

---

# ENVIRONMENTAL STUDIES DEPARTMENT

**Director**, Associate Professor Denise Bruesewitz

**Associate Director**, Assistant Professor Justin Becknell

**Program Faculty and Staff:** Professors Whitney King (Chemistry) and Philip Nyhus, Associate Professors Denise Bruesewitz, and Karena McKinney (Chemistry); Assistant Professors Alison Bates, Justin Becknell, Gail Carlson, Stacy-ann Robinson, and Christopher Walker (English); Visiting Assistant Professors Meg Boyle, Amanda Gallinat, and Torrance Hanley; Laboratory Instructor II Abby Pearson; Program Coordinator Lindsey Cotter; Research Scientist Manuel Gimond; Administrative Assistant Leslie Lima.

**Affiliated Faculty and Staff:** Professors Catherine Bevier (Biology), Michael Burke (English/Creative Writing), Michael Donihue (Economics), Mary Ellis Gibson (English), Mary Beth Mills (Anthropology), Tanya Sheehan (Art), and Judy Stone (Biology); Associate Professors Keith Peterson (Philosophy), Matthew Schneider-Mayerson (English), and Hong Zhang (East Asian Studies); Assistant Professors Allison Barner (Biology), Greg Drozd (Chemistry), Bess Koffman (Geology), Benjamin D. Lisle (American Studies), Jennifer Meredith (Economics), Chris Moore (Biology), and Aleja Ortiz (Geology); Visiting Assistant Professor Bruce Rueger (Geology); Senior Lab Instructor in Biology Sarah Gibbs Staffiere (Biology); Bigelow Senior Scientists Pete Countway, David Emerson, Nichole Price, Doug Rasher, and Benjamin Twining.

The Environmental Studies Department offers interdisciplinary majors in environmental policy, environmental science, and environmental computation as well as a minor that can be elected by majors in any discipline

The Environmental Studies Department at Colby was founded in 1971 and has received national recognition for its innovative, research-based curriculum that engages students with complex environmental issues at Colby, in Maine, and around the world. The program encourages and supports student environmental initiatives and activism. Examples of student-led environmental initiatives include establishing an organic gardening club, organizing activities to reduce carbon emissions on campus, developing a climate change action plan in the local community, organizing climate strikes, and raising awareness about the dangers of using hazardous chemicals at the state and federal levels. Resources are available to support student internships, research experiences, and initiatives. A majority of students study abroad.

We are committed to a curriculum that engages students in learning about environmental justice and environmental racism, as well as listening, responding to, and amplifying perspectives from vulnerable and marginalized communities. We greatly value diversity among our students, and we are committed to strengthening diversity in environmental studies.

A strategic partnership between Colby and the Bigelow Laboratory for Ocean Sciences has expanded educational and research opportunities in marine sciences for students. The partnership includes a semester of study in residence at Bigelow, on-campus courses taught by Bigelow research scientists, student research opportunities, and curricular innovations that combine scientific research with economic and social policy analysis.

The Environmental Studies Department curriculum emphasizes inquiry-based learning and original research. Each major provides a broad-based course of study that combines interdisciplinary breadth and focus-area depth to prepare graduates to understand and to address complex environmental challenges. Each major is flexible and enables students to pursue their individual academic goals and interests. The interdisciplinary nature of our curriculum is enhanced by close ties to many departments and programs in the natural sciences, social sciences, humanities, and other interdisciplinary programs. Our curriculum benefits from our Maine location, including access to diverse natural areas and unique access to government, research, nonprofit, and business institutions. Our graduates are prepared to take leadership positions in businesses, nonprofits, consulting firms, educational institutions, and government agencies. Many of our graduates complete postgraduate or professional study in environmental sciences/studies/management, ecology, limnology, international development, law, marine science and oceanography, medicine, natural resource conservation and management, planning, public health, public policy, and other related areas.

A student may elect only one of the majors offered by the Environmental Studies Department. A student cannot elect both the chemistry: environmental science concentration and an environmental science major with an environmental chemistry focus.

## Requirements for the Major in Environmental Policy

The interdisciplinary environmental policy major provides an extensive introduction to the study of U.S. and international environmental policy. Students combine a foundation course in environmental studies with core courses in environmental economics, U.S. environmental policy and law, international environmental policy and politics, statistics, and ecology. Diverse electives allow students to explore topics such as introductory geographic information systems (GIS), conservation biology, climate change adaptation, energy, environmental justice, marine and freshwater and forest ecosystems, public health, and the environmental humanities.

Environmental policy majors are encouraged to take Environmental Studies 118 (spring) and Biology 163 (fall) and 164 (spring) in their first year at Colby. Students pursuing this major should elect Environmental Studies 233 and 271 (if possible) in the fall and ES234 in the spring of their sophomore year. Students must complete at least one course at the 300 level or above from category III below. No more than one course at the 100 level may be used to fulfill category III. No requirement for the major may be taken satisfactory/unsatisfactory. AP credit can fulfill core course requirements based on exam performance and coverage. Exemption from Environmental Studies 118 is granted with

an AP test score of 4 or 5, allowing advanced placement into other courses. Courses not listed below, such as those offered by some off-campus study programs, may count toward the major pending prior approval by the program director. Up to two courses may be counted toward the major from approved semester-long off-campus study programs.

Environmental policy majors are encouraged to work with their advisor to develop a curricular pathway that includes both depth and breadth of study. Recommended thematic groupings selected from electives in category III and category IV below include: conservation and resources, energy and climate, environmental humanities, environmental justice, public health, and water resources. See the Environmental Studies Department website for details on suggested courses for these groupings. Students are welcome to develop additional thematic pathways (e.g., green building, urban and regional planning, food and agriculture).

### **I. Required Environmental Studies Core Courses**

#### *Biology*

- 163 Cellular Basis of Life
- 164 Evolution and Diversity

#### *Environmental Studies*

- 118 Environment and Society
- 271 Introduction to Ecology

#### *Economics*

- 133 Principles of Microeconomics
- 231 Environmental and Natural Resource Economics

### **II. All of the Following Courses**

#### *Environmental Studies*

- 233 Environmental Policy
- 234 International Environmental Policy

#### *Statistics*

- 212 Introduction to Statistical Methods

### **III. Humans and the Environment (three courses, at least two from environmental studies)**

#### *Anthropology*

- 256 Land, Food, Culture, and Power

#### *East Asian Studies*

- 242 Development and Environmental Issues in Contemporary China

#### *English*

- 120 Inventing Nature in New England
- 337 Climate Fiction

#### *Environmental Studies*

- 120 Ecology and Natural History in Maine
- 151 Landscape and Meaning: An Exploration of Environmental Writing
- 212 Introduction to GIS and Remote Sensing (if not used to satisfy IV below) *or*
- 214 Introduction to GIS and Spatial Analysis (if not used to satisfy IV below)
- 236 Agroecosystems
- 238 Renewable Energy Systems
- 239 Seafood Forensics
- 242 Marine Conservation and Policy
- 265 Global Public Health
- 276 Global Change Ecology (if not used to satisfy IV below)
- 283 Environmental Humanities: Stories of Crisis & Resilience
- 297 Sustainable International Food Systems
- 323 Sustainability Science: From Theory to Practice
- 326 International Climate and Environmental Justice
- 319 Conservation Biology (if not used to satisfy IV below)
- 325 Environmental Justice
- 341 Community, Economics, and Conservation
- 344 Marine Fisheries Management

- 346 Global Food Policy
- 350 Another World is Possible: Ecotopian Visions
- 357 Literature and Environment
- 398 Social Sciences Methods in Environmental Studies

