Ecosystem Management and Forestry

The Ecosystem Management and Forestry major is replacing the Forestry and Natural Resources major in the College of Natural Resources.

Bachelor of Science (BS)

Ecosystem Management and Forestry (EMF) focuses on the conservation and restoration of the earth's natural resources through hands-on study of the ecology, stewardship, and management of forest, woodland, and grassland ecosystems.

The program offers two specializations to choose from, and if the student chooses a specialization in Forestry, they can qualify to take the Registered Professional Forester's licensing exam in California.

- The **Forestry specialization** provides students with the ecological, quantitative, and social foundation to be the managers and leaders in the management of forests and forest resources. The Forestry specialization is accredited by the Society of American Foresters and provides four years of qualifying education or professional experience for licensing as a professional forester in California. The goals of the Forestry specialization are very closely associated with the educational requirements of the forestry profession and prepare our students for a variety of careers in forestry or closely related natural resource fields.
- The **Natural Resource Management specialization** provides students with greater flexibility to explore subjects in ecology, physical environment, monitoring and measurement, and management and policy. Students can choose to concentrate their studies in water management, ecology, climates change or design their own concentration based on interest.

Students in the program, regardless of concentration, have ample opportunity to acquire interdisciplinary skills in the ecology, stewardship, and management of ecosystems such as forests, woodlands, and grasslands. Within the program, students can choose to emphasize topics such as wildlife biology, water policy, fire science, ecosystem restoration, environmental justice, remote sensing and GIS, and rural sociology.

EMF graduates are well-prepared for graduate school and careers in environmental consulting, public agencies, non-profit conservation organizations, and private companies. Students also have the option of preparing for professional careers in forestry, wildlife, and range management.

Admission to the Major

Freshman students may apply directly to the major, or they may select the College of Natural Resource's undeclared option and declare the major by the end of their fourth semester. For further information regarding how to declare the major after admission, including information on a change of major of change of college, please see the College of Natural Resources Undergraduate Student Handbook. (https://nature.berkeley.edu/handbook)

Honors Program

Students with a GPA of 3.6 or higher may enroll in the College of Natural Resources honors program (H196) once they have reached upper division standing. To fulfill the program requirements, students design, conduct, and report on an individual research project working with a faculty sponsor. For further information about registration for the honors symposium and the honors requirements, please see the College of Natural Resources website (http://nature.berkeley.edu/site/honors_program.php).

Minor Program

A minor in Forestry is available for students who are interested in learning about forestry and renewable resource management as an adjunct to their chosen fields. Students in many diverse majors such as business administration, integrative biology, and civil engineering may find this minor complementary to their professional career goals. For information regarding how to declare the minor, please contact the department.

Other Majors and Minors Offered by the Department of Environmental Science, Policy, and Management:

Conservation and Resource Studies (http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/conservation-resource-studies) (Major and Minor)

Environmental Sciences (http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/environmental-sciences) (Major only)

Molecular Environmental Biology (http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/molecular-environmental-biology) (Major only)

Society and Environment (http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/society-environment) (Major only)

Students in this major choose a specialization in Forestry or Natural Resource Management. The specific requirements for each concentration are outlined below. In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a *Pass/No Pass* basis only. Other exceptions to this requirement are noted as applicable.
2. A minimum cumulative grade point average (GPA) of 2.0 is required.
3. A minimum GPA of 2.0 in upper division major requirements is required.
4. At least 15 of the 36 required upper division units must be taken in the College of Natural Resources (except for students majoring in Environmental Economics and Policy; please see the EEP major adviser for further information).
5. A maximum of 16 units of independent study (courses numbered 97, 98, 99, 197, 198, and 199) may count toward graduation, with a maximum of 4 units of independent study per semester.
6. No more than 1/3 of the total units attempted at UC Berkeley may be taken *Pass/Not Pass*. This includes units in the Education Abroad Program and UC Intercampus Visitor or Exchange Programs.

7. A maximum of 4 units of physical education courses will count toward graduation.

For information regarding residency requirements and unit requirements, please see the College Requirements tab.

Summary of Major Requirements

Please see below for the specific details regarding these requirements.

