ENVIRONMENTAL STUDIES

Director of undergraduate studies: Amity Doolittle, 121 KRN, 432-9771, amity.doolittle@yale.edu; www.yale.edu/evst

FACULTY ASSOCIATED WITH THE PROGRAM OF ENVIRONMENTAL STUDIES

Professors  D. Michelle Addington (School of Architecture, Forestry & Environmental Studies), Paul Anastas (Forestry & Environmental Studies), Gaboury Benoit (Forestry & Environmental Studies), Graeme Berlyn (Forestry & Environmental Studies), Ruth Blake (Geology & Geophysics), Garry Brewer (Emeritus) (School of Management), Derek Briggs (Geology & Geophysics), Kelly Brownell (Psychology, Public Health), Gary Brudvig (Chemistry, Molecular Biophysics & Biochemistry), Benjamin Cashore (Forestry & Environmental Studies), Peter Crane (Forestry & Environmental Studies), Michael Donoghue (Ecology & Evolutionary Biology, Forestry & Environmental Studies), Michael Dove (Forestry & Environmental Studies, Anthropology), Menachem Elimelech (Chemical & Environmental Engineering), John Mack Faragher (History, American Studies), Durland Fish (Public Health, Forestry & Environmental Studies), Thomas Graedel (Forestry & Environmental Studies), Daniel Kevels (History, History of Medicine), Benedict Kiernan (History), Robert Mendelsohn (Forestry & Environmental Studies, Economics), Alan Mikhail (History), Mark Pagani (Geology & Geophysics), Jeffrey Park (Geology & Geophysics), Peter Perdue (History), Linda Peterson (English), Jeffrey Powell (Ecology & Evolutionary Biology, Forestry & Environmental Studies), Peter Raymond (Forestry & Environmental Studies), Nicholas Robinson (Adjunct) (Forestry & Environmental Studies), Susan Rose-Ackerman (Law School, Political Science), James Saiers (Forestry & Environmental Studies), Oswald Schmitz (Forestry & Environmental Studies, Ecology & Evolutionary Biology), James Scott (Political Science, Anthropology), Karen Seto (Forestry & Environmental Studies), Kalyanakrishnan Sivaramakrishnan (Anthropology, Forestry & Environmental Studies, History), David Skelly (Forestry & Environmental Studies, Ecology & Evolutionary Biology), Brian Skinner (Geology & Geophysics), Ronald Smith (Geology & Geophysics, Forestry & Environmental Studies), Stephen Stearns (Ecology & Evolutionary Biology), Charles Tomlin (Forestry & Environmental Studies) (Visiting), Karl Turekian (Geology & Geophysics), John Wargo (Forestry & Environmental Studies, Political Science), Harvey Weiss (Near Eastern Languages & Civilizations, Anthropology), John Wettlaufer (Geology & Geophysics), Robert Wyman (Molecular, Cellular, & Developmental Biology)

Associate Professors  David Post (Ecology & Evolutionary Biology), Julie Zimmerman (Chemical & Environmental Engineering)

Assistant Professors  Hagit Afflick (Geology & Geophysics), Mark Bradford (Forestry & Environmental Studies), Alex Felson (Forestry & Environmental Studies), Anjelica Gonzalez (Biomedical Engineering), Karen Hébert (Forestry & Environmental Studies, Anthropology), William Rankin (History, History of Science), Paul Sabin (History), David Vasseur (Ecology & Evolutionary Biology), Zhengrong Wang (Geology & Geophysics)

Senior Lecturers  Shimon Anisfeld, Carol Carpenter, John Grim

Lecturers  Mary Beth Decker, Amity Doolittle, Kealoha Freidenburg, Gordon Geballe, Julie Newman, Linda Puth, Catherine Skinner, Carl Zimmer

Environmental Studies provides an interdisciplinary approach to understanding and solving environmental problems. From the natural sciences, students learn experimental techniques and methods of analysis needed to make accurate observations, to document change, to distinguish those changes resulting from human activity, and to understand what comprises healthy landscapes and functioning ecosystems. Students look to the humanities and social sciences for explanations of the ways people behave and for analyses of our institutions and their social, political, and economic activities. The Environmental Studies major prepares students for graduate study in a range of disciplines including law, medicine, and public health, and for careers in business, environmental management and conservation, teaching, and writing.

