

Forestry and Natural Resources

The Forestry and Natural Resources curriculum is transitioning to **Ecosystem Management and Forestry** (<http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/ecosystem-management-forestry>), **effective Fall 2017**. Students admitted **Fall 2017 or earlier** can follow the curriculum here, but new students will be expected to declare Forestry and Natural Resources by the end of their sophomore year (before the end of Spring 2020) to be eligible for the old program. Incoming students in Fall 2018 will be expected to follow the **Ecosystem Management and Forestry** (<http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/ecosystem-management-forestry>) requirements. For updates, please visit the major website (<https://nature.berkeley.edu/advising/majors/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 or 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 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.

- 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).
- 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.
- 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.
- 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
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BIOLOGY 1B	General Biology Lecture and Laboratory
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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 C8	Foundations of Data Science
STAT 20	Introduction to Probability and Statistics

Economics (select one):

ECON 1	Introduction to Economics
ECON 2	Introduction to Economics--Lecture Format
ENVECON C1	Introduction to Environmental Economics and Policy (rec)

Physical Sciences (select one):

EPS 50	The Planet Earth
GEOG 1	Course Not Available
GEOG 40	Introduction to Earth System Science

Human Dimensions of Natural Resources (HDNR) Concentration

Biology (select one):

BIOLOGY 1B	General Biology Lecture and Laboratory
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Math (select one):

MATH 1A	Calculus
MATH 16A	Analytic Geometry and Calculus
MATH 32	Precalculus

Statistics (select one):

POL SCI 3	Introduction to Empirical Analysis and Quantitative Methods
SOCIOL 5	Evaluation of Evidence
STAT 2	Introduction to Statistics
STAT 20	Introduction to Probability and Statistics

Economics/Business (select one):

ECON 1	Introduction to Economics
ECON 2	Introduction to Economics--Lecture Format
ENVECON C1	Introduction to Environmental Economics and Policy
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
 or INTEGBI 15: Ecology
 ESPM 102B Natural Resource Sampling
 & 102BL 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 and Planning
 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: Management and Policy in the 21st Century
 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 Rangeland Ecology
 ESPM 116C Tropical Forest Ecology
 ESPM 134 Fire, Insects, and Diseases in Forest Ecosystems
 ESPM 187 Restoration Ecology
 INTEGBI 102L Introduction to California Plant Life with Laboratory
 INTEGBI 153 Ecology
 INTEGBI 154 Plant Ecology
 INTEGBI 157L 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 GIS and Environmental Spatial Data Analysis
 ARCH C177
 GEOG 187 Geographic Information Analysis
 LD ARCH 110 Ecological Analysis
 LD ARCH C188 Geographic Information Systems

Management & Policy (MP):

ESPM 155AC Sociology and Political Ecology of Agro-Food Systems
 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 and Planning

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:

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, 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 155AC	Sociology and Political Ecology of Agro-Food Systems
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>).

Reading and Composition (<http://guide.berkeley.edu/archive/2017-18/undergraduate/colleges-schools/natural-resources/reading-composition-requirement>)

In order to provide a solid foundation in reading, writing and critical thinking all majors in the College require two semesters of lower division work in composition. Students must complete a first-level reading and composition course by the end of their second semester and a second-level course by the end of their fourth semester.

Foreign Language (<http://guide.berkeley.edu/archive/2017-18/undergraduate/colleges-schools/natural-resources/foreign-language-requirement>): **EEP Majors only**

The Foreign Language requirement is only required by Environmental Economics and Policy (EEP) majors. It may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Quantitative Reasoning (<http://guide.berkeley.edu/archive/2017-18/undergraduate/colleges-schools/natural-resources/quantitative-reasoning-requirement>): **EEP Majors only**

The Quantitative Reasoning requirement is only required by Environmental Economics and Policy (EEP) majors. The requirement may be satisfied by exam or by taking an approved course.

Undergraduate Breadth

Undergraduate breadth provide Berkeley students with a rich and varied educational experience outside of their major program. Breadth courses are built into CNR major requirements. The EEP major is the only CNR major that requires the entire 7 course breadth. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

High School Exam Credit

CNR students may apply high school exam credit (Advanced Placement, International Baccalaureate, A-Level Exam) towards many College and Major Requirements. See AP Exam Equivalency Chart and Higher Level IB Exam Equivalency Chart in the CNR Student Handbook (<https://nature.berkeley.edu/handbook>) for more information.

Units Requirements

Students must complete at least 120 semester units of courses subject to certain guidelines:

- At least 36 units must be upper division courses, including a minimum of 15 units of upper division courses in the College of Natural Resources.
- A maximum of 16 units of Special Studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of Physical Education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/ NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation.

Semester Unit Minimum

All CNR students must enroll in at least 13 units each fall and spring semester.

Semester Unit Maximum

To request permission to take more than 19.5 units in a semester, please see the major adviser.

Semester Limit

Students admitted as freshmen must graduate within 8 fall/spring semesters at UC Berkeley. Students admitted as transfer students must graduate within 4 fall/spring semesters at UC Berkeley. Students who go on EAP and UCDC can petition for additional semesters. Summer session, UC Extension and non-UC study abroad programs do not count towards this semester limit. Students approved for double majors or simultaneous degrees in two colleges may be granted an additional semester. CNR does not limit the number of total units a student can accrue.

Senior Residence Requirement

After reaching senior status (90 semester units earned), students must complete at least 24 of the remaining 30 units in at least two semesters in residence at the College of Natural Resources. To count as residence, a semester must consist of at least four passed units. Inter-campus Visitor, Education Abroad Program, UC Berkeley Washington Program, and UC Berkeley Extension units do not count toward this requirement.

Students may use Summer Session to satisfy one semester of the Senior Residence Requirement, provided that four units of coursework are completed.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (UCEAP) or the UC Berkeley Washington Program may meet a modified Senior Residence Requirement by completing 24 of their final 60 semester units in residence (excluding UCEAP). At least 12 of these 24 units must be completed after senior status is reached.

Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless students go abroad for a semester or year or want to take courses at another institution or through University Extension during their senior year. In these cases, students should make

an appointment to see an adviser to determine how they can meet the Senior Residence Requirement.

Grade Requirements

- A 2.0 UC GPA is required for graduation.
- A 2.0 average in all upper division courses required of the major program is required for graduation.

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.

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 a.m. to noon and 1 to 4 p.m. Closed Wednesday 9 a.m. to noon.

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.

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 our website (<https://nature.berkeley.edu/advising/meet-cnr-advisors>) to explore all of our advising services.

Undergraduate Adviser, Forestry and Natural Resources

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