPM C138/</td>
<td>MCELLBI C114/ PLANTBI C114</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI C148/</td>
<td>Pesticide Chemistry and Toxicology</td>
<td>3</td>
</tr>
<tr>
<td>NUSCTX C148/</td>
<td>Molecular Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 152</td>
<td>Global Change Biology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 157</td>
<td>Data Science in Global Change Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 158</td>
<td>Biodiversity Conservation in Working Landscapes</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 162</td>
<td>Bioethics and Society</td>
<td>4</td>
</tr>
<tr>
<td>ESPM C170</td>
<td>Carbon Cycle Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 172</td>
<td>Photogrammetry and Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 173</td>
<td>Introduction to Ecological Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 174</td>
<td>Design and Analysis of Ecological Research</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 181A</td>
<td>Fire Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 184</td>
<td>Agroforestry Systems</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 185</td>
<td>Applied Forest Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 186</td>
<td>Management and Conservation of Rangeland Ecosystems</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 187</td>
<td>Restoration Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 188</td>
<td>Case Histories in Wildlife Management</td>
<td>2</td>
</tr>
<tr>
<td>GEOG C146</td>
<td>Communicating Ocean Science</td>
<td>4</td>
</tr>
<tr>
<td>GEOG C148</td>
<td>Biogeography</td>
<td>4</td>
</tr>
<tr>
<td>GEOG/LD ARCH C188</td>
<td>Geographic Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI C100</td>
<td>Communicating Ocean Science</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 102LF</td>
<td>Introduction to California Plant Life with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 103LF</td>
<td>Invertebrate Zoology with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI 104LF</td>
<td>Natural History of the Vertebrates with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI 106A</td>
<td>Physical and Chemical Environemnt of the Ocean</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 117LF</td>
<td>Medical Ethnobotany Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>INTEGBI C144</td>
<td>Animal Behavior</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 146LF</td>
<td>Behavioral Ecology with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI C149</td>
<td>Molecular Ecology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 151</td>
<td>Plant Physiological Ecology</td>
<td>6</td>
</tr>
<tr>
<td>&amp; 151L</td>
<td>and Plant Physiological Ecology Laboratory</td>
<td></td>
</tr>
<tr>
<td>INTEGBI 152</td>
<td>Environmental Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 153</td>
<td>Ecology</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 154</td>
<td>Plant Ecology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; 154L</td>
<td>and Plant Ecology Laboratory</td>
<td></td>
</tr>
<tr>
<td>INTEGBI C156</td>
<td>Principles of Conservation Biology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 157LF</td>
<td>Ecosystems of California</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 158LF</td>
<td>Biological and Geomorphology of Tropical Islands</td>
<td>13</td>
</tr>
<tr>
<td>INTEGBI 162</td>
<td>Ecological Genetics</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 163</td>
<td>Molecular and Genomic Evolution</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 168</td>
<td>Systemsatics of Vascular Plants and Systematics of Vascular Plants with Laboratory</td>
<td>6</td>
</tr>
<tr>
<td>&amp; 168L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTEGBI 173LF</td>
<td>Mammalogy with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI 174LF</td>
<td>Ornithology with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 175LF</td>
<td>Herpetology with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>LD ARCH 110</td>
<td>Ecological Analysis</td>
<td>3</td>
</tr>
<tr>
<td>LD ARCH C188</td>
<td>Geographic Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI 102</td>
<td>Survey of the Principles of Biochemistry and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI C112</td>
<td>General Microbiology</td>
<td>6</td>
</tr>
<tr>
<td>&amp; C112L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCELLBI C114</td>
<td>Introduction to Comparative Virology</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI C116</td>
<td>Microbial Diversity</td>
<td>3</td>
</tr>
<tr>
<td>NUSCTX 110</td>
