Forestry and Natural Resources

Bachelor of Science (BS)

Forestry and Natural Resources (FNR) 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 concentrations to choose from, and if the student chooses a specialization in Professional Forestry, they can qualify to take the Registered Professional Forester's licensing exam in California.

Students in the FNR major select between two concentrations:

- The Forestry and Natural Sciences concentration is split into two specializations, Professional Forestry and Natural Sciences. The Professional 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 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. The Natural Sciences specialization allows students to focus their studies more specifically to ecology and the physical environment
- The Human Dimensions of Natural Resources concentration provides students with greater flexibility to explore subjects in ecology, physical environment, monitoring and measurement, and management and policy.

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.

FNR graduates are well-prepared for graduate school and careers in environmental consulting, public agencies, nonprofit 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 (http://www.cnr.berkeley.edu/site/forms/oisa/undergrad_handbook.pdf) .

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 zoology, business administration, 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/2015-16/undergraduate/degree-programs/conservation-resource-studies) (Major and Minor)
Environmental Sciences (http://guide.berkeley.edu/archive/2015-16/undergraduate/degree-programs/environmental-sciences) (Major only)
Molecular Environmental Biology (http://guide.berkeley.edu/archive/2015-16/undergraduate/degree-programs/molecular-environmental-biology) (Major only)
Society and Environment (http://guide.berkeley.edu/archive/2015-16/undergraduate/degree-programs/society-environment) (Major only)

Students in this major choose a concentration in Forestry and Natural Sciences or Human Dimensions of Natural Resources. 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 residence 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 Concentration Requirements: Five to seven courses	
General Breadth Requirements: Two courses	
Upper Division Requirements:	
Five Core Courses	
Summer Forestry Field Camp or Fall Semester course on Polynesian Island of Moorea	
Six Upper Division Electives, Restricted by Concentration	

Lower Division Requirements for all FNR Majors:

ESPM Environmental Science Core (select one):		
ESPM 2	The Biosphere	
ESPM 6	Environmental Biology	
ESPM C10	Environmental Issues	
ESPM 15	Introduction to Environmental Sciences	
ESPM Social Science Core (select one):		
ESPM C11	Americans and the Global Forest	
ESPM C12	Introduction to Environmental Studies	
ESPM 50AC	Introduction to Culture and Natural Resource Management	
ESPM 60	Environmental Policy, Administration, and Law	
General Breadth Requirements (two courses):		
Select courses from the Seven Course Breadth listing on the College of Letters & Science website.		
One course from the Arts & Literature, Historical Studies, or Philosophy & Values category (3-4 units)		
One course from the Social & Behavioral Science or International Studies category (3-4 units)		

Lower Division Requirements, by Concentration

Students in this major choose a concentration in either Forestry and Natural Sciences (FNS) or Human Dimensions of Natural Resources (FDNR). See below for the lower division requirements for each concentration.

Forestry & Natural Sciences (FNS) Concentration

CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	
BIOLOGY 1B	General Biology Lecture and Laboratory	
Math (select one calculus sequence):		
MATH 16A & MATH 16B	Analytic Geometry and Calculus and Analytic Geometry and Calculus	
MATH 1A & MATH 1B	Calculus and Calculus	
Statistics (select one):		
STAT 2	Introduction to Statistics	
STAT 20	Introduction to Probability and Statistics	
Economics (select one):		4
ENVECON C1	Introduction to Environmental Economics and Policy (rec)	
ECON 1	Introduction to Economics	
ECON 2	Introduction to Economics--Lecture Format	
Physical Sciences (select one):		4
EPS 50	The Planet Earth	
GEOG 1	Global Environmental Change	
GEOG 40	Introduction to Earth System Science	