#### *History*

- 248 Nuclear Visions, Environmental Realities
- 348 U.S. Environmental History

#### *Philosophy*

- 216 Philosophy of Nature
- 243 Environmental Ethics
- 328 Radical Ecologies

#### *Religious Studies*

- 298 American Spirituality and the Environment

#### *Science, Technology, and Society*

- 215 Weather, Climate, and Society

### **IV. Three of the Following Courses (at least one from environmental studies)**

#### *Biology*

- 198 Biochemistry of Food
- 211 Taxonomy of Flowering Plants
- 225 Immunology
- 237 Woody Plants
- 246 Parasitology
- 259 Plants of the Tropics
- 275 Human Physiology
- 277 Vertebrate Natural History
- 328 Community Ecology
- 334 Ornithology
- 382 Population Modeling

#### *Chemistry*

- 121 and 122 Earth System Chemistry I and II *or*
- 141 and 142 General Chemistry I and II *or*
- 147 Comprehensive General Chemistry (cannot be counted with Chemistry 121 and 122 or 141 and 142)
- 217 Environmental Chemistry
- 261 Chemistry of Aqueous Environments
- 263 Atmospheric Chemistry
- 331 Chemical Methods of Analysis
- 341 Physical Chemistry
- 351 Environmental Chemical Analysis
- 452 Problems in Chemical Analysis

#### *Economics*

- 278 Joules to Dollars
- 343 Environment and Development

#### *Environmental Studies*

- 212 Introduction to GIS and Remote Sensing *or*
- 214 Introduction to GIS and Spatial Analysis
- 218 Exploratory Data Analysis in *R*
- 236 Agroecosystems
- 238 Renewable Energy Systems
- 244 Marine Communities
- 276 Global Change Ecology
- 319 Conservation Biology
- 323 Sustainability Science: From Theory to Practice
- 338 Forest Ecosystems

- 345 Offshore Energy: Environmental Permits and Community Planning
- 356 Aquatic Ecology
- 358 Ecological Field Study
- 366 Environment and Human Health
- 371 Current Topics in Environmental Science
- 398 Conservation Paleobiology

#### *Geology*

- 12X One Introductory Geology course *or*
- 254 Earth Surface Processes
- 262 Earth's Climate: Past, Present, and Future
- 363 Paleoceanography
- 378 Geologic Environments in the Marine Realm
- 398 Tropical Islands and Ecogeomorphology

#### *Physics*

- 141 Foundations of Mechanics *or*
- 143 Honors Physics
- 145 Foundations of Electromagnetism and Optics

### **V. One of the Following Capstone Courses**

#### *Environmental Studies*

- 493 Environmental Policy Practicum *or*
- 494 Environmental Science Research Experience (with permission of director)

### **VI. Senior Colloquia**

#### *Environmental Studies*

- 401, 402 Senior Colloquium (one credit for the year)

Environmental Studies 401 (fall semester) and 402 (spring semester) provide one credit for the senior year and typically are taken in addition to a normal four-course semester.

Students are strongly encouraged to participate in relevant on- and off-campus opportunities, including research projects, public policy and/or humanities experiences, field studies, civic engagement, or internships in the discipline to complement their academic work.

Environmental studies majors may apply for Environmental Studies Department financial assistance to participate in relevant research or internship opportunities. These opportunities can be discussed with the ES Program Coordinator, academic advisors, or the ES Program Director.

## **Requirements for the Major in Environmental Science**

The interdisciplinary environmental science major includes foundation courses and core courses in biology and ecology, chemistry or physics, geology or GIS, mathematics, and environmental economics. Students select a focus area to explore in depth. Focus areas include aquatic sciences (freshwater and marine), conservation biology, ecosystem ecology, energy and climate, and public health. Students may also petition the Environmental Studies Department director to propose well-structured alternative focus areas. The senior capstone course provides a hands-on approach to environmental science research in local freshwater, marine, or forest ecosystems.

Environmental science majors are encouraged to enroll in Biology 163 (fall) and 164 (spring) and Environmental Studies 118 (spring) in their first year, and Environmental Science 271 (fall) in their sophomore year. Students should also take chemistry (CH121/122 or CH141/142 or CH147) in their first or second year. Students interested in the environmental science major with a marine science focus should consider the Bigelow Laboratory Changing Oceans semester program in their junior year.

Majors must complete at least two courses at the 300 level or above selected from categories III and IV below. No more than one course at the 100 level may be used to fulfill category III. No requirement for the major may be taken satisfactory/unsatisfactory. AP credits may provide advanced placement in biology, chemistry, physics, calculus, and microeconomics. Environmental science majors should consult with their advisor as early as their first year at Colby to identify any courses beyond the major requirements that may be desirable to meet their postgraduate goals, especially graduate or professional school. Courses not listed below, such as those offered by some off-campus study programs, may count toward the major pending prior approval by the program director. Up to two courses may be counted toward the major from approved semester-long off-campus study programs.

### **I. Required Environmental Studies Core Courses**

#### *Biology*

- 163 Cellular Basis of Life
- 164 Evolution and Diversity

### *Environmental Studies*

- 118 Environment and Society
- 271 Introduction to Ecology

### *Economics*

- 133 Principles of Microeconomics
- 231 Environmental and Natural Resource Economics

## **II. Required Science and Mathematics Courses**

### *Chemistry*

- 121 and 122 Earth System Chemistry I and II *or*
- 141 and 142 General Chemistry I and II *or*
- 147 Comprehensive General Chemistry

OR

### *Physics*

- 141 Foundations of Mechanics or 143 Honors Physics *and*
- 145 Foundations in Electromagnetism and Optics

### *Geology*

- 121 and 122 Earth System Chemistry I and II *or*
- 12X An Introductory Geology course *or*
- 161 Introduction to Ocean Science

Note: The two-semester Chemistry/Geology 121 and 122 sequence can replace the requirement to take two chemistry and one geology/GIS course.

OR

### *Environmental Studies*

- 212 Introduction to GIS and Remote Sensing *or*
- 214 Introduction to GIS and Spatial Analysis

### *Mathematics and Statistics*

- Mathematics: Any four-credit calculus class numbered MA 120 or above *and*
- Statistics 212 Elementary Statistics

Students electing the energy and climate focus area are encouraged to also take a four-credit calculus class numbered MA 160 or above.

## **III. Humans and the Environment (two courses, not taken from the same discipline unless that discipline is environmental studies, at least one course from Environmental Studies)**

### *Anthropology*

- 256 Land, Food, Culture, and Power

### *East Asian Studies*

- 242 Development and Environmental Issues in Contemporary China

### *English*

- 337 Climate Fiction

### *Environmental Studies*

- 120 Ecology and Natural History in Maine
- 151 Landscape and Meaning
- 212 Introduction to GIS and Remote Sensing Studies (if not used to satisfy II above) *or*
- 214 Introduction to GIS and Spatial Analysis (if not used to satisfy II above)
- 233 Environmental Policy
- 234 International Environmental Policy
- 236 Agroecosystems
- 238 Renewable Energy Systems
- 239 Seafood Forensics
- 242 Marine Conservation and Policy
- 265 Global Public Health

- 276 Global Change Ecology
- 283 Environmental Humanities: Stories of Crisis & Resilience
- 297 Sustainable International Food Systems
- 319 Conservation Biology
- 323 Sustainability Science: From Theory to Practice
- 325 Environmental Justice
- 326 International Climate and Environmental Justice
- 341 Community, Economics, and Conservation
- 344 Marine Fisheries Management
- 345 Offshore Energy: Environmental Permits and Community Planning
- 350 Another World is Possible: Ecotopian Visions
- 357 Literature and Environment
- 358 Ecological Field Study
- 364 Climate Change, Justice, and Health
- 366 Environment and Human Health
- 397B Community, Economics, and Conservation

#### *History*

- 248 Nuclear Visions, Environmental Realities
- 348 U.S. Environmental History

#### *Philosophy*

- 216 Philosophy of Nature
- 243 Environmental Ethics
- 328 Radical Ecologies

#### *Religious Studies*

- 298 American Spirituality and the Environment

#### *Science, Technology, and Society*

- 215 Weather, Climate, and Society

### **IV. Focus Area (four courses, depending on the focus area chosen, and an additional culminating experience chosen in consultation with advisor)**

The Environmental Studies Department will consider well-structured proposals for alternative focus areas. Advanced Placement credits can provide advanced placement in focus areas but cannot reduce the number of required focus-area courses below four.

