Natural Resources Management and Environmental Sciences

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Interim Department Head: Richard Thompson

Academic Programs

<table>
<thead>
<tr>
<th>Program name</th>
<th>Program type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Earth and Soil Sciences</td>
<td>BS</td>
</tr>
<tr>
<td>Environmental Management and Protection</td>
<td>BS</td>
</tr>
<tr>
<td>Environmental Soil Science</td>
<td>Minor</td>
</tr>
<tr>
<td>Forestry and Natural Resources</td>
<td>BS</td>
</tr>
<tr>
<td>Forestry Sciences</td>
<td>MS</td>
</tr>
<tr>
<td>Indigenous Studies in Natural Resources and the Minor Environment</td>
<td>MS</td>
</tr>
</tbody>
</table>

The Natural Resources Management and Environmental Sciences department offers three undergraduate majors – Environmental Earth and Soil Sciences, Environmental Management and Projection, and Forestry and Natural Resources. Students have access to several thousand acres of agricultural, forest, and rangeland managed by the college. Students gain hands-on experience with equipment and techniques in common use by foresters, natural resources managers, soil scientists, agricultural scientists, geologists, and environmental scientists. The department is equipped for analysis of soil, plant, tree, rock, and water samples. Analytical methods available to students include inductively coupled plasma – atomic emission spectroscopy (ICP-AES), flame atomic absorption spectrometry (FL-AAS), high temperature combustion analysis of carbon, nitrogen, and sulfur, petrographic microscopy with digital image analysis, as well as a suite of geographic and geospatial analytical techniques and instrumentation.

The department maintains greenhouse research space with an outdoor erosion research facility, providing opportunities for students to assess erosion control practices used to protect and improve water quality. Additionally, the department operates state-of-the-art weather monitoring equipment on Cal Poly rangelands, providing data for a wide variety of interdisciplinary research projects.

Experiential Learning

The Natural Resources Management and Environmental Sciences Department has a number of outdoor field sites where faculty and student learn-by-doing projects and research are conducted. Facilities sited at the Cal Poly campus include a Forestry Skills Center, computer labs, GIS laboratories, Coastal Resources Institute Research field lab, and several well-equipped greenhouses. Most importantly, the department plays a lead role in administrating the Swanton Pacific Ranch and School Forest near Santa Cruz, California. This 3800-acre ranch includes redwood forests, salmonid-bearing streams, agricultural land, and many other ecosystems. The Swanton Pacific Ranch provides hands-on learning of active forest, ranch, agricultural, and watershed management activities. The management of these forest resources is internationally certified by the Forest Stewardship Council. Students make extensive use of these facilities. Significant field work and laboratory activities occur in all undergraduate and graduate programs requiring field clothing and associated safety equipment.

In addition to these campus-based learning experiences, the NRES department places great importance on work experience before graduation. Work experience validates the student's career goals, confirms the relevance of their classroom education, while offering a pathway to employment. Students can earn course credit through internship, and similar supervisory courses, for volunteer or paid work positions related to their major.

Students are encouraged to reinforce their education, develop professional contacts, and strengthen their career potential by participating in any of the following activities: the Environmental Sciences Club; the Soil Judging Team; Association of Environmental Professionals Student Chapter (AEP); Society of American Foresters Student Chapter (SAF); Logging Team; Student Association of Fire Ecology; and/or Xi Sigma Pi Forestry Honorary Society; attending international and national conferences; and internships and cooperative education programs with government and industry. Each of these opportunities, combined with a friendly, helpful atmosphere, provide students a college experience that is highly personal as well as rewarding. Students also are encouraged to investigate opportunities for international education. Please see the Cal Poly International Program (http://catalog.calpoly.edu/academicsupportandcampuslife/academicervicesandprograms/calpolyinternationalcenter) program section of this catalog. Significant field work and laboratory activities occur in all undergraduate and graduate programs requiring field clothing and associated safety equipment.

Undergraduate Programs

BS Environmental Earth and Soil Sciences

The BS in Environmental Earth and Soil Sciences provides a strong foundation for understanding and improving the utilization of land, water, and atmospheric resources. The program emphasizes a wide range of disciplines in natural resources and in the cultures that use and modify them. The core of the Environmental Earth and Soil Sciences curriculum is composed of geology, soil science, and basic science courses and is strengthened by a diverse array of related topical and technical specialties, which include: climate change studies, environmental mitigation strategies, environmental policy and management, forest and environmental practices, geospatial technology, hydrology, soil geotechnical studies, sustainable agriculture, and urban forestry.

The Environmental Earth and Soil Sciences major provides detailed and thorough training in the natural and cultural processes that govern the relationship between humans and their habitats. The program also furnishes students with the marketable expertise to assess, manage, repair, and improve this fragile relationship while acquiring a well-rounded education in the natural sciences. In addition, majors can meet the educational requirements for professional certification in a number of areas (e.g. erosion and sediment control, hydrology, soil conservation, soil science) and find their training ideal for graduate school preparation in a number of related disciplines.

