Bachelor of Science degree with a major in Environmental Science & Management — with concentrations in:
Ecological Restoration
Energy & Climate
Environmental Education & Interpretation
Environmental Planning & Policy
Geospatial Science
Natural Resources

Minors
- Ecological Restoration
- Environmental Education & Interpretation
- Environmental & Natural Resources Planning
- Environmental Policy
- Natural Resources
- Natural Resources Recreation

Certificates of Study
- Environmental Education & Interpretation
- Environmental & Natural Resources Planning
- Geospatial Science
- Natural Resources Policy & Administration

Master of Science degree in Natural Resources — with a concentration in Environmental Science & Management

Department Chair
Steven R. Martin, Ph.D.

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Natural Resources Building 200
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Associated Faculty & Advisors
Natalie Arroyo, Gillian Black, Craig Benson, Kerry Byrne, Jeff Dunk, Yvonne Everett, Kevin Fingerman, James Graham, David Gwenzi, Jennifer Kalt, Buddhika Madurarppuma, Nick Malloy, Jennifer Marlow, Steven Martin, Judith Mayer, Melanie McCavour, Jack Murphy, Alison O’Dowd, Jennifer Ortega, Laurie Richmond, Amy Rock, Roxann Schroeder, Jennifer Tarton, William Trush, Julie Van Sickle, Tashina Welliver

The Program
Students completing this program will have demonstrated:
- the knowledge and skills to understand, analyze, address and manage the consequences of human actions on the physical, biological, and cultural world.
- the knowledge and skills to seek out the information and resources necessary to understand complex environmental issues.
- the writing, speaking, and electronic communication skills needed to communicate with the public and professionals concerning the environmental sciences.
- the ability to apply critical thinking skills as the basis for decision making and sound value judgments.

Graduates should find work with state, federal, and local governments, nonprofit conservation organizations, private sector consulting firms [particularly those dealing with environmental impact analysis, environmental planning, wetlands delineation, environmental restoration, geospatial applications in natural resources, energy technology and planning, and natural resource management], or go on to professional and graduate schools to study ecology, environmental law, environmental planning, human dimensions of natural resources, outdoor recreation management, geospatial science, natural resources management, wilderness management, public administration, or environmental policy.

Preparation
High school students need strong academic preparation in math, writing, and the sciences.

REQUIREMENTS FOR THE MAJOR
For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see “The Bachelor’s Degree” section of the catalog, pp. 67-82., and “The Master’s Degree” section of the catalog, pp. B3-B4.

Complete all courses in the major with a C- or better.

Core Courses (24 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ESM 105</td>
<td>Natural Resource Conservation</td>
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<tr>
<td>ESM 111</td>
<td>Environmental Science Seminar</td>
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<tr>
<td>GSP 101</td>
<td>Geospatial Concepts and Planning</td>
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<tr>
<td>GSP 101L</td>
<td>Geospatial Concepts Lab</td>
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<tr>
<td>STAT 103†</td>
<td>Introductory Biostatistics</td>
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</tr>
<tr>
<td>ESM 230</td>
<td>Environmental Methods</td>
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<tr>
<td>ESM 303</td>
<td>Applied Natural History &amp; Ecology</td>
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Select one of the following concentrations:

Ecological Restoration Concentration
Core courses plus:

Lower Division
- BIOL 105 (4) Principles of Biology
- BOT 105 (4) General Botany
- ESM 355 (3) Principles of Ecological Restoration

Upper Division
- ESM 425 (3) Environmental Impact Assessment
- ESM 435 (2) Grant Writing
- ESM 455 (4) Applied Ecological Restoration
- FOR 315 (3) Forest Management and
- FOR 431 (3) Forest Restoration,
or
- RRS 306 (3) Rangeland Resource Principles and
- RRS 430 (3) Wildland Restoration & Development

WSHD 310 (4) Hydrology & Watershed Management

Take one upper division course approved by your advisor; from BOT, ESM, FISH, FOR, GSP, RRS, SOIL, WSHD, or WLDF.

NOTE: 24 units may double-count toward GE requirements.