#### **A. Aquatic Sciences (Freshwater and Marine) (four courses)**

##### *Environmental Studies*

- 244 Marine Communities
- 356 Aquatic Ecology

Two Courses from the following:

##### *Biology*

- 328 Community Ecology
- 354 Marine Ecology

##### *Chemistry*

- 217 Environmental Chemistry
- 261 Aqueous Environmental Chemistry
- 351 Environmental Chemical Analysis
- 261 Chemistry of Aqueous Environments
- 331 Chemical Methods of Analysis

##### *Environmental Studies*

- 212 Introduction to GIS and Remote Sensing or 214 Introduction to GIS and Spatial Analysis or 218 Exploratory Data Analysis in R
- 239 Seafood Forensics (if not used to satisfy II above)
- 276 Global Change Ecology (if not used to satisfy II above)
- 344 Marine Fisheries Management
- 358 Ecological Field Study

The Bigelow Laboratory Changing Oceans semester program will fulfill three courses in the Aquatic Sciences focus area.

## **B. Climate and Energy (four courses)**

### *Environmental Studies*

- 276 Global Change Ecology
- 238 Renewable Energy Systems
- 323 Sustainability Science: From Theory to Practice

### *Chemistry*

- 217 Environmental Chemistry

OR

### *Economics*

- 278 Joules to Dollars

Two Courses from the following:

### *Biology*

- 382 Population Modeling

### *Chemistry*

- 241 Organic Chemistry I
- 242 Organic Chemistry II
- 217 Environmental Chemistry (if not used above)
- 263 Atmospheric Chemistry
- 278 Joules to Dollars (if not used above)
- 331 Chemical Methods of Analysis
- 341 Physical Chemistry: Thermodynamics and Kinetics
- 342 Physical Chemistry: Quantum and Statistical Mechanics
- 351 Environmental Chemical Analysis
- 452 Problems in Chemical Analysis

### *Environmental Studies*

- 218 Exploratory Data Analysis in R
- 236 Agroecosystems
- 345 Offshore Energy: Environmental Permits and Community Planning
- 364 Climate Change, Justice and Health

### *Geology*

- 254 Earth Surface Processes
- 262 Earth's Climate: Past, Present, and Future
- 363 Paleoceanography
- 398 Tropical Islands and Ecogeomorphology

### *Physics*

- 312 Physics of Fluids

The Bigelow Laboratory Changing Oceans semester program will fulfill up to two courses in the Climate and Energy focus area.

## **C. Conservation Biology (four courses)**

### *Environmental Studies*

- 319 Conservation Biology
- 338 Forest Ecosystems

Two Courses from the following:

### *Biology*

- 211 Taxonomy of Flowering Plants
- 237 Woody Plants
- 259 Plants of the Tropics
- 277 Vertebrate Natural History
- 328 Community Ecology
- 334 Ornithology

- 354 Marine Ecology
- 382 Population Modeling

*Environmental Studies*

- 212 Introduction to GIS and Remote Sensing *or*
- 214 Introduction to GIS and Spatial Analysis (if not used to satisfy II above)
- 218 Exploratory Data Analysis in *R*
- 236 Agroecosystems
- 242 Marine Conservation and Policy
- 244 Marine Communities
- 323 Sustainability Science: From Theory to Practice
- 356 Aquatic Ecology
- 358 Ecological Field Study
- 398 Conservation Paleobiology

**D. Ecosystem Ecology (four courses)**

*Environmental Studies*

- 276 Global Change Ecology
- 338 Forest Ecosystems

Two Courses from the following:

*Biology*

- 382 Population Modeling

*Chemistry*

- 217 Environmental Chemistry
- 261 Aqueous Environmental Chemistry
- 331 Chemical Methods of Analysis
- 351 Environmental Chemical Analysis
- 452 Problems in Chemical Analysis

*Economics*

- 278 Joules to Dollars

*Environmental Studies*

- 218 Exploratory Data Analysis in *R*
- 2xx Agroecosystems
- 244 Marine Communities
- 356 Aquatic Ecology

*Geology*

- 254 Earth Surface Processes
- 262 Earth's Climate: Past, Present, and Future
- 363 Paleoceanography

**E. Public Health (four courses)**

*Environmental Studies*

- 265 Global Public Health
- 366 Environment and Human Health

Two Courses from the following:

*Biochemistry*

- 362 Medical Biochemistry *or*
- 367 Biochemistry of the Cell I

*Biology*

- 225 Immunology
- 246 Parasitology
- 275 Mammalian Physiology
- 278 Biomedical Genomics and Bioinformatics



- 348 Pathogenic Bacteriology

#### *Chemistry*

- 241 Organic Chemistry I

#### *Environmental Studies*

- 212 Introduction to GIS and Remote Sensing or 214 Introduction to GIS and Spatial Analysis (if not used to satisfy II above) or 218 Exploratory Data Analysis in R
- 325 Environmental Justice
- 364 Climate Change, Justice and Health

#### *Statistics*

- 306 Topics in Epidemiology

### **V. One of the following Capstone Courses**

#### *Environmental Studies*

- 494 Environmental Science Research Experience or
- 493 Environmental Policy Practicum (with permission of director)

### **Guidelines for Counting Bigelow Courses toward major requirements**

Environmental Science majors with a focus area in aquatic sciences or energy and climate who successfully complete the Bigelow semester program may apply three courses from the Bigelow semester toward the major as follows:

- Three of the four courses towards the focus area OR
- Two courses toward the focus area and one as a replacement for ES494. If this option is selected, students must submit a scientific paper on their independent research project with the guidance of their Bigelow research advisor to their Environmental Studies Department academic advisor and the Environmental Studies Department director for approval at least one week prior to registration for fall classes in the prior spring semester.

#### **1. Senior Colloquia**

#### *Environmental Studies*

- 401, 402 Senior Colloquium (one credit for the year)

Environmental Studies 401 and 402 provide one credit for the senior year and typically are taken in addition to a normal four-course semester.

Students are encouraged to consider field courses offered by Colby or other approved programs. Students are strongly encouraged to participate in research experiences, field studies, or internships in the discipline to complement their academic work. Environmental studies majors may apply for Environmental Studies Department financial assistance to participate in relevant research or internship opportunities. These opportunities can be discussed with the ES program coordinator, academic advisors, or the ES program director.