Lower Division Requirements:	
ESPM Environmental Science Core: One course	
ESPM Social Science Core: One course	
Lower Division Specialization Requirements:	
8–9 lower division courses	
Upper Division Requirements:	
3 core courses in ecology, resource economics, and managements (capstone)	
Forestry Specialization	
Summer Forestry Field Camp or Fall Semester course on Polynesian Island of Moorea	
6 upper division courses and two upper division electives	
Natural Resource Management Specialization	
a) Summer Forestry Field Camp or Fall Semester course on Polynesian Island of Moorea and three upper division approved electives	
b) An approved concentration of 6 upper division courses	

Requirements for all EMF Majors

Lower division courses		
CHEM 1A	General Chemistry	3
or CHEM 3A	Chemical Structure and Reactivity	
BIOLOGY 1B	General Biology Lecture and Laboratory	4
MATH 16A & MATH 16B	Analytic Geometry and Calculus and Analytic Geometry and Calculus	6
or MATH 1A-B	Course Not Available	
or MATH 10A-B	Course Not Available	
STAT 20	Introduction to Probability and Statistics	4
or MATH 16A-B	Course Not Available	
ENVECON C1	Introduction to Environmental Economics and Policy *	4
or ECON 1	Introduction to Economics	
or ECON 2	Introduction to Economics--Lecture Format	
EPS 50	The Planet Earth	4
or GEOG 1	Course Not Available	
or GEOG 40	Introduction to Earth System Science	
ESPM 72	Introduction to Geographic Information Systems	3
or ESPM C177	GIS and Environmental Spatial Data Analysis	
ESPM Core Requirements		
ESPM Environmental Sciences Core: Select one from the following:		
ESPM 2	The Biosphere	
ESPM 6	Environmental Biology	
ESPM C10/ LS C30V	Environmental Issues	
ESPM 15	Introduction to Environmental Sciences	
ESPM Social Sciences Core: Select on from the following:		
ESPM C11/ LS C30U	Americans and the Global Forest	4
ESPM C12	Introduction to Environmental Studies	4
ESPM 50AC	Introduction to Culture and Natural Resource Management	4
ESPM 60	Environmental Policy, Administration, and Law	4
Upper division courses		
ESPM 137	Landscape Ecology	3
or INTEGBI 153	Ecology	
ESPM 102C	Resource Management	4
ESPM C183	Forest Ecosystem Management	4

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs have set requirements and are noted officially on the transcript in the memoranda section, but they are not noted on diplomas.

General Guidelines

1. All courses taken to fulfill the minor requirements below must be taken for graded credit.
2. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
3. No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.

Completing the Forestry and Natural Resources Minor Program

- Students must complete at least five courses taken from the predetermined list below. No substitutions will be permitted.
- At least three of the required five classes must be upper division.
- The courses taken must total at least 12 semester units.

Requirements

Required course:		
ESPM 105D	Forest Management and Assessment	
ESPM 182	Forest Operations Management	
ESPM 183	Forest Ecosystem Management and Planning	
ESPM 185	Applied Forest Ecology	
Electives (four courses):		
At least three courses must be upper division. ESPM 182, ESPM 183, and ESPM 185 may also be used as electives.		
ESPM C11	Americans and the Global Forest	4
ESPM 50AC	Introduction to Culture and Natural Resource Management	4
ESPM 60	Environmental Policy, Administration, and Law	4
ESPM 72	Introduction to Geographic Information Systems	3
ESPM 102A	Terrestrial Resource Ecology	4
ESPM 102B	Natural Resource Sampling	2
ESPM 102C	Resource Management	4
ESPM 102D	Climate and Energy Policy	4
ESPM 108A	Trees: Taxonomy, Growth, and Structures	3
ESPM 108B	Environmental Change Genetics	3

ESPM 116C	Tropical Forest Ecology	3
ESPM C129	Biometeorology	3
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems	3
ESPM 155AC	Sociology and Political Ecology of Agro-Food Systems	4
ESPM 172	Photogrammetry and Remote Sensing	3
ESPM 181A	Fire Ecology	3
ESPM 184	Agroforestry Systems	3
UC Forestry Summer Field Program at Baker Forest [1]		
The three Forestry Camp courses (ESPM 105A, ESPM 105B, ESPM 105C) may be used toward the minor.		
ESPM 105A	Sierra Nevada Ecology	4
ESPM 105B	Forest Measurements	1
ESPM 105C	Silviculture and Utilization	3

[1] For more information and to download application materials, please see the College of Natural Resource's website (http://forestrycamp.berkeley.edu).

