Energy & Transportation Planning

Environmental Science & Policy 125, Engineering 162, 165, 167, or 172........4
Select two courses from: Civil & Environmental Engineering 162, 165, 167, or 172....4

Soils and Biogeochemistry

Students who choose this major will study the interaction of physical, biological, and social components of environmental problems. Students completing the program will understand the scientific basis for environmental decision making and the legal, economic, and political issues involved in management of the environment.

The Program. Courses in biology, chemistry, physics, economics, geology, and calculus form the lower-division preparatory foundation of the curriculum. These are then tied together with Environmental Science and Policy 1, "Introduction to Environmental Analysis," which provides an interdisciplinary analysis of several environmental problems. The upper-division core consists of foundation courses in physical, biological, and social sciences, as well as applied courses in environmental monitoring, GIS, impact reporting, and statistical analysis. In their junior year, students must choose a specialized track from the following six options:

(a) Ecology, Biodiversity, and Conservation
(b) Natural Resource Management
(c) Climate Change and Air Quality
(d) Geospatial Information Science
(e) Watershed Science
(f) Soils and Biogeochemistry

A capstone course is required for all seniors and serves to integrate the science, policy/management and biology aspects of the ESM major. All students gain practical experience through field courses and a required internship. Selected students may also pursue an honors thesis in their senior year.

The ESM major is jointly administered by the Departments of Environmental Science and Policy (ESP) and Land, Air, and Water Resources (LAWR). Any student in good standing is eligible to transfer to the major; to do so, please see the student affairs officers in 2134 Wickson Hall or in 1150 Plant and Environmental Sciences Building.

Careers. Graduates from this program are prepared to pursue careers as practicing environmental scientists, resource analysts and planners working for public agencies and private firms specializing in environmental quality, natural resources or ecological research. The major is also an excellent preparation for graduate or professional training in physical and/or biological environmental science graduate programs, as well as in environmental law, administration and environmental policy.

B.S. Major Requirements:

English Composition and Public Speaking requirement.................................................. 3-8
University Writing Program 101, 102AG, 104A-E, or passing the Upper Division English Composition exam................................................................. 0-4
Communication 1, 3, or Dramatic Art 10................................................................. 3-4

Preparatory Subject Matter.............................................................. 48-57
Biological Sciences 2A, 2B, 2C ........................................ 15
Geology 1 or 50; (Geology 50 recommended)............................................................ 3-4
Chemistry 2A, 2B or 2AH, 2BH; (Chemistry 2C or 2CH recommended).................. 10
Physics 1A, 1B, or 7A, 7B, 7C ........................................ 6-12
Economics 1A, 1B ................................................................. 6-8
Mathematics 16A, 16B, 17A, 17B, or 21A, 21B (Mathematics 17A, 17B recommended)...... 6-8
Environmental Science and Policy 1 ................................................................. 4
Satisfaction of the General Education requirement.................................................. 8-12

Environmental Science and Management

[College of Agricultural and Environmental Sciences]

The Major Program

The Environmental Science and Management (ESM) major is designed for students who are interested in solving environmental problems from an interdisciplinary perspective linking the natural and social sciences.
Select one course from: Environmental Science and Management 108 or Environmental Science and Policy 179...3-4

Applied Biological Systems Technology 150..........................................................4

Internship-Environmental Science and Management 121, 131, Environmental Science and Policy 192.................................3

Capstone Class-Environmental Science and Management 195.......................2

Honors Thesis-Environmental Science and Management 194H......................0.3

Ecology, Biodiversity and Conservation Track..........................................................36-46

Select one course from: Atmospheric Science 60, 116, 133, Evolutionary Science and Policy 121, 131, Environmental Science and Policy 152, Geology 134, or Soil Science 100..................3-5

Select one course from: Environmental Science and Policy 170, 171, 172, 179, or Sociology 160..................4

Evolution and Ecology 100..................................................4

Select one course from: Environmental Science and Policy 127 or Wildlife, Fish, and Conservation Biology 154.................4

Select one course from: Environmental Horticulture 160 or Soil Science and Policy 123, 124, Evolution and Ecology 180A, Plant Sciences 147 and 147L or Wildlife, Fish, and Conservation Biology 100..................................................3-4