### **Requirements for the Major in Environmental Studies Computation**

The interdisciplinary major in environmental computation provides an introduction to environmental studies as a discipline as well as training in computational techniques used in environmental policy and science. Students become familiar with quantitative tools used to investigate environmental problems. The major is designed to provide students with proficiency in computational thinking, the analysis and understanding of environmental systems, challenges, and solutions, and in the design and implementation of algorithms for modeling and analysis. Students gain experience applying computational thinking and statistical methods to a diverse spectrum of topics in environmental studies and are introduced to the complexity of coupled human and natural systems and diverse computational methods. Diverse electives allow students to explore environmental topics in depth, including agriculture and food, conservation science, energy and climate, environmental humanities, marine and freshwater conservation, and public health.

Students interested in this major are encouraged to take Environmental Studies 118 (spring) in their first year, Computer Science 151 or 152 or 153, and 231 (fall or spring), and 251 or 252 (spring) in their first year, and one or more Environmental Studies electives in their second year. No requirement for the major may be taken satisfactory/unsatisfactory. Advanced Placement credits can fulfill core course requirements based on exam performance and coverage. Exemption from Environmental Studies 118 is granted with an AP test score of 4 or 5, allowing advanced placement into other courses. Courses not listed below, such as those offered by some off-campus study programs, may count toward the major pending approval of the program director. Up to two courses may be counted toward the major from approved off-campus study programs. Courses counted in one section cannot also be counted in another section (e.g., a 200-level Environmental Studies courses used as a Foundational Course cannot also be counted as an Application Course).

Students should consult with the Environmental Studies Department director or their Computer Science advisor when planning their course of study, including capstone experience.

## I. Required Foundational Courses (four courses)

### *Computer Science*

- 151 Computational Thinking: Visual Media or
- 152 Computational Thinking: Science (recommended) or
- 153 Computational Thinking: Smart Systems and
- 231 Data Structures and Algorithms

### *Environmental Studies*

- 118 Environment and Society and
- One 200-level course (e.g., 233, 234, 242, 244, 265, 271, 276, 283)

## II. Required Modeling and Analysis Courses (four courses)

### *Computer Science*

- 321 Software Engineering
- 251 Data Analysis and Visualization or 252 Mathematical Data Analysis and Visualization and one from the following:
- 330 Database Design, Development, and Deployment
- 341 Systems Biology or
- 343 Neural Networks or
- 346 Modeling and Simulation or
- 365 Computer Vision
- or other course approved by advisor

### *Environmental Studies*

- 212 Introduction to GIS and Remote Sensing or
- 214 Introduction to GIS and Spatial Analysis

### *Mathematics and Statistics*

- Statistics 212 Introduction to Statistical Methods or
- Mathematics, any four-credit calculus class numbered MA 160 or above

## III. Application Courses (five courses)

Five courses selected from the following:

### *Computer Science*

At least one and up to two courses at the 300 level or above

### *Environmental Studies*

At least three and up to four courses not also counted elsewhere to provide depth in an application area. Recommended application groupings include: conservation and resources (e.g., 319, 338, 344), ecosystem ecology (e.g., 276, 366), energy and climate (e.g., 217, 276, 3XX), environmental justice (e.g., 364, 325), public health (e.g., 265, 364, 366), and water resources (marine and freshwater) (e.g., 242, 244, 356). Courses from the Bigelow Semester can count toward this requirement; up to two courses from study abroad can be counted toward this requirement with prior approval from the director of the Environmental Studies Department. At least one course must be at the 300 level.

### *Mathematics and Statistics*

One course selected from the following

- Statistics
  - 321 Statistical Modeling
- Mathematics
  - 253 Linear Algebra
  - 262 Vector Calculus
  - 311 Ordinary Differential Equations
  - 332 Numerical Analysis

## IV. Culminating Experience

### *Environmental Studies*

- 401, 402 Environmental Studies Colloquium (one credit for the year)

One capstone selected from the following determined in consultation with the student's advisor:

- Computer Science 4xx or

- Environmental Studies 493 Environmental Policy Practicum or
- Environmental Studies 494 Research Experience in Environmental Science

Environmental studies 401 and 402 provide one credit for the senior year and typically are taken in addition to a normal four-course semester.

Students are strongly encouraged to participate in relevant on- and off-campus opportunities, including research projects, civic engagement, internships, field studies, and other opportunities to complement their academic work. Environmental Studies majors may apply for Environmental Studies Department financial assistance to participate in relevant research or internship opportunities.

Environmental Studies 401 and 402 provide one credit for the senior year and typically are taken in addition to a normal four-course semester. Environmental studies majors may apply for Environmental Studies Department financial assistance to participate in relevant research or internship opportunities.

## Requirements for Honors in Environmental Studies

Environmental studies majors with a minimum cumulative grade point average of 3.7 at the end of the January Term of the junior year or with special program approval are eligible to apply for the Environmental Studies Honors Research Program. Interested students should contact a faculty sponsor during the spring semester of the junior year to discuss a project. Students who are studying abroad in the spring should try to make initial contact with a potential sponsor in the spring via email, but may complete their proposal in the fall at the beginning of the academic year. If the faculty sponsor and the program director approve a proposed project, students will register for ES483 (Honors Project) in the fall semester and Jan Plan. During the fall, students must write a thesis proposal, have it approved by the environmental studies faculty, and make progress on their research. Students approved by the Environmental Studies Department will continue their research during the spring semester in Environmental Studies 484 (Honors Project). A maximum of eight credits for honors research is allowed for the entire year. Additional details are provided on the Environmental Studies Department web page.

Students enrolled in Environmental Studies 493 or 494 may petition the program to expand their independent study for these courses into an honors project to be conducted in January and the spring semester.

Successful completion of the honors program will include an approved thesis, an oral presentation at the Colby Liberal Arts Symposium, a successful thesis defense, and the completion of the required coursework for the major. Students fulfilling these requirements will graduate with "Honors in Environmental Studies." In cases where requirements for honors have not been fulfilled at the end of the spring semester, Environmental Studies 483 and 484 (Honors Research) will revert to a graded Environmental Studies 491/291/492 (Independent Study).

## Requirements for the Minor in Environmental Studies

The environmental studies (ES) minor allows students from all areas of study to explore environmental issues. With the ES minor, students engage in cross-disciplinary thinking and have the flexibility to choose courses that complement their interests. AP credit in a relevant subject allows advanced placement, but it does not reduce the number of courses required for the minor. Students who receive an AP 4 or 5 for environmental science do not have to take Environmental Studies 118 but must take an additional ES course at the 200-300 level.

Requirements are

- ES118
- Four ES courses at the 200-300 level. At least one must be a 300-level course, and students may include one environmentally focused course from another department, program, or from an approved study abroad program by petition to the ES minor advisor.

## Course Offerings

**ES118s Environment and Society** An introduction to the multi study of the relationship between humans and the world around us. Through an examination of the most pressing environmental problems—such as climate change, biodiversity loss, and environmental racism—students will be introduced to methods and key concepts of Environmental Studies. Through lectures, case studies, and collaborative work, students will assess the strengths and weaknesses of approaching environmental problems from the sciences, social sciences, and humanities, and gain tools to work toward a more just environmental future. *Four credit hours.* BOYLE, BRUESEWITZ, SCHNEIDER-MAYERSON

**ES120Cs Ecology and Natural History in Maine: Thoreau to Rachel Carson** Explores the ecology and natural history of Maine through the writings of four well-known scientists and writers: Henry David Thoreau, Kate Furbish, Robert MacArthur, and Rachel Carson. Their observations of Maine's plants, wildlife, and environment sparked ideas about environmental activism and ecological theory that are still considered foundational. We will read their original Maine writing, consider the intended audiences, and place their scientific work in the context of land use change, the professionalization of science, and the western conservation movement. We will practice our own natural history observations. Finally, we will consider the role of writing in ecology: how does good writing contribute to good science and vice versa? *Four credit hours.* **W1.** GALLINAT