Prerequisites  The major requires preparation in chemistry, either CHEM 112 and 113, or 114 and 115, or 118; a term of introductory biology, either MCDB <120> or E&EB <122>, or two half-term courses chosen from BIOL 101, 102, 103, and 104; a natural science laboratory chosen from CHEM 117L, 119L, MCDB <121L>, 221L, E&EB <123L>, or 223L; and a term course in mathematics (MATH 112 or above, except MATH 190) or in physics (PHYS 170 or above). Students are advised to take chemistry and biology during the freshman year before enrolling in the EVST core courses in natural sciences. Students should complete the prerequisites by the end of the fall term in their sophomore year, prior to application to the major (see below). Where relevant, students may employ acceleration credit to fulfill the prerequisites. Students entering Yale with advanced placement in both biology and chemistry must complete one term of introductory laboratory science. Students with advanced placement in only one of these subjects must take the remaining science prerequisite and its associated laboratory.

Requirements of the major  In addition to the prerequisites, twelve and one-half or thirteen and one-half course credits are required for the major, including four core courses, one core laboratory, a departmental seminar, a concentration of six courses, and a one- or two-term senior project and colloquium (EVST 496). All courses in the major must be taken for a letter grade.

Core courses  Students are required to take at least two core courses in the humanities and social sciences selected from EVST 120, 226, 255, 340, or 345. They must also take the environmental science core courses EVST 201, 202L, and 223. Completing one course in each area is recommended before the end of the sophomore year.

Departmental seminar  All majors must complete a departmental seminar approved by the director of undergraduate studies. This requirement may be completed in any year of study. Approved seminars include EVST 215, 285, and 290.
Area of concentration  Students plan their concentration in consultation with the director of undergraduate studies and the student’s adviser. A concentration is defined as six courses that provide depth in a problem or issue of interest, as well as disciplinary expertise. Past concentrations have included biodiversity, climate change, energy, environmental history, food and agriculture, human health, resource use and sustainability, and urban planning. Students also have the opportunity to design a unique concentration within the major, working with the director of undergraduate studies.

Senior requirement  Seniors must complete one or two terms of an independent research project and colloquium, taken as EVST 496. In the junior year, students consult with their advisers on the design of the project and submit a preliminary plan for approval to the director of undergraduate studies.

Application to the Environmental Studies major  Students typically apply to enter the major during their sophomore year. Application must be made in writing to the director of undergraduate studies during the designated application period in either the fall or the spring term; details can be found on the program’s Web site (http://www.yale.edu/evst) . Juniors who have already completed considerable course work toward the major may also apply during the designated application period. Students considering a major in Environmental Studies should consult the director of undergraduate studies as early as possible in the freshman year.

Summer environmental internship  During the summer between the junior and senior years, many students gain experience in the field through research or internships in an area pertinent to their senior research project. Internships may be arranged with nonprofit organizations, government agencies, or corporations. Although the summer program is optional, many students take advantage of this opportunity with some financial support from the program.