Human Dimensions of Natural Resources (HDNR) Concentration

Biology (select one):		
BIOLOGY 1B	General Biology Lecture and Laboratory	4
Math (select one):		
MATH 16A	Analytic Geometry and Calculus	
MATH 1A	Calculus	
MATH 32	Precalculus	
Statistics (select one):		
STAT 2	Introduction to Statistics	
STAT 20	Introduction to Probability and Statistics	
POL SCI 3	Introduction to Empirical Analysis and Quantitative Methods	
SOCIOL 5	Evaluation of Evidence	
Economics/Business (select one):		
ENVECON C1	Introduction to Environmental Economics and Policy	
ECON 1	Introduction to Economics	
ECON 2	Introduction to Economics--Lecture Format	
UGBA 10	Principles of Business	

Physical Science: Select one course from the Physical Sciences category from the Seven Course Breadth listing on the College of Letters & Science website.

Upper Division Requirements for all FNR Majors:

Field Program Requirement:

Participation in a field program is required of all FNR majors. Students may choose from the eight-week summer field program—Forestry Field Camp—in the northern Sierra Nevada or the fall semester course on the Polynesian island of Moorea, Biology & Geomorphology of Tropical Islands.

Option A: 8-week Forestry Field Camp (11 units) [1]	
ESPM 105A	Sierra Nevada Ecology
ESPM 105B	Forest Measurements
ESPM 105C	Silviculture and Utilization
ESPM 105D	Forest Management and Assessment

Option B: Fall Semester Course on the Polynesian Island of Moorea (13 units): [2]	
ESPM C107	Biology and Geomorphology of Tropical Islands
Core Courses:	
ESPM 72	Introduction to Geographic Information Systems
ESPM 102A	Terrestrial Resource Ecology
ESPM 102B & 102BL	Natural Resource Sampling and Laboratory in Natural Resource Sampling
ESPM 102C	Resource Management
ESPM 102D	Climate and Energy Policy

1 Recommended before junior year. More information is available from the College of Natural Resources's website (http://forestrycamp.berkeley.edu).

2 More information is available on the program's website (http://ib.berkeley.edu/moorea/Information.html).

Upper Division Restricted Electives, by Concentration (6 courses)

Forestry and Natural Sciences (FNS) Restricted Electives

The FNS Concentration has two specializations for the restricted elective requirement: Professional Forestry or Natural Sciences.

Professional Forestry Specialization:	
ESPM 108A	Trees: Taxonomy, Growth, and Structures
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems
ESPM 182	Forest Operations Management
ESPM 183	Forest Ecosystem Management
ESPM 185	Applied Forest Ecology
Plus one additional course from one of the following subject categories listed below: Physical Environment (PE) or Monitoring & Measurement (MM).	
Natural Sciences Specialization:	
Two courses each from both the Ecology (E) and the Physical Environment (PE) subject categories listed below, plus one additional course from each of the following: Monitoring & Measurement (MM) and Management & Policy (MP).	

Human Dimensions of Natural Resources (HDNR) Restricted Electives

Select six courses from the four subject categories below, one course from each category and two additional courses from any category

Ecology (E):	
ESPM C103	Principles of Conservation Biology
ESPM 106	American Wildlife: Identification and Conservation
ESPM 108A	Trees: Taxonomy, Growth, and Structures
ESPM 108B	Environmental Change Genetics
ESPM 111	Ecosystem Ecology
ESPM 112	Microbial Ecology
ESPM 113	Insect Ecology
ESPM 114	Wildlife Ecology
ESPM 115B	Biology of Aquatic Insects
ESPM C115C	Fish Ecology
ESPM 116B	Range Ecology, Improvements, and Management
ESPM 116C	Tropical Forest Ecology
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems
ESPM 187	Restoration Ecology
INTEGBI 102LP	Introduction to California Plant Life with Laboratory
INTEGBI 153	Ecology
INTEGBI 154	Plant Ecology
INTEGBI 157LF	Ecosystems of California
Physical Environment (PE):	
EPS 117	Geomorphology
ESPM 120	Soil Characteristics
ESPM 121	Development and Classification of Soils
ESPM C128	Chemistry of Soils
ESPM C129	Biometeorology
GEOG 140A	Physical Landscapes: Process and Form
Monitoring & Measurement (MM):	
ANTHRO 169A	Data Analysis and Computational Methods
ANTHRO 169B	Research Theory and Methods in Socio-Cultural Anthropology
ARCH 110AC	The Social and Cultural Processes in Architecture & Urban Design
ESPM 172	Photogrammetry and Remote Sensing
ESPM 174	Design and Analysis of Ecological Research
ESPM/LD ARCH C177	GIS and Environmental Spatial Data Analysis
GEOG 187	Geographic Information Analysis
LD ARCH 110	Ecological Analysis
LD ARCH C188	Geographic Information Systems
Management & Policy (MP):	
ESPM 155	Course Not Available
ESPM 165	International Rural Development Policy
ESPM 168	Political Ecology
ESPM 169	International Environmental Politics
ESPM 181A	Fire Ecology
ESPM 182	Forest Operations Management
ESPM 183	Forest Ecosystem Management
ESPM 184	Agroforestry Systems
ESPM 185	Applied Forest Ecology
ESPM 186	Management and Conservation of Rangeland Ecosystems
ESPM 188	Case Histories in Wildlife Management