**[ES122] Environmental Impacts of Pandemics on Human and Natural Systems** Investigates the environmental impacts of

pandemics, on scales ranging from the personal to global, and will place students' personal experiences with the recent coronavirus crisis into a larger perspective. This recent crisis has affected the entire planet, precipitating changes in mobility, resource use, and government, with lasting impacts on human and natural environments for decades to come. Changes in fossil fuel use, personal consumption of manufactured goods, the structure of government, and social integration across groups and nations could change the way we live across the planet, with significant lasting impacts on the environment. This course will investigate the scope of those changes. *Three credit hours.*

**ES126f Environmental Activism** An introduction to the history, theory, and practice of environmental activism, incorporating both global and local perspectives. We focus on individual activists, grassroots groups, indigenous people, and large environmental organizations, analyze their motivations, strategies, and experiences, and determine how their actions have sparked effective social, political, and environmental change. We explore the social phenomena that underlay environmental activism, taking an interdisciplinary approach that encompasses history, environmental justice, social movement theory, political theory, public policy, and communications. We make significant use of primary source narratives by activists and communities on the front-lines of environmental struggles. We will place particular emphasis on climate and energy activism. **Energy/Exhaustion humanities theme course.** *Prerequisite:* First-year standing. *Four credit hours.* S. CARLSON

**[ES143] Sustainable and Socially Responsible Business** Provides a broad overview of sustainable and socially responsible business principles and the ways in which companies incorporate them. Also introduces sustainable and socially responsible investment strategies and reviews their potential impact and effectiveness. Through a series of readings, lectures, guest speakers, and real-world case studies, students are exposed to the issues and opportunities facing green businesses. Includes small-group and individual presentations. *Three credit hours.*

**[ES151] Landscapes and Meaning: An Exploration of Environmental Writing** An exploration of the works of selected 20th-century environmental writers and how their life experiences contribute to a sense of connection with and action on behalf of the Earth. Through readings, film, writing assignments, group discussion, and journaling, students will develop critical thinking and communication skills while reflecting on their own personal relationship with nature. *Three credit hours.* L.

**[ES153] Environmental Approaches to Antiquity** Listed as Classics 153. *Four credit hours.* H.

**ES161f Introduction to Ocean Science** Listed as Geology 161. *Four credit hours.* N. TWINING

**[ES197] Old Ways, New Hope: Approaching the Climate Crisis w/Indigenous Wisdom** 1. Personal understanding of Indigenous (a. Indigenous: originating or occurring naturally in a particular place; native. b. Regardless of our roots, we have indigenous ancestors. c. Find our native place/identify our Ænative, our æIndigenousñ ancestors. 2. Exploring the elements of ?Indigenous Wisdom?. 3. Specifics of why Indigenous wisdom is considered a climate solution. 4. Creation of university curriculum. *Three credit hours.*

**[ES211] Taxonomy of Flowering Plants** Listed as Biology 211. *Four credit hours.*

**ES212s Introduction to GIS and Remote Sensing** A comprehensive theoretical and practical introduction to the fundamental principles of geographic information systems and remote sensing digital image processing. Topics include data sources and models, map scales and projections, spatial analysis, elementary satellite image interpretation and manipulation, and global positioning systems. Current issues and applications of GIS, with emphasis on environmental topics. Students develop and carry out independent projects using GIS. *Prerequisite:* Sophomore or higher standing. Not open to students who have completed Environmental Studies 214 or 214J. *Four credit hours.* NYHUS

**ES214f Introduction to GIS and Spatial Analysis** An introduction to geographic information systems' (GIS) data management and visualization capabilities as well as the theory and application of spatial analysis techniques. Topics covered include spatial data representation in a GIS, effective map making, coordinate systems and projections, exploratory spatial data analysis (ESDA), and spatial statistical analysis. *Prerequisite:* Sophomore or higher standing. Not open to students who have completed Environmental Studies 212 or 214J. *Four credit hours.* GIMOND

**ES214Jj Introduction to GIS and Spatial Analysis** An introduction to geographic information systems' (GIS) data management and visualization capabilities as well as the theory and application of spatial analysis techniques. Topics covered include spatial data representation in a GIS, effective map making, coordinate systems and projections, exploratory spatial data analysis (ESDA), and spatial statistical analysis. *Prerequisite:* Sophomore or higher standing. Not open to students who have completed Environmental Studies 212 or 214. *Three credit hours.* GIMOND

**[ES215] Weather, Climate, and Society** Listed as Science, Technology, and Society 215. *Four credit hours.* **N.**

**[ES216] Philosophy of Nature** Listed as Philosophy 216. *Four credit hours.*

**[ES217] Environmental Chemistry** Listed as Chemistry 217. *Three credit hours.*

**ES218s Exploratory Data Analysis in R** Exploratory data analysis employs methods such as robust data summaries and data visualization to isolate important patterns and features in the data to shed light on the phenomena being investigated. Students will learn the building blocks of effective graphic design for data exploration and for publication using the *R* programming environment. They will also learn how to manipulate and restructure complex data sets (including spatial data) for data analysis. Students will use *R* and *RStudio* to generate dynamic reports that will integrate both analysis and presentation with a strong emphasis on reproducible research. *Prerequisite:* Sophomore standing. *Four credit hours.* GIMOND

**[ES219] Architectural Design Workshop** Listed as Art 218. *Three credit hours.*

**[ES224] Creative Environmental Storytelling** Explores the roles of awe, mindfulness, and active imagination in environmental writing. Students will be encouraged to access their "inner hermit" and explore how, as biological beings, we can create effective storytelling to envision a future where all life thrives. Students will explore the writings of others and practice writing their own stories. Introduces the idea of the evolutionary body and how it can relate to effective engagement for positive environmental change. Previously offered as Environmental Studies 297C (Jan Plan 2019). *Three credit hours.*

**[ES228] Nature and the Built Environment** Listed as American Studies 228. *Four credit hours.* **H.**

**ES231fs Environmental and Natural Resource Economics** Listed as Economics 231. *Four credit hours.* MEREDITH, NASIM

**ES233f Environmental Policy** A comprehensive and interdisciplinary introduction to the process and challenges of developing, implementing, and evaluating environmental policy. The roles of costs and benefits, uncertainty and risks, science and technology, and attitudes and ethics are explored. Historic and contemporary case studies are used to examine major institutions and actors, laws and regulations, incentives and enforcement approaches, and their role in addressing our nation's most pressing environmental problems. Students complete a semester-long research assignment. *Prerequisite:* Environmental Studies 118 or 126. *Four credit hours.* NYHUS

**ES234s International Environmental Policy** The principles and rules relating to environmental protection are one of the fastest growing areas of international law. Introducing students to key foundational principles, governance structures, and regulatory techniques, this course will explore each of the major areas of international environmental regulation through case studies and analyses of international environmental treaties relating to, for example, atmospheric protection, climate change, and freshwater and marine resources. The ever-increasing overlap with other areas of international law such as human rights and trade will also be explored. Special attention will be paid to the perspectives of countries in the Global South, and to the justice implications of international environmental law and policy. *Prerequisite:* Environmental Studies 118 or 126. *Four credit hours.* **I.** BOYLE

**ES236s Agroecosystems** Agriculture in the 21st century must increase productivity to feed a growing human population and reduce its environmental impact, all while the climate changes and available arable land declines. Agroecosystems will explore the science behind the solutions to this problem with a survey of agroecology, soil science, meteorology, and hydrology. We will discuss novel perspectives on agricultural ecosystems, the balance of global land use, and examine how traditional and high-tech approaches to food production might be the key to feeding humanity with a smaller footprint. *Prerequisite:* Environmental Studies 118. *Four credit hours.* BECKNELL