REQUIREMENTS OF THE MAJOR

Prerequisites  CHEM 112 and 113, or 114 and 115, or 118; MCDB <120> or E&EB <122>, or 2 from BIOL 101–104; CHEM 117L, 119L, MCDB <121L>, 221L, E&EB <123L>, or 223L; MATH 112 or above (except MATH 190) or PHYS 170 or above

Number of courses  12½ or 13½ course credits beyond prereqs, incl one- or two-term senior project

Specific courses required  EVST 201, 202L, 223; 2 from EVST 120, 226, 255, 340, 345

Distribution of courses  1 departmental sem, 6 courses in area of concentration

Senior requirement  One- or two-term research project and colloq (EVST 496)

Introductory Courses

*EVST 010a / G&G 010a, Earth, Resources, Energy, and the Environment  David Evans and Mary-Louise Timmermans
Humankind’s interactions with, and place within, the natural world. Plate tectonics and natural disasters, biological evolution and mass extinction, human evolution, population growth and ecology, industrial resources, groundwater and pollution, fossil fuels and energy transitions, the carbon cycle and greenhouse gases, paleoclimates, current global warming, alternative energies, and a planetary perspective on the Earth as a singular oasis in space. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.  SC

*EVST 020a / F&ES 020a, Sustainable Development in Haiti  Gordon Geballe
The principles and practice of sustainable development explored in the context of Haiti’s rich history and culture, as well as its current environmental and economic impoverishment. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.  WR

*EVST 100a or b / APHY 100a or b / ENAS 100a or b / G&G 105a or b / PHYS 100a or b, Energy Technology and Society  Daniel Prober
The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. Enrollment limited to 24. For application instructions, visit the course site on Classes*v2 (http://classesv2.yale.edu).  QR, SC

EVST 102b / CHEM 102b / ENVE 202b, Introduction to Green Chemistry  Paul Anastas
Overview of the basic concepts and methods needed to design processes and synthesize materials in an environmentally benign way. Related issues of global sustainability. Case studies that suggest possible solutions for the serious environmental and toxicological issues currently facing industry and society. Intended for non-science majors with a basic high school background in chemistry and physics, as well as high school algebra. Does not satisfy premedical chemistry requirements or requirements for the Chemistry major.
Core Courses

HUMANITIES AND SOCIAL SCIENCES

[ EVST 120, Introduction to Environmental History ]

[ EVST 226, Global Environmental History ]

EVST 255b / F&ES 255b / PLSC 215b, Environmental Politics and Law  John Wargo
Exploration of the politics, policy, and law associated with attempts to manage environmental quality and natural resources. Themes of democracy, liberty, power, property, equality, causation, and risk. Case histories include air quality, water quality and quantity, pesticides and toxic substances, land use, agriculture and food, parks and protected areas, and energy.

EVST 340b / ECON 330b, Economics of Natural Resources  Robert Mendelsohn
Microeconomic theory brought to bear on current issues in natural resource policy. Topics include regulation of pollution, hazardous waste management, depletion of the world’s forests and fisheries, wilderness and wildlife preservation, and energy planning. After introductory microeconomics.

*EVST 345a / ANTH 382a / F&ES 384a, Environmental Anthropology  Michael Dove
History of the anthropological study of the environment: nature-culture dichotomy, ecology and social organization, methodological debates, politics of the environment, and knowing the environment.

ENVIRONMENTAL SCIENCE

EVST 201a / G&G 140a, Atmosphere, Ocean, and Environmental Change  Ronald Smith
Physical processes that control Earth’s atmosphere, ocean, and climate. Quantitative methods for constructing energy and water budgets. Topics include clouds, rain, severe storms, regional climate, the ozone layer, air pollution, ocean currents and productivity, the seasons, El Niño, the history of Earth’s climate, global warming, energy, and water resources. Must be taken concurrently with EVST 202L.

*EVST 202La / G&G 141La, Laboratory for Atmosphere, Ocean, and Environmental Change  Ronald Smith
Laboratory and field exercises to accompany EVST 201. Must be taken concurrently with EVST 201.

EVST 233a / E&EB 220a, General Ecology  David Vasseur and David Post
The theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem function, and ecological interactions at broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious diseases are placed in an ecological context. Prerequisite: MATH 112 or equivalent.

Intermediate and Advanced Courses

The following courses have been approved for developing areas of concentration. Other courses may be suitable for designing an area of concentration with permission of the director of undergraduate studies.

