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 Management

Minors
- Ecological Restoration
- Environmental Education & Interpretation
- Environmental & Natural Resources Planning
- Environmental Policy
- Natural Resources Management
- 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 — Environmental & Natural Resources Science option

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 apply science to understanding 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. 66-80, and “The Master’s Degree” on page 81-80.

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

**Core Courses (20 units)**
- ESM 105  (3) Environmental Conflict Resolution
- ESM 325  (3) Environmental Law & Regulation

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
- CHEM 107  (4) Fundamentals of Chemistry
- GSP 270  (3) Geographic Information Science (GIS)
- sol 260  (3) Intro to Soil Science
- STAT 109  (4) Introductory Biostatistics*

**Upper Division**
- BOT 350  (4) Plant Taxonomy
- ESM 355  (3) Principles of Ecological Restoration
- ESM 425  (3) Environmental Impact Assessment
- ESM 435  (2) Grant Writing
- ESM 455  (4) Applied Ecological Restoration
- WSHD 310  (4) Hydrology & Watershed Management

Take one of the following:
- FISH 470  (3) River Fish Restoration Ecology* or
- FOR 431  (3) Forest Restoration, or
- RRS 430  (3) Wildland Restoration & Development*

Take two upper division courses 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.

* Course requires one or more prerequisites that are not required elsewhere in the major.
Energy & Climate Concentration
Core courses plus:

**Lower Division**

BIOL 105  (4) Principles of Biology, or CHEM 107  (4) Fundamentals of Chemistry
BOT 105  (4) General Botany, or CHEM 107  (4) Fundamentals of Chemistry
ECDN 104  (3) Contemporary Topics in Economics
MATH 105  (3) Calculus for the Biological Sciences & Natural Resource
PHYX 106  (4) College Physics: Mechanics & Heat
PHYX 107  (4) College Physics: Electromagnetism & Modern Physics
STAT 109  (4) Introductory Biostatistics

**Upper Division**

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

Take two climate science courses:

CHEM 370  (3) Earth System Chemistry
OCN 420*  (3) Oceans and Climate
WSHD 458  (3) Climate Change & Land Use

Take two tools courses:

ECDN 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:

GEOG 106  (3) Physical Geography, or CHEM 107  (4) Fundamentals of Chemistry
PHYX 104  (4) Descriptive Astronomy
ESM 210  (3) Public Land Use Policies & Management
ESM 215  (3) Natural Resources & Recreation
ESM 253  (3) Interpretive Computer Graphics
CD 256  (3) Middle Childhood Development, or PSYC 213  (3) The School-Age Child
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 Planning & Policy Concentration
Core courses plus:

**Lower Division**

CHEM 107  (4) Fundamentals of Chemistry
BOT 105  (4) General Botany
STAT 108  (4) Elementary Statistics, or STAT 109  (4) Introductory Biostatistics
ESM 210  (3) Public Land Use Policies & Management
GSP 270  (3) Geographic Information Science (GIS)

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

* *CHEM 109 & CHEM 110 may be substituted for CHEM 107.
Upper Division

ESM 360  [3] Intro to Environmental Planning Methods
ESM 460  [3] Environmental Planning for Public Lands & Rural Communities, or
ESM 475  [4] Senior Practicum (Capstone)
ESM 482  [2] Internship, or
ESM 499  [2] Directed Study

Take one ecology & management course:
ESM 370  [3] Energy Technology & Society
ESM 420  [3] Ecosystem Analysis
ESM 430  [3] Natural Resource Management in Protected Areas
FISH 476  [3] Ecology of Running Waters *
WLDF 480  [3] Conservation Biology *

Take one natural resource science fundamentals course:
FOR 130  [3] Dendrology
SOIL 260  [3] Intro to Soil Science
BOT 350  [4] Plant Taxonomy *

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, PSC, 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
STAT 109  [4] Introductory Biostatistics *
GSP 216  [3] Intro to Remote Sensing

Upper Division
GSP 316  [4] Cartography
GSP 370  [3] Intermediate GIS
ESM 410  [3] Environmental Science Practicum (capstone)

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 300  [3] Intro to Fishery Biology
FOR 307  [3] California’s Forests & Woodlands
GEOL 300  [3] Geology of California *
GEOL 303  [3] Earth Resources & Global Environmental Change *
GEOL 308  [3] Natural Disasters
OCN 301  [3] Marine Ecosystems — Human Impact
OCN 304  [3] Resources of the Sea

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

REQUIREMENTS FOR THE MINORS

Ecological Restoration Minor

Required Courses
SOIL 260  [3] Intro to Soil Science

Take one restoration course:
FISH 470  [3] River Fish Restoration Ecology
FOR 431  [3] Forest Restoration

Take one of the following elective courses (or course approved by ESM Program Coordinator):

BOT 330  [2] Plant Ecology, and
GSP 330L  [1] Plant Ecology Lab
BOT 350  [4] Plant Taxonomy
ESM 420  [3] Ecosystem Analysis
FISH 310  [4] Ichthyology
FISH 320  [3] Limnology
FOR 130  [3] Dendrology
FOR 430  [3] Forest Ecosystems
WLDF 460  [3] Conservation Biology

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 430  [3] NR Management in Protected Areas
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 (1-4) 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 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

Natural Resources Minor

BIOL 105 (4) Principles of Biology
ESM 105 (3) Natural Resource Conservation
SOIL 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