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:

Select one from the following (for Fall 2014 admits or later):	
ESPM 105D	Forest Management and Assessment
ESPM 182	Forest Operations Management
ESPM 183	Forest Ecosystem Management
ESPM 185	Applied Forest Ecology

Electives (four courses):

At least three courses must be upper division. ESPM 182, ESPM 183, ESPM 185 may also be used as electives.	
ESPM C11	Americans and the Global Forest
ESPM 50AC	Introduction to Culture and Natural Resource Management
ESPM 60	Environmental Policy, Administration, and Law
ESPM 72	Introduction to Geographic Information Systems
ESPM 102A	Terrestrial Resource Ecology
ESPM 102B	Natural Resource Sampling
ESPM 102C	Resource Management
ESPM 102D	Climate and Energy Policy
ESPM 108A	Trees: Taxonomy, Growth, and Structures
ESPM 108B	Environmental Change Genetics
ESPM 116C	Tropical Forest Ecology
ESPM/EPS C129	Biometeorology
ESPM 134	Fire, Insects, and Diseases in Forest Ecosystems
ESPM 155	Course Not Available
ESPM 172	Photogrammetry and Remote Sensing
ESPM 181A	Fire Ecology
ESPM 184	Agroforestry Systems
UC Forestry Summer Field Program at Baker Forest [1]	
The four Forestry Camp courses (ESPM 105A, ESPM 105B, ESPM 105C, ESPM 105D) may be used toward the minor.	
ESPM 105A	Sierra Nevada Ecology
ESPM 105B	Forest Measurements
ESPM 105C	Silviculture and Utilization

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

For College Requirements, please refer to the College of Natural Resources (http://guide.berkeley.edu/archive/2015-16/undergraduate/colleges-schools/natural-resources/#collegerequirementstext) .

Mission

The Forestry and Natural Resources (FNR) major at the University of California at Berkeley is designed to prepare students to manage forests and wildlands while sustaining ecological integrity and producing vital ecosystem services. 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 in the challenge of managing forest and natural resources in a rapidly-changing world.

The FNR major includes a professional option (Forestry and Natural Sciences, Professional Forestry specialization) that is accredited by the Society of American Foresters. The Forestry and Natural Resources major also includes a Natural Sciences specialization in the Forestry and Natural Sciences concentration and a Human Dimensions of Natural Resources concentration.

The Professional Forestry specialization 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 with a FNR major from UC Berkeley, they will have the basic knowledge and skills to assess and manage forest resources. Graduates with the Professional Forestry specialization should have basic competencies as defined by the Society of American Foresters' requirements of accredited degree programs. Graduates with the Natural Sciences or Human Dimensions in Natural Resources concentrations will have similar competencies.

Learning Goals for the Major

Knowledge and skills for FNR majors 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 areas follows.

1. Ecology and Biology
    a. 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

a. 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
   a. 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
   a. 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.