[ EVST 170, Sustainability and Institutions: Innovation and Transformation ]

*EVST 200b / G&G 115b, Earth System Science  Jeffrey Park
A survey of geoscience. Interaction of lithosphere, hydrosphere, atmosphere, and Earth’s deep interior; natural controls on environment and climate in past, present, and future; rocks, minerals, glaciers, earthquakes, and volcanoes; natural hazards and natural resources. (Formerly G&G 200)

EVST 206b / AMST 176b / HIST 144b / HSHM 206b / HUMS 323b, Science and Technology in the United States  Daniel Kevles
The development of science and technology in American society from the colonial period through the late twentieth century. The rise of the United States to a world-class scientific and technological power; the American scientific community and the tensions it has faced in a democratic society; the role of science and technology in exploration, agriculture, industry, national defense, religion, culture, and social change.

*EVST 221a / E&EB 230a / F&ES 221a, Field Ecology  Linda Puth
A field-based introduction to ecological research, using experimental and descriptive approaches, comparative analysis, and modeling for field and small-group projects. Weekly field trips explore local lake, salt marsh, rocky intertidal, traprock ridge, and upland forest ecosystems. Includes one Saturday field trip and a three-day trip during the October recess. Concurrently with or after E&EB 220 or with permission of instructor.

*EVST 234La, Field Science: Environment and Sustainability  Kealoha Freidenburg
A field course that explores the effects of human influences on the environment. Analysis of pattern and process in forested ecosystems; introduction to the principles of agroecology, including visits to local farms; evaluation of sustainability within an urban environment. Weekly field trips and one weekend field trip.

*EVST 244a, Coastal Environments in a Changing World  Mary Beth Decker and John Wargo
The effects of human action and natural phenomena on coastal marine ecosystems. Methods used by coastal scientists to address environmental issues; challenges associated with managing and conserving coastal environments. Priority to Environmental Studies majors; open to nonmajors as space permits.
Examination of contemporary human relations to nature in light of global economic transformation. Case studies explore changes in the production and consumption of food, agriculture, and natural resources; the politics of environmental conservation; and the rise of new techno-natures and risks.

* EVST 250b / ANTH 245b, Nature and Globalization  
Karen Hébert

The idea of wilderness in American history, art, film, public policy, and literature, from the Puritans to the present. Authors include Thoreau, Faulkner, Jack London, Mary Rowlandson, Aldo Leopold, and Rachel Carson. A weekend field trip is held early in the term.

HU

* EVST 258b / AMST 258b, Wilderness in the North American Imagination  
Staff

Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; G&G 110 recommended.

EVST 256b / G&G 256b, Environmental Geomicrobiology  
Ruth Blake

Microbial diversity in natural geologic habitats and the role of microorganisms in major biogeochemical cycles. Introduction to prokaryote physiology and metabolic diversity; enrichment culture and molecular methods in geomicrobiology. Prerequisite: college-level chemistry.

SC

* EVST 257b / F&ES 257b, Ecosystems Patterns and Processes  
Peter Raymond and Mark Bradford

Study of ecosystem ecology and biogeochemistry. The use of concepts and data from these disciplines to predict and manage the impact of environmental changes on ecosystem services underlying the provisioning of resources such as food and clean water. Case studies of environmental changes include invasive species and changing climate. Undergraduate enrollment limited to 15.

SC RP

* EVST 257b / F&ES 277b, Environmental Science and Policy  
Mark Bradford

The synthesis of science, both for scientists and for policy makers. Usefulness of the two types of synthesis for developing scientific research and policy. Advancement of complementary practices between science and policy arenas. Concepts and data from ecological and biogeochemical disciplines are used to predict and manage the effects of environmental change on ecosystem services that underlie the provisioning of resources such as food and clean water.