Select one course from: Environmental Science and Policy 121 or Wildlife, Fish, and Conservation Biology 122.........................4

Evolution and Ecology 104, 115, 181, Environmental Science and Policy 151, 155, Plant Biology 117 or Wildlife, Fish, and Conservation Biology 155.........................3-4

Select one course from: Evolution and Ecology 147 or Plant Sciences 162 or Environmental Horticulture 160.........................3-4

Select one biome level course on wetlands, forests, or water from: Environmental Science and Management 144, Environmental Science and Policy 124, 150C, 151, 155, Evolution and Ecology 115, 138, Plant Sciences 120.................................3-5

Select one organismal biology course on birds, mammals, or plants from: Entomology 103, 116, Evolution and Ecology 112, 114, 134, Plant Biology 102* 116*, 119*, Wildlife, Fish, and Conservation Biology 110, 111, 120, 134; *these are combined lecture/lab courses and will fulfill both the organismal lecture/lab requirements simultaneously........3-5

Complete one lab associated with either the biome level or organismal biology course above: Evolutionary Science and Policy 151L, 155L, Evolution and Ecology 112L, 180B, Wildlife, Fish, and Conservation Biology 110L, 111L, 120L, 134L.................................2-3

Natural Resource Management Track..........................................................32-41

Select three courses from: Environmental Science and Policy 160, 163N, 166N, 167, 168A, 169, 171, 172, 179, or Sociology 160.........................3-5

Select one course from: Environmental Science and Policy 161 or Hydrologic Science 130.........................3-5

Statistics 103 (or equivalent upper-division statistics).........................4

Select two courses from: Entomology 104, Environmental Science and Management 141, 144, Environmental Science and Policy 151, 155, Evolution and Ecology 115, Plant Biology 117, Plant Sciences 130 or Wildlife, Fish, and Conservation Biology 110, 111, 120, or 134.........................6-8

Select two courses from: Atmospheric Science 116, Environmental Science and Management 121, 131 or Soil Science 100.........................6-9

Select one course from: Environmental Science and Management 125 or 165.........................4

Climate Change and Air Quality Track..........................................................32-41

Select three courses from: Atmospheric Science 115, 116, 133, 160, Environmental Science and Management 131 or Geology 108..........................................................9-12

Select two courses from: Environmental Science and Management 100, 121, Environmental Science and Policy 116N, Hydrologic Science 143 or Soil Science 100.................................6-9

Select one course from: Environmental Science and Management 144, Environmental Science and Policy 124, 150C, 151, 155, Evolution and Ecology 115 or Plant Sciences 130.........................3-4

Select one course from: Evolution and Ecology 147 or 149.................................4

Select two courses from: Environmental Science and Policy 163, 165N, 166N, 167, 171, 172, 179, or Sociology 160.........................6-8

Geospatial Information Science Track..........................................................33-42

Select two courses from: Applied Biological Systems Technology 181N, 182, Environmental Science and Management 185, or 186.........................8-9

Select two courses from: Environmental Science and Policy 124, 150C, 151, 155, Soil Science 100, 160, Environmental Science and Policy 172, 172, 172, or Sociology 160.........................6-8

Select two courses from: Environmental Science and Policy 121, Statistics 104, 106, 110, 112A, 130A, or 130B.........................8

Other applicable information technology courses from the Engineering department including database management, digital library science, and Web technologies may be substituted for spatial information with approval.

Select three courses from the following options. Must include both physical and biological courses from Atmospheric Science 110, 116, 133, Soil Science 100, Environmental Science and Policy 124, 150C, 151, 152, 155, Geology 136, Plant Sciences 101 or Plant Biology 117.................................9-14

Soils and Biogeochemistry Track..........................................................38-46

Select one course from: Environmental Science and Management 185, Geology 134, Hydrologic Science 147 or Soil Science 118.........................3-4

Select two courses from: Environmental Science and Management 160, Environmental Science and Management 144, Environmental Science and Policy 116N, 150A, 150C, 151, 155, Geology 132 or 172 or Plant Sciences 130.........................6-8

Watershed Science Track..........................................................38-47

Environmental Science and Management 121 or Hydrologic Science 10.........................3

Soil Science 100 or 105, 107, 109..................................................5