Due to the multidisciplinary nature of the Environmental Earth and Soil Sciences major, students have access to diverse faculty and
laboratories in several colleges on campus. California's Central Coast offers a diverse environmental and cultural setting for real-world training and experiences in earth sciences.

Undergraduate students majoring in Environmental Earth and Soil Sciences earn the credentials for useful careers in resource assessment and administration. They graduate with a substantial and well rounded education in the natural sciences. Moreover, Environmental Earth and Soil Sciences graduates possess the understanding, flexibility, and tools to appreciate and adapt to a changing world and its employment opportunities.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

**Concentrations**

**Geology**

Students learn the fundamentals of a broad variety of geologic subdisciplines, including mineralogy, petrology, seismology, stratigraphy, geochemistry, geomorphology and structural geology. Each of these fundamental subdisciplines are supported by curriculum that emphasizes methods of data collection, interpretation and professional communication of results. Upon completion of this concentration, students are able to critically evaluate geologic reports within the context of our evolving societal needs, and are prepared to pursue post graduate degrees in the geosciences and/or careers in the geotechnical industry.

**Hydrology**

Students will learn the fundamentals of a broad variety of hydrologic subdisciplines including vadose zone hydrology, groundwater hydrology, soil erosion control, water quality, and watershed management. Each of these fundamental subdisciplines are supported by curriculum that emphasizes methods of data collection and interpretation, and professional communication of results. Upon completion of this concentration, students will be qualified to work in a water-related position for Federal and State agencies, private companies, and environmental consulting firms. Completion of the Hydrology Concentration will meet the course requirements of the U.S. Office of Personnel Management (OPM) for employment as a Hydrologist (Series 1315)

**BS Environmental Management and Protection**

This major is an undergraduate, interdisciplinary course of study integrating the biophysical and social/economical/political sciences in natural resource management. The curriculum emphasizes management and protection of ecosystem structures and processes that sustain uses of environmental resources. The major provides students with the science and management background that, when properly integrated, can guide consumptive uses of resources in a sustainable manner for current and future generations.

Since environmental problems arise from human demands and stresses on the environment, solutions must focus on the human dimension of ecosystems. Thus, environmental management is the management of both people and resources to attain human goals while protecting environmental values in order to sustain natural systems.

Graduates are prepared for a broad range of professional careers in environmental assessment, impact analysis, project management, and impact mitigation monitoring.

Knowledge of the legal and regulatory environment is balanced with study of ecological and economic theories and practices to solving social conflicts over environmental uses and impacts.

The Environmental Management and Protection major is endorsed and supported by the California Association of Environmental Professionals (AEP), a professional association representing the full range of environmental professions in both private and public sectors.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

**Concentrations**

**Watershed Management and Hydrology**

This concentration provides students a focused and encompassing program in watershed management, including a proficiency in watershed hydrology in forest ecosystems, Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration, and urban/wildland hydrologic implications. Students pursuing this concentration can qualify as hydrologists under U.S. Government OPM guidelines (GS 1315).

**Wildlife Biology Concentration**

This specialized course of study prepares students for wildlife biology certification and employment in the fish and wildlife areas of law enforcement, management, and production.

**BS Forestry and Natural Resources**

The Bachelor of Science degree program in Forestry and Natural Resources prepares students for careers in the protection and management of our forest and natural resources. Students may specialize in watershed management and hydrology, wildlife fire and fuels management, or wildlife biology. Optionally, students may select courses from approved electives that are categorized by career area.

Graduates qualify for such positions as: forester, environmental planner and assessor, natural resource manager, urban forester, park administrator, watershed manager, hydrologist, fire and fuels manager, and many other related environmental career areas. Cal Poly graduates are employed throughout the world: establishing, managing and sustaining forests and urban wildland areas; providing opportunities for a full range of uses; teaching; extension; research; and protecting and managing the environment.

Students can complete an internship equivalent to half-time work. Paid internships are available at Swanton Pacific Ranch, or the student may choose to pursue a seasonal job, volunteer work, or a cooperative education program. Work experience for academic credit must be documented by a work supervisor and approved by the student's academic advisor.

Students are required to purchase 8-inch+ high field boots, hard-hats (OSHA approved), hand calculator capable of linear regression, 10X hand lens, and an engineer's scale rule prior to taking 200- or 300-level major courses. Students are strongly encouraged to purchase a laptop before beginning 300-level major courses.

The Society of American Foresters accredits the Forestry and Natural Resources program. Also, the U.S. Office of Personnel Management...
(OPM) recognizes employment as a forester with the Federal Government upon graduation.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

Concentrations

Watershed Management and Hydrology
This concentration provides students a focused and encompassing program in watershed management, including a proficiency in watershed hydrology in forest ecosystems, Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration, and urban/wildland hydrologic implications. Students pursuing this concentration can qualify as hydrologists under U.S. Government OPM guidelines (GS 1315).