SO

* EVST 280a / RLST 282a, American Indian Religions and Ecology  
Mary Evelyn Tucker and John Grim

Study of the religious beliefs of diverse Native American peoples from a history-of-religions perspective. Oral-narrative and textual forms in which these beliefs have been recorded. Focus on myths, symbols, and rituals, and their relationships with native homelands, geography, and biodiversity. The significance of traditional environmental knowledge.

HU
*EVST 353a / LAST 353a or b, Sustainability in Latin America  Garry Brewer
The concept of sustainability applied to five topics of high priority in Latin America: biodiversity, payments for environmental services, eco-efficiency, social enterprises and entrepreneurship, and capacity building. Added support provided by visiting scholars from the University of the Andes.  SO

*EVST 362bG / ARCG 362bG / G&G 362bG, Observing Earth from Space  Xuhui Lee
A practical introduction to satellite image analysis of Earth’s surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management. Prerequisites: college-level physics or chemistry, two courses in geology and natural science of the environment or equivalents, and computer literacy.  QR, SC

*EVST 399b, Agriculture: Origins, Evolution, Crises  Harvey Weiss
Analysis of the societal and environmental drivers and effects of plant and animal domestication, the intensification of agroproduction, and the crises of agroproduction: land degradation, societal collapses, sociopolitical transformation, sustainability, and biodiversity.  SO

*EVST 400b / E&EB 275bG, Biological Oceanography  Mary Beth Decker
Exploration of a range of coastal and pelagic ecosystems. Relationships between biological systems and the physical processes that control the movements of water and productivity of marine systems. Anthropogenic impacts on oceans, such as the effects of fishing and climate change. Includes three Friday field trips. Enrollment limited to 15.  SC

*EVST 420a / EAST 425a / HIST 313Ja, Asian Environments and Frontiers  Peter Perdue and Kwangmin Kim
The impact of Asian farmers, merchants, and states on the natural world. Focus on imperial China, with discussion of Japan, Southeast Asia, and Inner Asia in the early modern and modern periods. Themes include frontier conquest, land clearance, water conservancy, urban footprints, and relations between agrarian and nonagrarian peoples. Attention to environmental movements in Asia today.  WR, HU

[ EVST 422, Anthropology of Climate Change, Past and Present ]

*EVST 424a / ANTH 406a / PLSC 420a, Rivers: Nature and Politics  James Scott
The natural history of rivers and river systems and the politics surrounding the efforts of states to manage and engineer them.  SO

*EVST 473b / ANTH 473bG / ARCG 473bG, Abrupt Climate Change and Societal Collapse  Harvey Weiss
The coincidence of societal collapses throughout history with decadal and century-scale drought events. Challenges to anthropological and historical paradigms of cultural adaptation and resilience. Examination of archaeological and historical records and high-resolution sets of paleoclimate proxies.  HU, SO

Departmental Seminars

*EVST 215a / ENGL 459a, Scientific and Environmental Writing  Carl Zimmer
An intensive workshop in writing about science and the environment for a broad audience. Translating complex subjects into elegant prose, conducting interviews, handling controversies, researching articles, and finding one’s voice. Readings include exemplary works ranging from newspaper articles to book excerpts.  WR RP


*EVST 290b / F&ES 290b, Geographic Information Systems  Charles Tomlin
A practical introduction to the nature and use of geographic information systems (GIS) in environmental science and management. Applied techniques for the acquisition, creation, storage, management, visualization, animation, transformation, analysis, and synthesis of cartographic data in digital form.

Senior Project

*EVST 496a or b, Senior Research Project and Colloquium  Paul Sabin and staff
Independent research under the supervision of members of the faculty, resulting in a senior essay. Students meet with peers and faculty members regularly throughout the fall term to discuss the progress of their research. Projects should offer substantial opportunity for interdisciplinary work on environmental problems. Students typically complete a two-term senior essay, but students completing the requirements of two majors may consider a one-term senior project.