Select two courses from: Environmental Science and Management 108 or Hydrologic Science 141 (but not both), Hydrologic Science 143 or Environmental Science and Management 108 or Hydrologic Science 151 (but not both).........................6-8

Select one course from: Geology 35, 136, 139, or 140.........................3-5

Select one course from: Applied Biological Systems Technology 181N or 182.........................4

Select two courses from: Soil Science 102, 105, 107, 109, 111, 120, or 134.........................4-5

Select two courses from: Environmental Science and Policy 166N, 168A, 169, 172, 179, Hydrologic Science 130, or Land, Air and Water Resources 60.........................6-9

Atmospheric Science 133.........................4

Select one course from: Entomology 116, Evolution and Ecology 154, or Wildlife, Fish, and Conservation Biology 120 or 134.........................3-4

Total Units for the Major.........................111-114

Major Advisers. Marcel Holyoak (Environmental Science and Policy) and Terrance Nathan (Land, Air and Water Resources)

Advising centers for the major, including peer advising, are located in both the Environmental Science and Policy and Land, Air and Water Resources departments.

Students whose last names begin with the letters A-L, please see Melissa Whaley in 2134 Wickson Hall.

Students whose last names begin with the letters M-Z, please see Lecole Brooks in 1150 Plant and Environmental Sciences.

Courses in Environmental Science and Management (ESM)

Lower Division

8. Water Quality at Risk (3)


30. World Ecosystems & Geography (3)

Lecture—3 hours. Introduction to the earth’s major geographic regions and ecosystems, such as deserts, temperate forests, and oceans with an examination of how climate, vegetation regimes, ecological processes, agriculture and other human activities have shaped the world. (Same course as Environmental Science and Policy 30.) Not open to students who have successfully completed Environmental and Resource Sciences 30. Formerly Environmental and Resource Sciences 30.) Offered alternate years. GE credit: SciEng|SE, SS, WC, —(W) Jackson

47. Watershed Processes and Water Quality in the Tahoe Basin (2)

Lecture—3 hours; laboratory—2 hours; fieldwork—9 hours; discussion—3 hours; term paper. Prerequisite: basic knowledge of environmental, soil, or hydrologic sciences. Watershed processes, runoff water-quality management, restoration in Lake Tahoe Basin. Soils, precipitation-runoff, revegetation and adaptive management related to erosion control, effective solutions, development of restoration strategies. Students develop field restoration plans and 3 days of instruction in Tahoe City. (Same course as Hydrologic Science 47.) Not open to students who have successfully completed Environmental and Resource Sciences 47. Formerly Environmental and Resource Sciences 47.) GE credit: SciEng|SE, SS, WC, —(W) Jackson

92. Internship (1-12)

Internship—3.36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off-campus in restoration involves 3 days of instruction in Tahoe City. (Same course as Hydrologic Science 47.) May be repeated for credit—F, W, S, F, W, S.

98. Directed Group Study (1-5)

Prerequisite: consent of instructor. For lower major division students. (P/NP grading only.)
Environmental Science and Policy

98F. Student Facilitated Course Development (1-3)
Prerequisite: consent of instructor. Restricted to upper division standing or consent of instructor. Student-facilitated (taught) course intended for lower division students. Offered irregularly. (P/NP grading only.)—W. (W. S.)—F, W, S.

99. Special Study for Undergraduates (1-5)
Prerequisite: consent of instructor. Primarily for lower division students. May be repeated for credit. (P/NP grading only.)—F, W. S. (F, W, S.)

Upper Division

100. Principles of Hydrologic Science (4)
Lecture—4 hours. Prerequisite: Chemistry 2B, Mathematics 16B, and Physics 7A or 9A. Topics include hydrology (surface and ground water), hydraulic flow through porous media, water balance, climate, atmosphere, ocean, and water flow through the landscape. Not open to students who have successfully completed Environmental and Resource Sciences 100. (Formerly Environmental and Resource Sciences 100.) GE credit: SciEng | QL, SE, SL.—F (F.)—W. (W.)—S. (S.)—F, W, S.

