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 prehealth programs), and environmental engineering.

Admission to the Major

Freshman applicants may apply directly to the major or may select the College of Natural Resource's undeclared option, and declare the major by the end of their fourth semester. For further information regarding how to declare the major after admission, including information on a change of major and/or change of college, please see the College Requirements tab. In addition to the University, campus, and college requirements listed below, students must fulfill the below requirements specific to their major program.

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 Senior Research Laboratory in Environmental Sciences and ESPM H175B Senior Research Seminar in Environmental Sciences and ESPM H175C Senior Research Laboratory in Environmental Sciences fall of their senior year, and ESPM H175D Senior Research Seminar in Environmental Sciences and ESPM H175E Senior Research Laboratory in Environmental Sciences 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)

Forestry and Natural Resources (http://guide.berkeley.edu/undergraduate/degree-programs/forestry-natural-resources) (Major and 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 are 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): |
|-----------------|-----------------|
| ESPM 2          | The Biosphere   |
| ESPM 6          | Environmental Biology |
| ESPM C10        | Environmental Issues |
| ESPM 15         | Introduction to Environmental Sciences |
| ESPM C46        | Climate Change and the Future of California |

| ESPM Social Science Core (select one): |
|-----------------|-----------------|
| ESPM C11        | Americans and the Global Forest |
Environmental Sciences

ESPM C12/ ENGLISH C77 Introduction to Environmental Studies

ESPM 50AC Introduction to Culture and Natural Resource Management

ESPM 60 Environmental Policy, Administration, and Law

Environmental Economics

ENVECON Introduction to Environmental Economics and
C1/ECON C3 Policy

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

**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
- & BIOLOGY 1B General Biology Lecture and Laboratory
- BIOLOGY 1B, plus one of the following: INTEGBI 153, INTEGBI 154, ESPM 111, ESPM 113, ESPM 114, ESPM 115B, or ESPM 116B

**Physics (one course):**

- PHYSICS 8A Introductory Physics

**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
- PB HLTH 141 Introduction to Biostatistics
- PB HLTH 142 Introduction to Probability and Statistics in Biology and Public Health
- STAT 131A Introduction to Probability and Statistics for Life Scientists

**Intro to Methods of Environmental Science**

- ESPM 100ES Introduction to the Methods of Environmental Science (must be taken spring of junior year)

**Senior Research Seminar: First Half (select one):**

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

**Senior Research Seminar: Second Half (select one):**

- ESPM 175B 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/EPP C183 satisfies the modeling requirement only if taken Spring 2015 or earlier

**Human Environment Interactions (select one):**

- ANTHRO 137: Energy, Culture and Social Organization
- ESPM 102D: Climate and Energy Policy
- ESPM 151: Society, Environment, and Culture
- ESPM 155AC: Sociology and Political Ecology of Agro-Food Systems (formerly ESPM 155)
- ESPM 160AC: American Environmental and Cultural History
- ESPM 161: Environmental Philosophy and Ethics
- ESPM 162: Bioethics and Society
- ESPM 163AC: Environmental Justice: Race, Class, Equity, and SOCIOL 137A: The Environment
- ESPM 166: Natural Resource Policy and Indigenous Peoples
- ESPM C167: Environmental Health and Development
- PB HLTH C160: Behavioral Sciences Concentration Electives