<td>Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI C110L</td>
<td>Biology of Fungi with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI C112</td>
<td>General Microbiology</td>
<td>6</td>
</tr>
<tr>
<td>&amp; C112L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLANTBI C114</td>
<td>Introduction to Comparative Virology</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI/ MCELLBI C116</td>
<td>Microbial Diversity</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI C120</td>
<td>Biology of Algae and Laboratory for Biology of Algae</td>
<td>2</td>
</tr>
<tr>
<td>&amp; 120L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLANTBI 122</td>
<td>Bioenergy</td>
<td>2</td>
</tr>
<tr>
<td>PLANTBI 180</td>
<td>Environmental Plant Biology</td>
<td>2</td>
</tr>
<tr>
<td>PB HLTH 150A</td>
<td>Introduction to Epidemiology and Human Disease</td>
<td>4</td>
</tr>
<tr>
<td>PB HLTH 150B</td>
<td>Introduction to Environmental Health Sciences</td>
<td>3</td>
</tr>
<tr>
<td>PB HLTH 162A &amp; PB HLTH 162L</td>
<td>Public Health Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; Public Health Microbiology Laboratory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Physical Sciences Concentration Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 140</td>
<td>Energy and Environment</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 149</td>
<td>Special Topics in Energy and Environment</td>
<td>1-4</td>
</tr>
<tr>
<td>CHM ENG 140</td>
<td>Introduction to Chemical Process Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CHM ENG 141</td>
<td>Chemical Engineering Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>CHM ENG 142</td>
<td>Chemical Kinetics and Reaction Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CHM ENG 150A</td>
<td>Transport Processes</td>
<td>4</td>
</tr>
<tr>
<td>CHM ENG 150B</td>
<td>Transport and Separation Processes</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 103</td>
<td>Inorganic Chemistry in Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 104A</td>
<td>Advanced Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 104B</td>
<td>Advanced Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 105</td>
<td>Instrumental Methods in Analytical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 120A</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 120B</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 125</td>
<td>Physical Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM C130/</td>
<td>Biophysical Chemistry: Physical Principles and the Molecules of Life</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI C100A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 130B</td>
<td>Biophysical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 135</td>
<td>Chemical Biology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM/EPS C182</td>
<td>Atmospheric Chemistry and Physics Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENG 100</td>
<td>Elementary Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CIV ENG 101</td>
<td>Fluid Mechanics of Rivers, Streams, and Wetlands</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENG 103</td>
<td>Introduction to Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENG C106</td>
<td>Air Pollution</td>
<td>3</td>
</tr>
</tbody>
</table>
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 C100/ GEOG C146 Communicating Ocean Science 4
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 Geological Oceanography 4
EPS C180 Air Pollution 3
EPS C181/ GEOG C139 Atmospheric Physics and Dynamics 3
EPS C182 Atmospheric Chemistry and Physics Laboratory 3
ENE,RES C100/ PUB POL C184 Energy and Society 4
ENE,RES 102 Quantitative Aspects of Global Environmental Problems 4
ENGIN 115 Engineering Thermodynamics 4
ESP M 102B Natural Resource Sampling & 102BL and Laboratory in Natural Resource Sampling 4
ESP M 120 Soil Characteristics 3
ESP M 121 Development and Classification of Soils 3
ESP M 122 Field Study of Soil Development 1
ESP M C128/ CIV ENG C116 Chemistry of Soils 3
ESP M EPS C129 Biometeorology 3
ESP M C130/ GEOG C136 Terrestrial Hydrology 4
ESP M 131 Soil Microbial Ecology 3
ESP M C148/ NUSCTX C114 Pesticide Chemistry and Toxicology 3
ESP M 157 Data Science in Global Change Ecology 4
ESP M 164 GIS and Environmental Science 3
ESP M C170 Carbon Cycle Dynamics 3
ESP M 172 Photogrammetry and Remote Sensing 3
ESP M 173 Introduction to Ecological Data Analysis 3
ESP M 174 Design and Analysis of Ecological Research 4
ESP M/ EPS C180/ CIV ENG C106 Air Pollution 3
ESP M 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 C188 Geographic Information Systems 4
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 4