**ES237j Advocating for the Environment** Listed as Jan Plan 237. *Three credit hours.* INCHES

**ES238s Renewable Energy Systems** Introduces students to major themes of renewable energy systems. Students will analyze alternative energy solutions for a sustainable future. Emphasis will be on the different forms of renewable energy, within the context of the existing energy mix, energy policy, resource potential, and institutional opportunities and barriers. We will explore renewable energy potential and solutions through textbook and supplemental readings, current event briefings, group work and activities. *Prerequisite:* Environmental Studies 118. *Four credit hours.* BATES

**ES239f Seafood Forensics: Uncovering Fraud in Ocean Food Systems** Seafood is a critical component of the global food system. However, the sustainability of ocean resources hinges on the veracity with which seafood is labeled, and mislabeling is on the rise. We will explore the varied impacts of fraud in ocean food systems. Students will learn how mislabeling affects the management and conservation of

marine resources, supply chain economics, and risks to human health. Students will study how new molecular tools are being used to combat fraud, and explore the broader policy implications of forensic science. Students will grow their scientific literacy and enhance their writing and presentation skills. Previously offered as Environmental Sciences 298 (Spring 2019). *Prerequisite:* Biology 163. *Four credit hours.* RASHER

**[ES240] Microbes in the Environment** Listed as Biology 240. *Three credit hours.* N.

**ES241s Development and Environmental Issues in Contemporary China** Listed as East Asian Studies 242. *Four credit hours.*  
S, I. ZHANG

**ES242s Marine Conservation and Policy** Human activities and effects—including overfishing, water pollution, climate change, and benthic habitat destruction—have all had major impacts on ocean ecosystems. Through lectures and discussions we will investigate global, regional, and local threats to marine biodiversity and ecosystem function. Potential conservation solutions will be considered. Independent and group research projects will investigate the science and policy of marine conservation issues and will evaluate and synthesize information from scientific literature, popular media, and online discussions. *Prerequisite:* Environmental Studies 118 or 126. *Four credit hours.* HANLEY

**ES243s Environmental Ethics** Listed as Philosophy 243. *Four credit hours.* PETERSON

**[ES244] Marine Communities** Introduces students to key ecological interactions in marine communities around the world, including kelp forests, coral reefs, sea grasses, and the open ocean. A key learning goal is improved scientific literacy through in-depth reading and synthesis of scientific papers and the development of a research proposal. *Prerequisite:* Biology 271 or Environmental Studies 271. *Four credit hours.*

**[ES245] Land, Sovereignty, and Art** Listed as American Studies 245. *Noncredit.* U.

**ES246j Ocean Forecasting: AI, Ecology, and Data Justice on the Seas** Listed as Jan Plan 246. *Three credit hours.* RECORD

**[ES247] Climate Geoengineering: Evaluating Strategies to Sequester CO<sub>2</sub>** Human emissions of CO<sub>2</sub> are changing Earth's climate. Increased attention is focusing on ways to actively remove and sequester atmospheric CO<sub>2</sub>. Such approaches carry ethical and technical risks, as well as costs and benefits that must be carefully evaluated if we are to make informed decisions about their potential use. We will review geoengineering approaches to atmosphere CO<sub>2</sub> removal, including technical and biogeochemical bases and potential financial costs. We will consider the risks of action and inaction, as well as governance structures that could regulate geoengineering activities. Discussion and presentation of primary literature will be the focus of the course, culminating in a final paper advocating for a specific course of climate action. Previously offered as Environmental Studies 297B (Jan Plan 2021). *Prerequisite:* Chemistry 121, 141 or 147 and a 100-level biology, environmental studies, or geology course. *Three credit hours.*

**ES254f Earth Surface Processes: Introduction to Geomorphology** Listed as Geology 254. *Four credit hours.* N. GIESCHE

**[ES259] Plants of the Tropics** Listed as Biology 259. *Three credit hours.*

**ES261s Chemistry of Aqueous Environments** Listed as Chemistry 261. *Four credit hours.* KING

**ES262s Earth's Climate: Past, Present, and Future** Listed as Geology 262. *Four credit hours.* N. KOFFMAN

**ES263f Atmospheric Chemistry** Listed as Chemistry 263. *Four credit hours.* MCKINNEY

**[ES265] Global Public Health** An introduction to the principles and measures of global health, disease burdens, and environmental determinants of health, including poverty, climate change, pollution, population, violence, and lack of safe food, clean water, and fuels. We will also study international health institutions, key actors, and environmental regimes for the regulation of environmental health hazards. Through small-group presentations and discussion we will explore global case studies that highlight the complex relationship between human health and the environment. *Prerequisite:* Environmental Studies 118, 126 or a course in the natural sciences. *Four credit hours.*

**ES270s Applied Ecology** Effective environmental policy and ecosystem management requires ecological knowledge. We will consider the application of ecological concepts, methods and models to environmental problems. We will review the key concepts of ecology using case studies to examine the role ecological science plays in areas such as ecosystem restoration, water quality management, invasive species management, agriculture, and global climate change. The weekly laboratory component of the course will include hands-on

experiences in the field and the lab in observation and experimentation with an emphasis on data interpretation and translation of ecological studies. *Prerequisite:* Environmental Studies 118. *Four credit hours.* **N, Lb.** BRUESEWITZ

**ES271f Ecology** Listed as Biology 271. *Four credit hours.* **N, Lb.** GALLINAT, MOORE

**ES276s Global Change Ecology** Provides an interdisciplinary introduction to the principles of climate, ecosystems, and biogeochemistry needed to understand human impacts on the natural environment. Students will study the impacts of climate warming, our changing atmosphere, land-use change, altered hydrologic and nutrient cycles, and other global changes. We will examine key elements of global ecosystem function and investigate how human activities have altered global ecosystems since the Industrial Revolution. We will critically assess scientific evidence for anthropogenic changes, and consider both impacts and solutions to the challenges of global changes. Relies heavily on reading of primary scientific literature and group participation and discussion. *Prerequisite:* Environmental Studies 118 or 126, and one college-level science course. *Four credit hours.* GALLINAT

**[ES277] Vertebrate Natural History** Listed as Biology 277. *Four credit hours.*

**ES279j Geology of Bermuda** Listed as Geology 279. *Three credit hours.* **N, Lb.** RUEGER

**[ES282] Extreme Climate Change in the Gulf of Maine** Listed as Biology 282. *Three credit hours.*

**ES283fs Environmental Humanities: Stories of Crisis and Resilience** Listed as English 283. *Four credit hours.* **L.** SCHNEIDER-MAYERSON, WALKER

**ES297f Sustainable International Food Systems** Explores the international dimensions of food system sustainability, including relevant policies, processes, and institutions. Topics covered will include globalization; climate and environmental drivers of food insecurity, famine, and food price shocks; institutional responses, policy processes, and law and regulation of international food system sustainability/sustainable agriculture; invasive species; technology/finance cooperation for climate adaptation in food systems; diverse knowledges about food systems; connections between terrestrial and marine food systems; human rights and social safeguards; and, land tenure and labor. *Four credit hours.* BOYLE

**ES319f Conservation Biology** Concepts of conservation biology are examined in detail. Topics include patterns of diversity and rarity, sensitive habitats, extinction, captive propagation, preserve design, and reclamation of degraded or destroyed ecosystems. Interdisciplinary solutions to the challenges of protecting, maintaining, and restoring biological diversity are discussed. Offered in alternate years. *Prerequisite:* Environmental Studies 118, 126 or 271 or Biology 263, and sophomore or higher standing. *Four credit hours.* NYHUS