Wildlife Biology Concentration
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Wildland Fire and Fuels Management
Focused study on the management of fire and fuels on landscapes ranging from the wildlands to the urban interface. Emphasis on the technologies, issues and policies in managing fire, using fire as an ecosystem management tool and social and economic impacts of fire.

Other Concentration Available
The Outdoor Recreation Management concentration, offered by the Recreation, Parks, and Tourism Administration Department, is available to Forestry and Natural Resources majors, preparing them for careers in the planning, development, leadership, and management of outdoor recreation opportunities on public and private lands.

Environmental Soil Science Minor
Natural Resources Management & Environmental Resources Department
Coordinator: Dr. Chip Appel
Bldg. 180, Room 515
Phone: 805.756.1691
Email: cappel@calpoly.edu

Students completing the minor gain skills in understanding and assessing the science and management of soils. Because soils are necessary for sustaining all living organisms, this minor is relevant to all students. Students will gain practical, meaningful, and hands-on experiences in both environmental and agricultural applications of the world's finite soil resources. This minor allows students the opportunity to relate their interests to the ecology, classification, mineralogy, chemistry, physics, and fertility parameters of soils.

Indigenous Studies in Natural Resources and the Environment
Natural Resources Management & Environmental Resources Department
Bldg. 11, Room 217
Phone: 805.756.2702

Priya Verma, Natural Resources Management and Environmental Sciences
805.756.2773; pverma@calpoly.edu

Kate Martin, Ethnic Studies
805.756.2827; kmartin@calpoly.edu

This interdisciplinary minor is sponsored by the Natural Resources Management and Environmental Sciences department in the College of Agriculture, Food and Environmental Sciences and the Ethnic Studies department in the College of Liberal Arts. The minor consists of innovative coursework and provides research opportunities that incorporate indigenous ecological knowledge in areas such as conservation biology, environmental biology, wildlife and fisheries sciences, forest resources management, environmental studies and environmental sciences: as well as agriculture, ethnic studies, geography, biology, and recreation, parks and tourism.

The Indigenous Studies in Natural Resources Management and the Environment minor aims to bring together principles of both Indigenous knowledge and Western science. Instruction in these two approaches will provide students with the necessary skills, practical research methods and critical thinking abilities for addressing complex environmental and health issues, and resource management problems facing both Indigenous and non-Indigenous communities around the world. Contact the minor coordinator for more details.

Water Science
An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, and Natural Resources Management and Environmental Sciences, that emphasizes one of three areas of study: irrigation, water policy, or watershed management. For more information, see the College of Agriculture, Food and Environmental Sciences (http://catalog.calpoly.edu/collegesandprograms/colleg eofagriculturefoodenvironmentalsciences) section.

The department also participates in offering minors in Land Rehabilitation and Restoration Ecology, Rangeland Resources, Anthropology-Geography, and Geology. Please see College of Agriculture, Food and Environmental Sciences (http://catalog.calpoly.edu/collegesandprograms/colleg eofagriculturefoodenvironmentalsciences), College of Liberal Arts (http://catalog.calpoly.edu/collegesandprograms/collegeofliberalarts) or the Physics (http://catalog.calpoly.edu/collegesandprograms/collegeofsciencesmathematics/physics) page for additional information.

Additional Minors

Geographic Information Systems for Agriculture
An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, Natural Resources Management and Environmental Sciences, and Horticulture and Crop Science. For more information, see the College of Agriculture, Food and Environmental Sciences (http://catalog.calpoly.edu/collegesandprograms/colleg eofagriculturefoodenvironmentalsciences) section.

Graduate Program
Cal Poly offers a Master of Science degree in Agriculture with a specialization in Soil Science. Please refer to the MS
Agriculture (http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmental sciences/#graduatetext) section of the College of Agriculture, Food and Environmental Sciences.

**MS Forestry Sciences**

The Master of Science degree program in Forestry Sciences offers advanced study in a range of forest science sub-disciplines or in preparation for study leading to the Ph.D. degree.

**Areas of Emphasis**

Students may select one of the following emphasis areas that incorporate specific scientific and professional disciplines:

**Forest Resource Sciences**

Offers advanced preparation in the forestry disciplines of watershed management and hydrology, biometrics, forest health, forest management, fire science, and urban and community forestry.

**Environmental Management**

Offers advanced preparation in the disciplines that comprise the field of environmental management, including environmental assessment, planning, mitigation and policy formation relating to a wide range of landscapes and ecosystems.

**Prerequisites**

For consideration as a graduate student, an applicant will have completed a bachelor’s degree in forestry at an accredited forestry four-year college or a related B.S. degree area such as environmental sciences with a minimum grade point average of 2.75 in the last 90-quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

**Program of Study**

Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level). The broad curriculum for the Master of Science degree in Forestry Sciences is:

- a) 20 units in the required core;
- b) 25 units in area of emphasis approved by the student’s major professor and department head;
- c) completion of a thesis or scholarly project, and an oral and written examination. At the discretion of the graduate committee, the written examination may consist of submitting an article for publication to a referred journal.