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<th>Biological Sciences Concentration Electives</th>
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<td>CHEM 103</td>
<td>Inorganic Chemistry in Living Systems</td>
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<tr>
<td>CHEM 115</td>
<td>Organic Chemistry—Advanced Laboratory Methods</td>
</tr>
<tr>
<td>CHEM C130/MCELLBI C100A</td>
<td>Biophysical Chemistry: Physical Principles and the Environment</td>
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<td>CIV ENG 101</td>
<td>Fluid Mechanics of Rivers, Streams, and Wetlands</td>
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<td>CIV ENG 107</td>
<td>Climate Change Mitigation</td>
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<td>CIV ENG 113</td>
<td>Ecological Engineering for Water Quality Improvement</td>
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<td>CIV ENG 114</td>
<td>Environmental Microbiology</td>
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<td>EPS/INTEGBI C100/GEOG C146</td>
<td>Communicating Ocean Science</td>
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<tr>
<td>ENE,RES 101</td>
<td>Ecology and Society</td>
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<td>ENE,RES 102</td>
<td>Quantitative Aspects of Global Environmental Problems</td>
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<tr>
<td>ESPM 102A</td>
<td>Terrestrial Resource Ecology</td>
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<td>ESPM 102B</td>
<td>Natural Resource Sampling &amp; Laboratory in Natural Resource Sampling</td>
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<td>ESPM C103/INTEGBI C156</td>
<td>Principles of Conservation Biology</td>
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<td>ESPM C105/ENVECON C115</td>
<td>Modeling and Management of Biological Resources</td>
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<td>ESPM 105A</td>
<td>Sierra Nevada Ecology</td>
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<tr>
<td>ESPM C107/INTEGBI C156L</td>
<td>Biology and Geomorphology of Tropical Islands</td>
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<tr>
<td>ESPM 108A</td>
<td>Trees: Taxonomy, Growth, and Structures</td>
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<tr>
<td>ESPM 108B</td>
<td>Environmental Change Genetics</td>
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<td>ESPM 110</td>
<td>Primate Ecology</td>
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<td>ESPM 111</td>
<td>Ecosystem Ecology</td>
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<td>Microbial Ecology</td>
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<td>Insect Ecology</td>
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<td>Wildlife Ecology</td>
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<td>ESPM 115B</td>
<td>Biology of Aquatic Insects</td>
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<td>ESPM C115C/INTEGBI C176L</td>
<td>Fish Ecology</td>
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<td>ESPM 116B</td>
<td>Rangeland Ecology</td>
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<td>ESPM 116C</td>
<td>Tropical Forest Ecology</td>
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<td>ESPM 117</td>
<td>Urban Garden Ecosystems</td>
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<td>Agricultural Ecology</td>
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<td>ESPM 120</td>
<td>Soil Characteristics</td>
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<td>ESPM 121</td>
<td>Development and Classification of Soils</td>
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<td>ESPM C126/INTEGBI C144</td>
<td>Animal Behavior</td>
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<td>ESPM/EPS C129</td>
<td>Biometeorology</td>
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<tr>
<td>ESPM 131</td>
<td>Soil Microbial Ecology</td>
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<tr>
<td>ESPM 134</td>
<td>Fire, Insects, and Diseases in Forest Ecosystems</td>
</tr>
</tbody>
</table>

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.
Environmental Sciences

ESP140 General Entomology 4
ESP144 Insect Physiology 3
ESP146L Medical and Veterinary Entomology Laboratory 1
ESP147 Field Entomology 1
ESP148/ NUSCTX114 Pesticide Chemistry and Toxicology 3
ESP/MIE149 Molecular Ecology 4
ESP152 Global Change Biology 3
ESP158 Biodiversity Conservation in Working Landscapes 4
ESP162 Bioethics and Society 4
ESP172 Photogrammetry and Remote Sensing 3
ESP173 Introduction to Ecological Data Analysis 3
ESP174 Design and Analysis of Ecological Research 4
ESP181A Fire Ecology 3
ESP184 Agroforestry Systems 3
ESP185 Applied Forest Ecology 4
ESP186 Management and Conservation of Rangeland Ecosystems 4
ESP187 Restoration Ecology 4
ESP188 Case Histories in Wildlife Management 2
GEOG C146 Communicating Ocean Science 4
GEOG 148 Course Not Available
GEOG/LDARCH 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 4
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 Biology and Geomorphology of Tropical Islands 13
INTEGBI 162 Ecological Genetics 4
INTEGBI 163 Molecular and Genomic Evolution 3
INTEGBI 168 Systematics of Vascular Plants 6
& 168L and Systematics of Vascular Plants with Laboratory 4
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
MCE1102 Survey of the Principles of Biochemistry and Molecular Biology 4
MCE1112 General Microbiology 6
& C112L and General Microbiology Laboratory 4
MCE1114 Introduction to Comparative Virology 4
MCE1116 Microbial Diversity 3
NUSCTX 110 Toxicology 4
PLANTBI C110L Biology of Fungi with Laboratory 4
PLANTBI 112 General Microbiology 6
& C112L and General Microbiology Laboratory 4
PLANTBI C114 Introduction to Comparative Virology 4
PLANTBI/ MCE1116 Microbial Diversity 3
PLANTBI 120 & 120L Biology of Algae and Laboratory for Biology of Algae 4
PLANTBI 122 Bioenergy 2
PLANTBI 180 Environmental Plant Biology 2
PB HLTH 140 Course Not Available
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 4
& PB HLTH 162L and Public Health Microbiology Laboratory 4
PB HLTH 170B Course Not Available 3