**ES323s Sustainability Science: From Theory to Practice** Focuses on interdisciplinary aspects of the field of sustainability science, drawing on multiple disciplines to address current societal challenges. The course provides a foundation in historical and modern thinkers in the field; an introduction to sectors that are commonly pursued by sustainability professionals (food systems, water, energy, urban environment, transportation, waste systems). The course will provide students with skills and tools to create positive change in society. We will develop skills through several hands-on projects that build on one another throughout the semester, using real world examples in various sectors as the basis for our learning. *Prerequisite:* Environmental Studies 118. *Four credit hours.* **S.** BATES

**[ES325] Environmental Justice** An examination of the historical and contemporary roots of the unequal distribution of environmental benefits and harms, focusing on the broad social and political processes that perpetuate inequity. Throughout this course, we explore how issues like race, gender, and wealth influence the allocation of the world's natural resources and how those inequities have resulted in the rampant environmental destruction and health disparities we see today. This course is designed to help students foster a nuanced understanding of environmental conditions and, through the analysis and development of case studies, encourage creative and impactful storytelling about the causes and consequences of environmental injustice. Previously offered as Environmental Studies 397 (Fall 2020). *Prerequisite:* Environmental Studies 118 or equivalent. *Four credit hours.*

**ES326f International Climate and Environmental Justice** Through lectures and speakers, discussions, reflection on assigned materials, and intensive work on a major project, students will learn about: environmental justice and accountability via international environmental law; efforts to document and bear witness to environmental (in)justice; international environmental and climate justice movements; justice implications of maladaptation/mitigation externalities; procedural justice in international environmental policymaking; sovereignty and climate justice; gender and environmental justice; emerging topics in climate justice; the "global"; and, philanthropy, partnership, and solidarity. *Prerequisite:* Environmental Studies 118. *Four credit hours.* BOYLE

**[ES327] Conservation Paleobiology** Managing for a changing climate challenges conservation in the Anthropocene and requires practitioners and ecologists to think beyond static historic baselines. Conservation paleobiology seeks to fill the gap between the short-term

nature of most ecological studies and the long-term goals of conservation to bring long temporal perspectives to conservation practitioners. Students will explore primary literature from paleobiology, conservation, and their intersection. After reading broadly in foundational to modern literature, we will focus on the place-based local case study of alpine plant communities in the northeastern United States and the conservation challenges of managing small, disjunct populations with assumed high vulnerability, but unknown paleo-histories. Previously offered as Environmental Studies 398A (Spring 2021). *Prerequisite:* Biology 271 or Environmental Studies 271. *Four credit hours.*

**[ES328] Radical Ecologies** Listed as Philosophy 328. *Four credit hours.*

**[ES331] Natural Resource Economics** Listed as Economics 341. *Prerequisite:* Economics 223. *Four credit hours.*

**[ES332] Chemical Methods of Analysis** Listed as Chemistry 331. *Four credit hours.*

**[ES333] Environmental Revolutions in American Literature and Culture** Listed as English 333. *Four credit hours.* L.

**ES335s Phenology: Ecology of the Seasons** Phenology, the timing of seasonal events in nature, reflects organismal life cycles and serves as a rapid, visible indicator of climate change. We will explore the environmental drivers, recent shifts, and ecological consequences of phenology. By combining deep reading and discussions of primary literature with collaborative science communication, students will gain familiarity with the phenology of New England and place local biological seasons into a global context. We will reflect on the process of reading scientific literature and develop habits for finding, interpreting, discussing, and synthesizing peer-reviewed papers. Students will also engage in original research by proposing and undertaking a project using public phenology data. *Prerequisite:* Biology 271 or Environmental Studies 271. *Four credit hours.* GALLINAT

**[ES337] Climate Fiction** Listed as English 337. *Four credit hours.* L.

**ES338s Forest Ecosystems** Forest ecosystems regulate climate, store and filter water, provide food and fiber, and serve as recreational areas and sacred spaces. These ecosystems are undergoing dramatic changes with important ecological, economic, and social consequences. We will examine these changes through the lenses of terrestrial ecosystem ecology, forest ecology, and ecosystem management. Using primary scientific literature as our guide, we will examine the status of forests around the world and how forest composition drives forest ecosystem processes. We will discuss how forest management and restoration can be used to increase the resilience of forest ecosystems and harness their productivity to mitigate carbon emissions and climate change. *Prerequisite:* Biology 271 or Environmental Studies 271. *Four credit hours.* N. BECKNELL

**[ES341] Community, Economics, and Conservation** An interdisciplinary examination of sustainability through the intersection of communities, economics, and conservation. Students will gain critical thinking and leadership skills by examining strategies, policy frameworks, and decision support tools for evaluating trade-offs between economic interests and the environment. Case studies will focus on providing tools in land conservation, finance, recreational planning, GIS, and ecosystem services, with an eye towards application in a student project. *Prerequisite:* Environmental Studies 118, 126, or Economics 231. *Four credit hours.*

**[ES344] Marine Fisheries Management** Managing marine fisheries represents one of the most significant challenges in the conservation of global resources. We explore political, cultural, and ecological factors essential for successful management. Through lectures, discussions, and readings, students become familiar with global fisheries issues, including high seas management, initiatives to protect the food security and biodiversity of tropical island nations, and management of marine and anadromous fish in the United States. *Prerequisite:* Biology 263 or Environmental Studies 118, 126, or 271, and sophomore or higher standing. *Four credit hours.*

**[ES345] Offshore Energy: Environmental Permits and Community Planning** Building an offshore wind farm requires environmental assessment of ecological and human impacts, obtaining permits, and community approval. This process is expensive, lengthy, and vital to the success of an offshore wind farm, and the clean energy transition. Using a case study approach, this course takes a hands-on approach to guide students through the process of renewable energy development from start to finish, open ocean to operational wind farm. The course has an emphasis on protection of marine species, consideration of ocean users such as fishing communities, and ways to work with local communities to improve equity and justice in decision-making. Students will develop the necessary, and applied skills to enter the energy workforce. *Prerequisite:* Environmental Studies 118. *Four credit hours.*

**ES348f U.S. Environmental History** Listed as History 348. *Four credit hours.* H, U. JACOBSON

**ES350f Another World is Possible: Ecotopian Visions** Listed as English 350. *Four credit hours.* SCHNEIDER-MAYERSON

**[ES351] Environmental Chemical Analysis** Listed as Chemistry 351. *Two credit hours.*



**[ES354] Marine Ecology** Listed as Biology 354. *Four credit hours.*

**[ES356] Aquatic Ecosystems** Concern over the impact of human activities on aquatic communities and ecosystems has brought aquatic ecology to the forefront of public attention. Through lecture, discussion, writing assignments, and laboratory work, students will explore the major ecological principles that influence the physical, chemical, and biological organization of aquatic ecosystems. Experimental approaches and sampling techniques used by limnologists will be employed in local lakes, streams, and rivers, as well as in the laboratory to investigate topics of concern in freshwater ecosystems, including eutrophication, pollution, land use change, invasive species, and the impact of climate change. *Prerequisite:* Environmental Studies 271, a W1 course, and sophomore or higher standing. *Four credit hours.*  
**W2.**