Energy & Climate Concentration
Core courses plus:

Lower Division
- BIOL 105 (4) Principles of Biology, or
- BOT 105 (4) General Botany
- CHEM 107 (4) Fundamentals of Chemistry **

† Course requires one or more prerequisites that are not required elsewhere in the major.
<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>CD 209</td>
<td>Middle Childhood Development</td>
</tr>
<tr>
<td>ESM 350</td>
<td>Fundamentals of Environmental Education &amp; Interpretation</td>
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<tr>
<td>ESM 351</td>
<td>Environmental Interpretation Field Trip</td>
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<tr>
<td>ESM 353</td>
<td>Environmental Education &amp; Interpretation Graphics</td>
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<tr>
<td>ESM 430</td>
<td>NR Management in Protected Areas</td>
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<tr>
<td>ESM 435</td>
<td>Environmental Education &amp; Interpretation Practicum (capstone)</td>
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<tr>
<td>ESM 482</td>
<td>Internship, or</td>
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<tr>
<td>ESM 489</td>
<td>Directed Study</td>
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<tr>
<td>GSP 270</td>
<td>Geographic Information Science (GIS)</td>
</tr>
<tr>
<td>GEDG 301</td>
<td>International Environmental Issues &amp; Globalization</td>
</tr>
</tbody>
</table>

**Upper Division**

- ECON 450: Energy Economics & Climate Policy
- ENGR 305: Appropriate Technology
- ESM 370: Energy, Technology & Society
- ESM 411: Sustainable Campus
- ESM 425: Environmental Impact Assessment

**Take two climate science courses:**
- CHEM 370: Earth System Chemistry
- OCN 420: Oceans and Climate
- WSVD 458: Climate Change & Land Use

**Take two tools courses:**
- ECON 423: Environmental & Natural Resource Economics
- ESM 309B: Environmental Communication
- ESM 435: Grant Proposal Writing
- GSP 270: Geographic Information Science (GIS)
- GEDG 301: International Environmental Issues & Globalization

**Environmental Science & Management**

**Core courses plus:**

**NOTE: 24 units may double-count toward GE requirements.**

**Environmental Education & Interpretation Concentration**

**Core courses plus:**

- BIOL 105: Principles of Biology, or
- BOT 105: General Botany
- GEOL 109: Introduction to Geology, or
- SOIL 260: Introduction to Soil Science
- CHEM 107: Fundamentals of Chemistry, or
- GEDG 106: Physical Geography, or
- PHYX 104: Descriptive Astronomy
- ESM 210: Public Land Use Policies & Management
- ESM 215: Natural Resources & Recreation
- ESM 253: Interpretive Computer Graphics
- CD 209: Middle Childhood Development
- ESM 350: Fundamentals of Environmental Education & Interpretation
- ESM 351: Environmental Interpretation Field Trip
- ESM 353: Environmental Education & Interpretation Graphics
- ESM 430: NR Management in Protected Areas
- ESM 435: Grant Proposal Writing

**Environmental Planning & Policy Concentration**

**Core courses plus:**

**NOTE: 24 units may double-count toward GE requirements.**

**Environmental & Natural Resources Recreation Concentration**

**Core courses plus:**

- BIOL 105: Principles of Biology, or
- BOT 105: General Botany
- CHEM 107: Fundamentals of Chemistry, or
- ESM 210: Public Land Use Policies & Management
- ESM 215: Natural Resources & Recreation
- SOIL 260: Intro to Soil Science
- GSP 270: Geographic Information Science (GIS)
- FOR 330: Adventure Theory & Practice
- ESM 425: Environmental Impact Assessment
- ESM 435: Environmental Education & Interpretation Practicum (Capstone)

**Lower Division**

- BOT 105: General Botany
- CHEM 107: Fundamentals of Chemistry, or
- ESM 210: Public Land Use Policies & Management
- GSP 270: Geographic Information Science (GIS)

**Upper Division**

- ESM 360: Intro to Environmental Planning Methods
- ESM 365: Local Government Planning
- ECON 423: Environmental & Natural Resource Economics
- ESM 425: Environmental Impact Assessment
- ESM 435: Grant Proposal Writing
- ESM 460: Environmental Planning for Public Lands & Rural Communities, or
- ESM 462: Coastal & Marine Planning
- ESM 475: Senior Practicum (Capstone)