108. Environmental Monitoring (3)
Lecture/discussion—2 hours; laboratory—2 hours; fieldwork. Prerequisite: entry level course work in student's major; specifically, Evolution and Ecology 101 (Evolution and Ecology), Environmental Science and Policy 100 (Environmental Biology and Management), Environmental Toxicology 101 (Environmental Toxicology), Wildlife, Fish, and Conservation Biology 100 (Wildlife, Fish, and Conservation Biology), Environmental and Resource Sciences 100 (Hydrologic Science), Soil Science 100 (Soil Science, Environmental Horticulture 100 (Environmental Horticulture and Urban Forestry), Landscape Architecture 100 (Landscape Architecture) or the equivalent for any of these courses. Instrumentation and methods for environmental and ecological monitoring: GPS, sensors, data logging, and GIS. Wide range of measurement for environmental parameters. Not open to students who have successfully completed Environmental and Resource Sciences 108. (Formerly Environmental and Resource Sciences 108.) GE credit: SciEng | QL, SE, SL.—F (F.)—W. (W.)—S. (S.)—F, W, S.

120. Global Environmental Interactions (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: one college level chemistry course; one college level biology course. Limited to 23 students per discussion section. Relationships among climate, geochemical cycles, soils and vegetation distribution in diverse landscapes and biomes. Emphasis on physical, chemical, and biological processes affecting hydrologic cycle and its impact on human impacts on the environment. Not open to students who have successfully completed Environmental Resources Sciences 60 or 120. (Formerly Environmental Resources Sciences 60 and 120.)—F, W, S. (F, W, S.)—F, W, S.

121. Water Science and Management (3)

131. Air as a Resource (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: Chemistry 10. Degradation of the atmospheric resource: historical and effects of air pollution examined. Evaluation of primary gaseous and particulate pollutants and discussion of their impact. Not open to students who have successfully completed Environmental and Resource Sciences 131. (Formerly Environmental and Resource Sciences 131.) GE credit: QL, SE, SL.—W. (W.)—Zhang

141. Role of Fire in Natural Ecosystems (4)
Lecture—3 hours; term paper. Prerequisite: basic biological concepts: Biological Sciences 2A or Plant Sciences 2; Environmental and Resource Sciences 2B or 2C. Fire regimes and roles in major North American vegetation types, especially in the west. Physics of fire, fire effects on organisms and ecosystems, fire system functioning, reconstructing fire histories, fire in resource management, and fire use by indigenous people. Not open to students who have successfully completed Environmental and Resource Sciences 141. (Formerly Environmental and Resource Sciences 141.) GE credit: SciEng | SE, SL, WE.—W. (W.)—Latimer

144. Trees and Forests (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Sciences 2 or Biological Sciences 1C or 2C. Biophysical structure and function of trees as organisms; forest functioning, reconstructing fire histories, forest vegetation, and use of trees by humans; relationships with carbon, nitrogen, and water cycles. GE credit: SciEng | SE, SL, WE.—W. (W.)—F, W, S.

185. Aerial Photo Interpretation and Remote Sensing (4)
Lecture—2 hours; laboratory—4 hours. Prerequisite: upper division standing. Basics of remote sensing and photogrammetry, electromagnetic radiation, radar, microwave sensing, and introduction to remote sensing applications. Not open to students who have successfully completed Environmental Resource Science 185. (Formerly Environmental Resource Science 185.)—F (F.)—lin

186. Environmental Remote Sensing (5)
Lecture—3 hours; laboratory—6 hours. Prerequisite: Mathematics 16B and Physics 7C or 7B, upper division standing, Landscape Architecture 150 recommended. Overview of satellite, airborne, and ground-based remote sensing, building on properties of electromagnetic radiation. Applications include hydrologic processes, weather and climate, vegetation, and use of images and processing techniques. Not open to students who have successfully completed Hydrologic Science 186 or Environmental and Resource Sciences 186. (Formerly Hydrologic Science 186 and formerly Environmental and Resource Sciences 186.) GE credit: SciEng | SE, SL, WE.—W. (W.)—ustin

192. Internship (1-12)
Internship—3.36 hours. Prerequisite: completion of 84 units; consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)—W. (W.)—F, W, S.

194H. Senior Honor Thesis (2-6)
Independent study—2.6 hours. Prerequisite: senior standing, overall GPA of 3.50 or higher and consent of master adviser. Independent study, guided research on an environmentally related subject of special interest to the student. GE credit: SciEng | SE, WE.