**ES357f Literature and Environment** Listed as English 357. *Four credit hours.* **L.** SCHNEIDER-MAYERSON

**[ES358] Ecological Field Study: St Johns, US Virgin Islands** Students will explore ecology and conservation of the diverse coastal, forest and freshwater ecosystems of St. John's. The Virgin Islands National Park occupies more than half of the area of the island, and it showcases a diversity of ecosystems including mangroves, coral, forests and streams. This class involves qualitative and quantitative field studies of the biological diversity and ecology of local ecosystems; field-based investigation of the environmental challenges facing these ecosystems; discussions with conservation practitioners about innovative conservation solutions and the efficacy of conservation activities; and exposure to regional culture and history. Lectures, field technique training, and student research during the first week prior to departure followed by a 3-week off-campus field trip. Cost: \$3,800. Financial aid available for qualified students. *Prerequisite:* Biology 164 or Environmental Studies 118 or 126, and permission of the instructor. *Three credit hours.*

**[ES362] Energy and Utopia** Listed as English 362. *Four credit hours.* **L.**

**ES363f Paleocyanography** Listed as Geology GE363. *Four credit hours.* **KOFFMAN**

**ES364f Climate Change, Justice, and Health** Examines the impacts of changing climate dynamics on human livelihoods, rights, health, and well-being. Through interdisciplinary readings, class discussions, research projects, and innovative communications, students will engage deeply with data from the natural and social sciences about human impacts, adaptations, and vulnerabilities, as well as explore climate justice activism. Key learning goals include improved information literacy and written and oral communication skills and increased understanding of the ways climate change is impacting the world in which we live. *Prerequisite:* Environmental Studies 118 or 126. *Four credit hours.* **CARLSON**

**ES365j Wildlife and Conservation in Namibia** An interdisciplinary field course introducing Namibia through the theme of rhinos, cheetah, and community-based conservation. Students will gain experience with wildlife behavior, ecology, community-based natural resource management, and the environment. Students will meet scientists and practitioners, study wildlife, engage with local communities, and complete a field journal. Students will meet at Colby for preparatory activities followed by three weeks in Namibia. Includes visits to centers of research and conservation, Etosha National Park, community conservancies, Skeleton Coast, and other areas of cultural and ecological importance. *Prerequisite:* Sophomore standing or above. *Three credit hours.* **NYHUS**

**ES366s Pollution and Human Health** How human health is affected by physical, chemical, biological, and social environments; how we use science to measure effects of these determinants at the level of cell, tissue, individual, and population; how we assess these determinants to make regulatory decisions. Topics include introductions to toxicology, epidemiology, and risk assessment; health effects of pollution, synthetic chemicals, consumer products, climate change, and the built environment; the etiology of health outcomes including cancer, obesity, endocrine disruption, and respiratory diseases. Students use primary scientific literature for independent research and, when appropriate, engage in environmental health policy debates in Congress and/or the Maine legislature. *Prerequisite:* Environmental Studies 118 or 126, and sophomore or higher standing. *Four credit hours.* **N.** **CARLSON**

**ES368s Global Climate Policy** Climate change is a global problem. How and whether a world of sovereign states can cooperate to reduce climate change risks to manageable levels are critical questions, but there is no political or expert consensus around the best way forward. This course will study global climate politics and policy in the context of the United Nations Framework Convention on Climate Change. Students will work individually and in groups to critically assess and propose international governance responses relating to climate mitigation, adaptation, loss and damage, and finance provision. Special attention will be paid to the vulnerabilities of small island developing states, and to climate justice. *Prerequisite:* Environmental Studies 118 or 126. *Four credit hours.* **S.** **BOYLE**

**[ES371] Current Topics in Environmental Science: Corals** Explores emerging and cutting-edge topics in the field of environmental science, with a focus on the global crisis in coral reef systems. Students will focus on contemporary scientific literature reviewing emerging topics from leading journals in environmental science and ecology journals, as well as engaging a variety of experimental designs, laboratory methods, and statistical approaches to investigate and understand environmental processes and human impacts in these

ecosystems. An independent research assignment will enhance writing skills. *Prerequisite:* Biology 271 or Environmental Studies 271.  
*Four credit hours.*

**[ES371J] Current Topics in Environmental Science: Corals** Explores emerging and cutting-edge topics in the field of environmental science, with a focus on the global crisis in coral reef systems. Students will focus on contemporary scientific literature reviewing emerging topics from leading journals in environmental science and ecology journals, as well as engaging a variety of experimental designs, laboratory methods, and statistical approaches to investigate and understand environmental processes and human impacts in these ecosystems. An independent research assignment will enhance writing skills. *Prerequisite:* Biology 271 or Environmental Studies 271.  
*Three credit hours.*

**[ES373] Life in Times of Extinction** Listed as English 373. *Four credit hours.* L.

**[ES378] Geologic Environments in the Marine Realm** Listed as Geology 378. *Three credit hours.* N.

**ES382f Population Modeling** Listed as Biology 382. *Four credit hours.* MOORE

**ES398s Reading Braiding Sweetgrass** Robin Wall Kimmerer (the 2022 Environmental Studies Cole Fellow) is a writer, researcher, and educator who braids together science and traditional knowledge to tell the stories of indigenous peoples and connect humans with the natural world. In preparation for Dr. Kimmerer's visit to Colby in April of 2022, students and faculty will join together in this seminar to read and discuss her book *Braiding Sweetgrass* and other writings. Faculty from a variety of disciplines will join us to engage with these writings and build a community of knowledge around Kimmerer's visit to Colby. *One credit hour.* BECKNELL

**ES401f, ES402s Environmental Studies Colloquium** Attendance at selected program colloquia during the fall and spring semesters; written reflections to be submitted. Required of all senior environmental studies majors. Typically taken in addition to a normal four-course semester. *One credit hour for the year. Prerequisite:* Senior standing in environmental studies. *Noncredit.* BRUESEWITZ

**[ES483J] Honors in Environmental Studies** *Noncredit.*

**ES484s Honors in Environmental Studies** Intended for majors approved for admission into the Environmental Studies Honors Program. Requires research conducted under the guidance of a faculty member and focused on an approved topic leading to the writing of a thesis. A maximum of eight credits may be earned in honors work. Upon successful completion of the thesis, an oral presentation, defense and all requirements for the major, the student will graduate with "Honors in Environmental Studies." *Prerequisite:* Senior standing and a 3.70 grade point average in the major at the end of the junior year or permission of the program. *One to four credit hours.* FACULTY

**ES491f, 492s Independent Study** Independent study devoted to a topic chosen by the student with the approval of the program committee. *Prerequisite:* Junior or senior standing as an environmental studies major or minor. *One to four credit hours.* FACULTY

**ES493f Environmental Policy Practicum** An in-depth analysis of current issues and policies affecting the environment. Students work individually and collaboratively on a project with a common theme and are assigned unique roles as researchers, editors, and technical coordinators. Reading and discussion of primary literature is augmented with invited speakers, field trips, and student presentations. *Prerequisite:* Environmental Studies 233 (for domestic emphasis) or 234 (for international emphasis), and senior standing as an environmental studies policy major. *Four credit hours.* BATES, HANLEY

**ES494f Environmental Science Research Experience** Causes of and solutions to selected environmental problems are investigated through lectures, laboratory and field work, discussions, and guest presentations. Focuses on completion of a group research project to investigate freshwater, forest or marine ecosystems. Research results are presented in a public forum at the end of the semester. The civic engagement component provides useful information to the community and the state and gives students experience interacting with interested stakeholders. Skill development includes research, communication (both oral and written), and collaborative work skills. *Prerequisite:* Biology/ Environmental Studies 271, and senior standing as an environmental science major. *Five credit hours.* BECKNELL, BRUESEWITZ