- ESM 482: Internship, or
- ESM 489: Directed Study

**‡ Course requires one or more prerequisites that are not required in the major.**

**‡‡ CHEM 109 & CHEM 110 may be substituted for CHEM 107.**
Take one ecology & management course:

- ESM 355  (3)  Principles of Ecological Restoration
- ESM 370  (3)  Energy Technology & Society
- ESM 420  (3)  Ecosystem Analysis
- ESM 430  (3)  Natural Resource Management in Protected Areas
- FOR 321 (3)  Fire Ecology
- FOR 374  (3)  Wilderness Area Management
- FISH 476‡ (3)  Ecology of Running Waters
- WLDF 460‡  (3)  Conservation Biology

Take one natural resource science fundamentals course:

- FOR 130  (3)  Dendrology
- GEOL 109  (3)  General Geology
- SOIL 260  (3)  Intro to Soil Science
- BOT 350‡ (4)  Plant Taxonomy
- WSHD 310  (4)  Hydrology & Watershed Management

Take two upper division policy and management courses, chosen from a list of approved courses provided by your advisor, from ENGR, FISH, FOR, GEOG, NAS, PHIL, PSCI, RRS, SOIL, WSHD, WLDF. 
(Prerequisites may be required for some courses, depending on choice.)

NOTE: 24 units may double-count toward GE requirements.

Geospatial Science Concentration
Core courses plus:

- GEOG 106 (3)  Physical Geography
- GSP 216 (3)  Intro to Remote Sensing
- GSP 270 (3)  Geographic Information Science (GIS)

Upper Division

- GSP 316 (4)  Cartography
- GSP 318 (3)  Geospatial Programming I
- GSP 326 (3)  Intermediate Remote Sensing
- GSP 330 (3)  Mobile Mapping
- GSP 370 (3)  Intermediate GIS
- GSP 418 (3)  Geospatial Programming II, or
- GSP 436 (3)  Advanced Remote Sensing, or
- GSP 470 (3)  Advanced Geospatial Analysis & Modeling

ESM 410 (3)  Environmental Science Practicum (capstone)
ESM 425 (3)  Environmental Impact Assessment
ESM 435 (2)  Grant Proposal Writing

Take one natural resources depth or course approved by advisor, minimum three units:

- ESM 360 (3)  Intro to Environmental Planning Methods
- ESM 430 (3)  Natural Resource Mgmt. in Protected Areas
- FISH 220 (3)  Water Resources & Conservation
- FISH 260 (3)  Fish Conservation & Mgmt.
- FOR 302 (3)  Forest Ecosystems & People
- FOR 307 (3)  California’s Forests & Woodlands
- GEOL 300‡ (3)  Geology of California
- GEOL 303 (3)  Earth Resources & Global Environmental Change
- GEOL 306‡ (3)  General Geomorphology
- GEOL 308 (3)  Natural Disasters
- OCN 301 (3)  Marine Ecosystems — Human Impact
- OCN 304 (3)  Resources of the Sea
- RRS 306 (3)  Wildland Resource Principles
- WSHD 310 (4)  Hydrology & Watershed Management
- WSHD 333 (3)  Wildland Water Quality
- WLDF 301 (3)  Principles of Wildlife Management
- WLDF 468 (3)  Spatial Wildlife Ecology

NOTE: 27 units may double-count toward GE requirements.

Requirements for the Minors
Complete all courses in the minor with a C- or better.

Ecological Restoration Minor

- BOT 105 (4)  General Botany
- SOIL 260 (3)  Intro to Soil Science
- ESM 355 (3)  Principles of Ecological Restoration

Plus take either:

- FOR 315 (3)  Forest Management and
- FOR 431 (3)  Forest Restoration
- RRS 306 (3)  Rangeland Resource Principles and
- RRS 430 (3)  Wildland Restoration & Development

Environmental Education & Interpretation Minor

- ESM 215 (3)  Natural Resources & Recreation
- ESM 253 (3)  Interpretive Computer Graphics [or equivalent]
- ESM 350/351 (3/1)  Fundamentals of Environmental Education & Interpretation, and Field Trip
- ESM 353 (3)  Environmental Education & Interpretation Graphics
- ESM 430 (3)  NR Management in Protected Areas
- ESM 450 (3)  Applied Environmental Education & Interpretation