Mission

The Ecosystem Management and Forestry (EMF) major at the University of California at Berkeley is designed to train tomorrow's leaders in ecosystem science, policy, and management with an emphasis on the ecology, stewardship, and management of forest, woodland, and grassland ecosystems. The program combines a foundation in the relevant natural and social sciences with explicit hands-on learning opportunities. Students completing this major will be prepared to engage policymakers and the public on the role and value of nature in our rapidly changing world.

The EMF major includes both a Forestry concentration that is accredited by the Society of American Foresters (SAF) and Natural Resource Management (NRM) concentration (SAF accreditation pending)

The Forestry concentration provides four years of qualifying education or professional experience for licensing as a professional forester in California. The goals of the Professional Forestry specialization are very closely associated with the educational requirements of the forestry profession and prepare our students for careers in forestry or closely related natural resource fields. When students graduate the EMF major with a Forestry concentration from UC Berkeley, they will have the basic knowledge and skills to assess and manage forest resources.

The Natural Resource Management concentration trains students how to solve ecosystem problems that require interdisciplinary skills. Students can choose to emphasize such topics as wildlife biology, water policy, fire science, ecosystem restoration, environmental justice, remote sensing, and GIS, or rural sociology. Students who graduate the EMF major with an NRM concentration are well-positioned tack current environmental challenges (climate change, fire, sudden oak death, exurban development, drought, and novel ecosystems) while working industry, government or environmental organizations.

Learning Goals for the Major

Forestry Concentration

Knowledge and skills are based on the four major subject areas required by the Society of American Foresters. These four subject areas and the basic competencies expected of students are as follows.

1. Ecology and Biology
    - Competencies must be documented as an:
        - Understanding of taxonomy and ability to identify forest species, their distribution, and associated habitat requirements.
        - Understanding of soil properties and processes, hydrology, water quality, and watershed functions.
        - Understanding of ecological concepts and principles including the structure and function of ecosystems, plant and animal communities, competition, diversity, population dynamics, succession, disturbance, and nutrient cycling.
        - Ability to make ecosystem, forest, and stand assessments.
        - Understanding of plant and animal physiology and the effects of climate, fire, pollutants, moisture, nutrients, genetics, insects and diseases on ecosystem health and productivity.
2. Measurement of Forest and Natural Resources
    - Competencies must be documented as an:
        - Ability to identify and measure land areas and conduct spatial analysis.
        - Ability to design and implement comprehensive inventories that meet specific objectives using appropriate sampling methods and units of measurement.
        - Ability to analyze inventory data and project ecosystem conditions.
3. Management of Forest and Natural Resources
    - Competencies must be documented as an:
        - Ability to develop and apply silvicultural and restoration prescriptions appropriate to management objectives including methods of establishing and influencing the composition, growth, and quality of forests and wildlands and understand the impacts of those prescriptions.
        - Ability to analyze the economic, environmental, and social consequences of resource management strategies and decisions.
        - Ability to develop management plans with specific multiple objectives and constraints.
        - Understanding of the valuation procedures, market forces, processing systems, transportation and harvesting activities that translate human demands for timber-based and other consumable natural resource products into the availability of those products.
        - Understanding of the valuation procedures, market, and non-market forces that avail humans the opportunities to enjoy non-consumptive products and services of forests and wildlands.

- Understanding of the administration, ownership, and organization of forest and resource management enterprises.

4. Resource Policy, Economics, and Administration
    - Competencies must be documented as an:
        - Understanding of resource policy and the processes by which it is developed.
        - Understanding of how federal, state, and local laws and regulations govern the practice of forestry and resource management.
        - Understanding of professional ethics and recognition of the responsibility to adhere to ethical standards in decision-making on behalf of clients and the public.
        - Ability to understand the integration of technical, financial, human resources, and legal aspects of public and private enterprises.