Social Sciences Concentration Electives
CIV ENG 107 Climate Change Mitigation 3
DEMOSOICOL 126 Sex, Death, and Data
DEMOSOICOL C175 Economic Demography 4
ECON/ ECON C102 Natural Resource Economics 4
ENVECON C125/ ENVECON C101 Environmental Economics 4
ENVECON C171/ ENVECON C151 Economic Development 4
ENVECON DEMOG C175 Economic Demography 4
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
ENGIN 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
ECON C125
ENVECON/ ECON C102 Natural Resource Economics 4
ENVECON C115/ Modeling and Management of Biological Resources 4
ENVECON C104/ Resources 4
ENVECON C131 Globalization and the Natural Environment 3
ENVECON 147 Regulation of Energy and the Environment 4
ENVECON C151/ Economic Development 4
ENVECON 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 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.
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 data set 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 (Environment & 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).

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 opportunity to enhance their marketability via real-world experiences;
- 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/MakeAppt): 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.*
ENV SCI 8X Climate Change: The Interface of Science and Public Policy 2 Units
Terms offered: Prior to 2007
The possible impacts of climate changes enhanced by or following from human activities create challenges for planners, policy-makers, industrialists, and all citizens of the globe. This course seeks to examine the science of climate change and the policy issues that follow from that change.
Climate Change: The Interface of Science and Public Policy: Read More [+]
Hours & Format
Summer: 6 weeks - 5 hours of lecture per week
Additional Details
Subject/Course Level: Environmental Sciences/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Berry
Climate Change: The Interface of Science and Public Policy: Read Less [-]

ENV SCI 10 Introduction to Environmental Sciences 3 Units
Terms offered: Fall 2013, Spring 2013, Fall 2012
A survey of biological and physical environmental problems, focusing on geologic hazards, water and air quality, water supply, solid waste, introduced and endangered species, preservation of wetland ecosystems. Interaction of technical, social, and political approaches to environmental management.
Introduction to Environmental Sciences: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Additional Details
Subject/Course Level: Environmental Sciences/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Environmental Sciences: Read Less [-]

ENV SCI 24 Freshman Seminar 1 Unit
Terms offered: Fall 2010, Fall 2009, Spring 2009
The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Freshman Seminars are offered in all campus departments, and topics vary from department to department and semester to semester. Enrollment limited to fifteen freshmen.
Freshman Seminar: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.
Hours & Format
Fall and/or spring: 15 weeks - 1 hour 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.
Freshman Seminar: Read Less [-]

ENV SCI 10L Field Study in Environmental Sciences 1 Unit
Terms offered: Fall 2010, Fall 2009, Fall 2008
Field and laboratory studies of Strawberry Creek throughout its course from the hills to the Bay are used to exemplify integration of the physical, biological, and social components of science-based approaches to environmental management.
Field Study in Environmental Sciences: Read More [+]
Rules & Requirements
Prerequisites: 10 (must be taken concurrently)
Hours & Format
Fall and/or spring: 15 weeks - 2 hours of fieldwork per week
Additional Details
Subject/Course Level: Environmental Sciences/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Instructors: Berry, Kondolf
Field Study in Environmental Sciences: Read Less [-]
**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.

Sophomore Seminar: Read More [+]

**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.

Sophomore Seminar: Read Less [-]

---

**ENV SCI 125 Environments of the San Francisco Bay Area 3 Units**

Terms offered: Spring 2011, Spring 2010, Spring 2009

The weather and climate, plants and animals, geology, landforms, and soils of the Bay Area, with an emphasis on the interaction of these physical elements, their modification by humans, and problems deriving from human use.

Environments of the San Francisco Bay Area: Read More [+]

**Hours & Format**

Fall and/or spring: 15 weeks - 3 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Environmental Sciences/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Instructor:** Berry

Environments of the San Francisco Bay Area: Read Less [-]

---

**ENV SCI 100 Introduction to the Methods of Environmental Science 4 Units**

Terms offered: Spring 2013, Spring 2012, Spring 2011

Introduction to basic methods used in environmental research by biological, physical, and social scientists. The course is designed to teach skills necessary for majors to conduct independent thesis research in the required senior seminar, 196A-196B/196L. Topics include development of research questions, sampling methods, experimental design, statistical analysis, scientific writing and graphics, and introductions to special techniques for characterizing environmental conditions and features. This course is the prerequisite to 196A, from which the senior thesis topic statement is determined.

Introduction to the Methods of Environmental Science: Read More [+]

**Rules & Requirements**

**Prerequisites:** Environmental science statistics requirement. Open only to declared environmental sciences majors

**Hours & Format**

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 1.5 hours of fieldwork per week

**Additional Details**

**Subject/Course Level:** Environmental Sciences/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Introduction to the Methods of Environmental Science: Read Less [-]