Environmental & Natural Resources Planning Minor

- GEOG 106 (3)  Physical Geography
- ESM 105 (3)  Natural Resource Conservation
- ESM 210 (3)  Public Land Use Policies & Management
- ESM 360 (3)  Intro to Environmental Planning Methods

Plus two courses from the following:

- ESM 325 (3)  Environmental Law & Regulation
- ESM 365 (3)  Local Government Planning
- ESM 425 (3)  Environmental Impact Assessment

Environmental Policy Minor

- ESM 105 (3)  Natural Resources Conservation
- ESM 210 (3)  Public Land Use Policies & Management
- ESM 325 (3)  Environmental Law & Regulation
- ESM 425 (3)  Environmental Impact Assessment
- PSCI 306 (3)  Environmental Politics

Take one course from the following:

- ECON 423 (3)  Environmental & Natural Resource Economics
- NAS 332 (3)  Environmental Justice
- PSCI 317 (4)  Public Policy Process
- PSCI 352 (4)  Water Politics
- PSCI 364 (4)  Technology & Development
- PSCI 373 (4)  Politics of Sustainability
- PSCI 412 (4)  Legal Research
- WSHD 430 (3)  Water Rights/Water Law

1 Course requires one or more prerequisites that are not required in the major.
**Natural Resources Minor**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Title</th>
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<tbody>
<tr>
<td>BIOL 105</td>
<td>4</td>
<td>Principles of Biology</td>
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<tr>
<td>ESM 105</td>
<td>3</td>
<td>Natural Resource Conservation</td>
</tr>
<tr>
<td>SOIL 260</td>
<td>3</td>
<td>Introduction to Soil Science</td>
</tr>
</tbody>
</table>

At least three courses from the following (at least six units must be 300 or above):

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<thead>
<tr>
<th>Course</th>
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<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ESM 210</td>
<td>3</td>
<td>Public Land Use Policies &amp; Management</td>
</tr>
<tr>
<td>ESM 215</td>
<td>3</td>
<td>Natural Resources &amp; Recreation</td>
</tr>
<tr>
<td>ESM 365</td>
<td>3</td>
<td>Local Government Planning</td>
</tr>
<tr>
<td>FISH 300</td>
<td>3</td>
<td>Introduction to Fishery Biology</td>
</tr>
<tr>
<td>FOR 315</td>
<td>3</td>
<td>Forest Management</td>
</tr>
<tr>
<td>FOR 374</td>
<td>3</td>
<td>Wilderness Area Mgmt.</td>
</tr>
<tr>
<td>OCN 301</td>
<td>3</td>
<td>Marine Ecosystems — Human Impact</td>
</tr>
<tr>
<td>OCN 304</td>
<td>3</td>
<td>Resources of the Sea</td>
</tr>
<tr>
<td>RRS 306</td>
<td>3</td>
<td>Wildland Resource Principles</td>
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<tr>
<td>WLDF 301</td>
<td>3</td>
<td>Principles of Wildlife Management</td>
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**Natural Resources Recreation Minor**

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<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ESM 210</td>
<td>3</td>
<td>Public Land Use Policies &amp; Management</td>
</tr>
<tr>
<td>ESM 215</td>
<td>3</td>
<td>Natural Resources &amp; Recreation</td>
</tr>
<tr>
<td>ESM 305</td>
<td>3</td>
<td>Environmental Conflict Resolution, or</td>
</tr>
<tr>
<td>ESM 309B</td>
<td>3</td>
<td>Environmental Communication</td>
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<tr>
<td>FOR 374</td>
<td>3</td>
<td>Wilderness Area Mgmt.</td>
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<tr>
<td>ESM 415</td>
<td>3</td>
<td>Recreation &amp; Park Planning, or</td>
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<tr>
<td>ESM 440</td>
<td>2</td>
<td>Managing Recreation Visitors</td>
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<tr>
<td>ESM 430</td>
<td>3</td>
<td>NR Management in Protected Areas</td>
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</tbody>
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