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 Biophysical Chemistry: Physical Principles and the MCE1100A Molecules of Life 4
CHEM C130B 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
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<th>Course Code</th>
<th>Course Title</th>
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<td>CIV ENG 115</td>
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<td>CIV ENG C116</td>
<td>Chemistry of Soils</td>
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<td>Rock Mechanics</td>
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<td>CIV ENG 173</td>
<td>Groundwater and Seepage</td>
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<tr>
<td>EPS 100A</td>
<td>Minerals: Their Constitution and Origin</td>
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<td>EPS 100B</td>
<td>Genesis and Interpretation of Rocks</td>
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<td>Field Geology and Digital Mapping</td>
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<td>EPS 131</td>
<td>Geochemistry</td>
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<td>EPS C146/ GEOG C145</td>
<td>Geological Oceanography</td>
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<td>EPS C180</td>
<td>Air Pollution</td>
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<td>EPS C181/ GEOG C139</td>
<td>Atmospheric Physics and Dynamics</td>
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<td>EPS C182</td>
<td>Atmospheric Chemistry and Physics Laboratory</td>
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<td>ENE,RES C100/ PUB POL C184</td>
<td>Energy and Society</td>
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<td>ENE,RES 102</td>
<td>Quantitative Aspects of Global Environmental Problems</td>
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<td>ENGIN 115</td>
<td>Engineering Thermodynamics</td>
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<td>ESPM 102B</td>
<td>Natural Resource Sampling and Laboratory in Natural Resource Sampling</td>
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<td>Soil Characteristics</td>
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<td>ESPM 121</td>
<td>Development and Classification of Soils</td>
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<td>ESPM 122</td>
<td>Field Study of Soil Development</td>
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<td>ESPM C128/ CIV ENG C116</td>
<td>Chemistry of Soils</td>
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<td>Biometeorology</td>
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<td>Soil Microbial Ecology</td>
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<td>ESPM C148/ NUSCTX C114</td>
<td>Pesticide Chemistry and Toxicology</td>
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<td>ESPM 164</td>
<td>GIS and Environmental Science</td>
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<td>ESPM 172</td>
<td>Photogrammetry and Remote Sensing</td>
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<td>Introduction to Ecological Data Analysis</td>
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<td>ESPM 174</td>
<td>Design and Analysis of Ecological Research</td>
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<td>ESPM/ EPS C180/ CIV ENG C106</td>
<td>Air Pollution</td>
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<td>ESPM 181A</td>
<td>Fire Ecology</td>
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<td>GEOG C139</td>
<td>Atmospheric Physics and Dynamics</td>
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<td>GEOG 140A</td>
<td>Physical Landscapes: Process and Form</td>
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<td>GEOG 142</td>
<td>Climate Dynamics</td>
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<td>GEOG 143</td>
<td>Global Change Biogeochemistry</td>
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<td>GEOG 144</td>
<td>Principles of Meteorology</td>
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<tr>
<td>GEOG C145</td>
<td>Geological Oceanography</td>
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<td>GEOG 180</td>
<td>Field Methods for Physical Geography</td>
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<td>GEOG 183</td>
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<td>INTEGBI 106A</td>
<td>Physical and Chemical Environment</td>
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<td>LD ARCH 120</td>
<td>Topographic Form and Design Technology</td>
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<td>Geographic Information Systems</td>
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<td>MATH 121A</td>
<td>Mathematical Tools for the Physical Sciences</td>
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<tr>
<td>MEC ENG 106</td>
<td>Fluid Mechanics</td>
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### Social Sciences Concentration Electives