195. Integrating Environmental Science and Management (2)
Lecture/discussion—2 hours. Prerequisite: senior status in Environmental Science and Management major or other environmental science major (e.g. Environmental Resource Science; Environmental Biology and Management; Environmental Toxicology; Environmental Policy Analysis and Planning, Wildlife, Fish, and Conservation Biology; Hydrologic Science.). Course covers practical aspects of environmental improvement through integrated analyses of contemporary issues or problems associated with advocacy, regulation, science and resource management from the perspectives of the physical and social sciences and current policy/management. May be repeated two times for credit. GE credit: SciEng or SocSci | SS or SE.—W. (W.)—Grimer

198. Directed Group Study (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)—F, W. S. (F, W, S.)—W. (W.)—F, W, S.

198F. Student Facilitated Course (1-3)
Prerequisite: consent of instructor. Student-facilitated (taught) course intended for upper division students. Not open to students who have completed Plant Biology 144 or Environmental Horticulture 144 or Environmental and Resource Science 144. (Former course Plant Biology/Environmental Horticulture/Environmental and Resource Science 144.) GE credit: SciEng | SE, SL.—F (F.)—berry, Dahlgren, Rice

199A. Student Teaching Course Development (1-3)
Prerequisite: consent of instructor. Restricted to upper division standing. Under the supervision of a faculty member, an undergraduate student plans and develops the course they will teach under 98F/198F. Offered irregularly. (P/NP grading only.)—W. (W.)—F, W, S.

199B. Student Teaching Course Development (1-3)
Prerequisite: course 199FA; consent of instructor. Restricted to upper division standing. Student facilitated. Under the supervision of a faculty member, an undergraduate student teaches a course under 98F/ 198F. Offered irregularly. (P/NP grading only.)—W. (W.)—F, W, S.

Environmental Science and Policy

[College of Agricultural and Environmental Sciences]

Marcel Holooyko, Ph.D., Chairperson of the Department
Mark N. Lubell, Ph.D., Vice Chairperson

Department Office. 2132 Vickson Mall 530752-3026

Faculty
Gwendolyn B. Arnold, Ph.D., Assistant Professor
Marissa L. Baskett, Ph.D., Associate Professor
David G. Grosholz, Ph.D., Professor, Specialist in Cooperative Extension
Susan L. Handy, Ph.D., Professor
Susan P. Harrison, Ph.D., Professor
Alan T. Hastings, Ph.D., Distinguished Professor
Robert Hijmans, Ph.D., Associate Professor
Marcel Holooyko, Ph.D., Professor
John L. Largier, Ph.D., Professor
C. Y. Cynthia Lin, Ph.D., Associate Professor
(Soil Science and Agricultural Economics)
Mark N. Lubell, Ph.D., Professor
Frances Moore, Ph.D., Assistant Professor
Steven G. Morgan, Ph.D., Professor
Joan M. Ogden, Ph.D., Professor
Steven S. Sadro, Ph.D., Assistant Professor
James N. Sanchirico, Ph.D., Professor
Mark W. Schwartz, Ph.D., Professor
Academic Senate Distinguished Teaching Award
Ann Ahl, Ph.D., Distinguished Professor
Daniel Spirling, Ph.D., Distinguished Professor
Environmental Science and Policy, Civil and Environmental Engineering
Mark W. Schwartz, Ph.D., Professor

Emeriti Faculty
Howard V. Cornell, Ph.D., Professor Emeritus
Charles R. Goldman, Ph.D., Professor Emeritus
Robert A. Johnstone, M.S., Professor Emeritus

Academic Senate Distinguished Teaching Award

Fall 2011 and on Revised General Education (GE) Area: Arts and Humanities; Science and Engineering; Social Sciences; ACH—American Cultures; DOM—Domestic Diversity; OLQ—Oral Skills; QS—Quantitative; SL—Scientific; VL—Visual; WC—World Cultures; WE—Writing Experience
Pre-Fall 2011 General Education (GE): ArtHum—Arts and Humanities; SciEng—Science and Engineering; SocSci—Social Sciences; Dom—Domestic Diversity; WE—Writing Experience Quarter Offered: F—Fall, W—Winter, S—Spring, Su—Summer; 2017/2018 offering in parentheses