Natural Resource Management Concentration

Knowledge and skills are based on the four major subject areas required by the Society of American Foresters. These four subject areas and the basic competencies expected of students are as follows:

1. Fundamental Knowledge of Ecosystem Components and Ecosystem Functioning
    - Competencies must be documented as an:
        - Knowledge of the elements of botany, zoology, entomology, plant pathology, plant physiology, and genetics essential to an understanding of higher#order ecological processes.
        - An understanding of taxonomy and systematics and an ability to identify dominant and/or ecologically significant components of the flora and fauna of ecosystems at regional to continental scales.
        - Knowledge of the important life history characteristics of dominant and special#concern species.
        - Knowledge of soil properties and processes, hydrology, water quality, and watershed functions.
        - An understanding of ecological concepts and principles including the structure and function of ecosystems, plant and animal communities, competition, diversity, population dynamics, succession, disturbance, and nutrient cycling;
        - An understanding of the effects of climate, fire, pollutants, moisture, nutrients, insects and diseases, and other environmental factors on ecosystem health and functioning at local and landscape scales.
2. Measurement and Assessment of Ecosystem Components, Properties, and Functioning
    - Competencies must be documented as an:
        - Ability to identify, measure, and map land areas and conduct spatial analyses.
        - Ability to design and implement accurate inventories and assessments of dominant or critical ecosystem components and services, ecosystem properties, and indicators of ecosystem health, including trees and other vegetation, vertebrate fauna, biodiversity, soil and water resources, timber, and recreational opportunities.
        - Ability to summarize and statistically analyze inventory and assessment data, evaluate the status of important ecosystem components, describe and interpret interactions and relationships, and project future ecosystem conditions.
3. Identification and Evaluation of Management Objectives
    - Competencies must be documented as an:
        - Understanding of the valuation procedures, including market and nonmarket forces, that apply to ecosystem goods and services such as timber, water, recreational opportunities, carbon and nutrient cycling, and plant and animal biodiversity.
        - Ability to explain the relationships between demand, costs of production, and availability of those goods and services.
        - Ability to describe procedures for measuring stakeholder values and managing conflicts in the evaluation and establishment of management objectives.
        - Ability to evaluate and understand the economic, ecological, and social trade#offs of alternative land uses and ecosystem management decisions at local, regional, and global scales.
        - Knowledge and understanding of environmental policy as applied to ecosystems and the processes by which it is developed.
4. Management Planning, Practice, and Implementation
    - Competencies must be documented as an:
        - Ability to develop and apply prescriptions for manipulating the composition, structure, and function of ecosystems to achieve management objectives, and to understand the impacts of those prescriptions at local and landscape scales.
        - Ability to identify and control or mitigate specific threats to ecosystems such as insects, diseases, fire, pollutant stressors, and invasive plants or animals.
        - Knowledge of the methods and procedures unique to the production of ecosystem goods and services such as timber, recreation, water, and wildlife populations.
        - Ability to describe the process of adaptive management and its application to the management of ecosystems.
        - Understanding of how federal, state, and local laws and regulations apply to management practice.
        - Ability to develop management plans with specific objectives and constraints that are responsive to ownership or stakeholder goals and demonstrate clear and feasible linkages between current condition and desired future condition.

- Understanding of professional ethics, including the SAF Code, and recognition of the responsibility to adhere to ethical standards in the practice of natural resource management on behalf of clients and the public.
- Ability to integrate the knowledge, understanding, and skills from prior coursework in the development of collaborative solutions to realistic management problems.

In the College of Natural Resources, we provide holistic, individual advising services to prospective and current students who are pursuing major and minors in our college. We assist with a range of topics including course selection, academic decision-making, achieving personal and academic goals, and maximizing the Berkeley experience. If you are looking to explore your options, or you are ready to declare a major, double major, or minor, contact the undergraduate adviser for your intended major. Visit the College of Natural Resources website (http://nature.berkeley.edu/advising/undergraduate-advising) to explore all of our advising services.

Undergraduate Adviser
Ginnie Sadil
gsadil@berkeley.edu
260 Mulford Hall
510-642-7895

Contact Ginnie via email to schedule an appointment or visit 260 Mulford Hall for drop-in advising. Advising hours are weekdays 9:00 a.m. to 12:00 a.m. and 1:00 p.m. to 4:00 p.m. Closed Wednesday from 9:00 a.m. to 12:00 p.m.