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<th>Credits</th>
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<tr>
<td>CIV ENG 107</td>
<td>Climate Change Mitigation</td>
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<tr>
<td>DEMOG/SOCIO</td>
<td>Sex, Death, and Data</td>
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<td>C126</td>
<td>Economic Demography</td>
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<td>DEMOG/ECON</td>
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<tr>
<td>C175</td>
<td>Natural Resource Economics</td>
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<td>ECON/ ENEVECON C102</td>
<td>Environmental Economics</td>
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<td>ECON C125/ ENEVECON C101</td>
<td>Economic Development</td>
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<td>ENE,RES C100</td>
<td>Energy and Society</td>
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<td>ENGIN 125</td>
<td>Ethics, Engineering, and Society</td>
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<td>ENGIN 157AC</td>
<td>Engineering, The Environment, and Society</td>
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<td>Microeconomic Theory with Application to Natural Resources</td>
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<td>ENVECON C115/ Modeling and Management of Biological Resources</td>
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<tr>
<td>ESPM C104</td>
<td>Globalization and the Natural Environment</td>
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<td>ENVECON 147</td>
<td>Regulation of Energy and the Environment</td>
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<tr>
<td>ENVECON C151/ Economic Development</td>
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<tr>
<td>ENVECON C171</td>
<td>Economic Development</td>
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<td>ENVECON 153</td>
<td>Population, Environment, and Development</td>
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<td>ENVECON 161</td>
<td>Advanced Topics in Environmental and Resource Economics</td>
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<tr>
<td>ENVECON 162</td>
<td>Economics of Water Resources</td>
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<td>ESPM 102C</td>
<td>Resource Management</td>
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<td>ESPM 102D</td>
<td>Climate and Energy Policy</td>
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<td>ESPM C104/ Modeling and Management of Biological Resources</td>
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<td>ENVECON C115</td>
<td>Economic Development</td>
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<td>ESPM 117</td>
<td>Urban Garden Ecosystem</td>
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<tr>
<td>ESPM 151</td>
<td>Society, Environment, and Culture</td>
<td>4</td>
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<tr>
<td>ESPM 155AC</td>
<td>Sociology and Political Ecology of Agro-Food Systems</td>
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</table>
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 coursework.

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

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. Breadth courses are built into CNR major requirements. The EEP major is the only CNR major that requires the entire 7 course breadth. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

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 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 reaching senior status (90 semester units earned), students must complete at least 24 of the remaining 30 units in at least two semesters in residence at the College of Natural Resources. To count as residence, a semester must consist of at least four passed units. 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 the UC Education Abroad Program (UCEAP) 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.

Most students automatically fulfill 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.

**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, 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 help 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:

### Career Connections

- **Environmental Policy and Advocacy:** Working for environmental organizations, government agencies, or non-government environmental organizations to promote policies that address environmental issues.
- **Conservation and Restoration:** Working in conservation organizations, government agencies, or non-government environmental organizations to protect natural habitats and ecosystems.
- **Environmental Law:** Working as an environmental lawyer or legal advocate to promote environmental laws and regulations.
- **Environmental Consulting:** Working for environmental consulting firms to provide technical expertise in environmental analysis and planning.
- **Environmental Education:** Working in schools or environmental organizations to educate people about environmental issues.
- **Environmental Technology:** Working in environmental technology companies to develop and implement new technologies for environmental protection.
- **Environmental Journalism:** Working as an environmental journalist to report on environmental issues.
- **Environmental Finance:** Working in financial firms or environmental organizations to manage environmental funds or investments.
- **Environmental Science:** Working in research institutions or universities to conduct environmental research.

### Career Clarity

- **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.
support students of all majors and class levels. The Career Center offers a wide variety of programs and resources to
Career and Internship Resources

• 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 and Internship Resources

The Career Center 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 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 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. 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 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. 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 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.

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.

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.

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