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 Recreation

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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Associated Faculty & Advisors
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The Program
Students completing this program will have demonstrated:
- the ability to understand science to understand ecosystems and natural resources
- the ability to understand the policy and social implications of environmental issues.
- 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. 66-81., and "The Master’s Degree" pp. 82-84.

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

Core Courses (24 units)
- ESM 111  [1] Environmental Science Seminar
- STAT 109†  [4] Introductory Biostatistics

Select one of the following concentrations:

Ecological Restoration Concentration
Core courses plus:

Lower Division
- SOIL 260  [3] Intro to Soil Science

Upper Division
- BOT 350  [4] Plant Taxonomy
- ESM 435  [2] Grant Writing
- FOR 315  [3] Forest Management and
- FOR 431  [3] Forest Restoration, or
- RRS 306  [3] Rangeland Resource Principles and

Take one upper division course approved by your advisor; from BOT, ESM, FISH, FOR, GEOL, GSP, RRS, SOIL, WSHD, or WLDF. [Prerequisites may be required for some courses, depending on choice.]

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

Energy & Climate Concentration
Core courses plus:

Lower Division
- BIOL 105  [4] Principles of Biology, or

† Course requires one or more prerequisites that are not required elsewhere in the major.
CHEM 107 (4) Fundamentals of Chemistry **
ECON 104 (3) Contemporary Topics in Economics
MATH 105I (3) Calculus for the Biological Sciences & Natural Resources
PHYX 106 (4) College Physics: Mechanics & Heat
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics

Upper Division
ECON 450 (4) Energy Economics & Climate Policy
ENGR 305 (3) Appropriate Technology
ENGR 371 (3) Energy Systems & Technology
ESM 370 (3) Energy, Technology & Society
ESM 411 (3) Sustainable Campus
ESM 425 (3) Environmental Impact Assessment

Take two climate science courses:
CHEM 370 (3) Earth System Chemistry
OCN 420I (3) Oceans and Climate
WSHD 458 (3) Climate Change & Land Use

Take two tools courses:
ECON 423 (3) Environmental & Natural Resource Economics
ESM 309B (3) Environmental Communication
ESM 435 (3) Grant Proposal Writing
GSP 270 (3) Geographic Information Science (GIS)
GEOG 301 (3) Int’l Environmental Issues & Globalization

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

Environmental Education & Interpretation Concentration
Core courses plus:
BiOL 105 (4) Principles of Biology, or
BOT 105 (4) General Botany
CHEM 107 (4) Fundamentals of Chemistry, or
ESM 210 (3) Public Land Use Policies & Management
ESM 215 (3) Natural Resources & Recreation
ESM 253 (3) Interpretive Computer Graphics

CD 209 (3) Middle Childhood Development
ESM 350 (3) Fundamentals of Environmental Education & Interpretation
ESM 351 (1) Environmental Interpretation Field Trip
ESM 353 (3) Environmental Education & Interpretation Graphics
ESM 430 (3) NR Management in Protected Areas
ESM 450 (3) Applied Environmental Education & Interpretation
ESM 453 (4) Environmental Education & Interpretation Practicum (capstone)

ESM 482 (2) Internship, or
ESM 499 (2) Directed Study

Take one skills course:
ART 340 (3) Graphic Design II
ART 356 (3) Museum & Gallery Practices
ESM 309B (3) Environmental Communication
ESM 425 (3) Environmental Impact Assessment
GSP 270 (3) Geographic Information Science (GIS)
REC 330 (3) Adventure Theory & Practice

Plus one upper division science or natural resources depth course approved by advisor (3 units).

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

Environmental & Natural Resources Recreation Concentration
Core courses plus:
BiOL 105 (4) Principles of Biology, or
BOT 105 (4) General Botany
CHEM 107 (4) Fundamentals of Chemistry **
ESM 210 (3) Public Land Use Policies & Management
ESM 215 (3) Natural Resources & Recreation
SOIL 260 (3) Intro to Soil Science
GSP 270 (3) Geographic Information Science (GIS)
FOR 374 (3) Wilderness Area Management
ESM 415 (3) Recreation & Park Planning (alternate years)
ESM 425 (3) Environmental Impact Assessment
ESM 430 (3) NR Management in Protected Areas
ESM 435 (2) Grant Proposal Writing
ESM 482 (2) Internship, or
ESM 499 (2) Directed Study

ESM 440 (2) Managing Recreation Visitors &
ESM 440L (1) Managing Recreation Visitors Lab
ESM 482 (2) Internship, or
ESM 499 (2) Directed Study

Take one of the following skills courses:
ESM 253 (3) Interpretive Computer Graphics
ESM 309B (3) Environmental Communication
ESM 350 (3) Fundamentals of Environmental Education & Interpretation
GSP 330 (3) Mobile Mapping
GSP 370 (3) Intermediate GIS

Plus one upper division natural resources management course (3 units), approved by advisor, from FISH, FOR, ESM, RRS, SOIL, WSHD, WLD.

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

Environmental Planning & Policy Concentration
Core courses plus:
BOT 105 (4) General Botany
CHEM 107 (4) Fundamentals of Chemistry **
ESM 210 (3) Public Land Use Policies & Management
GSP 270 (3) Geographic Information Science (GIS)

Lower Division

Upper Division
ESM 360 (3) Intro to Environmental Planning Methods
ESM 365 (3) Local Government Planning
ECON 423 (3) Environmental & Natural Resource Economics
ESM 425 (3) Environmental Impact Assessment
ESM 435 (2) Grant Proposal Writing
ESM 460 (3) Environmental Planning for Public Lands & Rural Communities, or
ESM 462 (3) Coastal & Marine Planning
ESM 475 (4) Senior Practicum (Capstone)

ESM 482 (2) Internship, or
ESM 499 (2) 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:**

**Lower Division**

- 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.
- FISH 300 (3) Intro to Fishery Biology
- 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

**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

Natural Resources Minor
BIOL 105  (4) Principles of Biology
ESM 105  (3) Natural Resource Conservation
SDIL 260  (3) Introduction to Soil Science

At least three courses from the following (at least six units must be 300 or above):
ESM 210  (3) Public Land Use Policies & Management
ESM 215  (3) Natural Resources & Recreation
ESM 365  (3) Local Government Planning
FISH 300  (3) Introduction to Fishery Biology
FOR 315  (3) Forest Management
FOR 374  (3) Wilderness Area Mgmt.
OCN 301  (3) Marine Ecosystems — Human Impact
OCN 304  (3) Resources of the Sea
RRS 306  (3) Wildland Resource Principles
WLDF 301  (3) Principles of Wildlife Management

Natural Resources Recreation Minor
ESM 210  (3) Public Land Use Policies & Management
ESM 215  (3) Natural Resources & Recreation
ESM 305  (3) Environmental Conflict Resolution, or
ESM 309B  (3) Environmental Communication
FOR 374  (3) Wilderness Area Mgmt.
ESM 415  (3) Recreation & Park Planning, or
ESM 440  (2) Managing Recreation Visitors

ESM 430  (3) NR Management in Protected Areas