GRADUATE PROGRAMS IN THE DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY

Environmental Biology department offers MS, MPS and PhD in Environmental and Forest Biology with areas of research designed to provide a strong background and focus to students pursuing different research topics. Faculty with nationally and internationally recognized expertise define the scope of subject matter within each study area, recommend acceptance of students, and guide them through a course of study appropriate to student goals and aspirations. Most students develop a degree of depth and specialization in at least one areas of graduate study (see below).

M.S.

The master of science degree in Environmental and Forest Biology entails a research-based thesis (6-12 credits of thesis research) in addition to 18-24 credits of graduate coursework (including special research topics and at least three seminars) for a total of at least 30 graduate credits. Students earning a M.S. degree find a much wider range of job options that have greater responsibilities and compensation compared to jobs that require only a B.S. degree. Many jobs at the M.S. level require an ability to perform research. Students interested in research positions in government, non-profit organizations, and academic and industry settings should pursue a M.S., rather than M.P.S. degree. Additionally, although not required by many graduate schools, a M.S. degree is often a key step toward earning a Ph.D. The M.S. student presents a thesis proposal to the major professor and committee who will guide completion of the research and writing of the thesis. A capstone seminar and defense of thesis are required.

M.P.S.

The master of professional studies degree in Environmental and Forest Biology requires graduate coursework credits graduate seminars and professional experience (internship). The M.P.S. degree is designed to accommodate a great breadth of student goals and needs, including students desiring additional education following some experience in their field, and science teachers seeking the master's degree for permanent certification. As in all degree programs in EFB, the student will be guided through the M.P.S. by a steering committee.

Ph.D.

The doctor of philosophy degree in Environmental and Forest Biology may be pursued directly from the bachelor’s level, or following a master's degree program. Doctoral study culminates in a dissertation (or its equivalent as refereed publications) based on original research. In many cases this work serves as a foundation for future studies and publications throughout the student's career. Research activity is often funded through extramural grants to the student’s major professor. Abundant opportunities exist to gain teaching experience during the doctoral program. A written and oral examination is required to proceed to doctoral candidacy, at least one year prior to the capstone seminar and defense of the dissertation. Of the 60 credits required, 30-48 are awarded for coursework (including special research topics and at least five seminars) and 12-30 credits for the dissertation.

Graduate Research Areas

Applied Aquatic & Fisheries Science

Study in this area provides advanced preparation in biological concepts of fisheries and aquatic sciences as they relate to ecology and resource management. M.P.S. students will undertake a professional experience in management or policy, or a synthesis course in aquatic ecology and management planning. M.S. and Ph.D. students will address important research questions with advanced methods in aquatic sciences. Research themes are diverse, examples include parasitology, zebrafish colony management, fish physiology, behavior, otolith microchemistry, population ecology and habitat relationships, restoration, hypoxia and environmental change, trophic dynamics and food webs, species conservation, species at risk, biodiversity, fisheries management, stream ecology, larval fishes, early life history, wetlands, invasive species ecology, limnology, marine ecology, contaminants, environmental change.

Chemical Ecology

Chemical ecologists study organismal interactions, both intra- and interspecific, mediated by chemical substances. These interactions occur among microbes, plants, and animals. Study of such interactions typically involves joint efforts of biologists and chemists in basic and applied research in the laboratory and field. The application of chemical ecology has contributed significantly to reduced pesticide use and improved yields in forestry and agriculture while protecting the environment from harmful contaminants.

The study of chemical ecology is offered through collaboration between the Department of Environmental Biology and the Department of Chemistry. Interested students should apply to the department of major interest. Faculty from both areas contribute to the development of a plan of study enabling each student to acquire advanced skills in either biology or chemistry and an ample understanding of the other field to grapple with problems requiring an understanding of both.

Conservation Biology

This area entails study and maintenance of biological diversity at the level of genes, populations, communities, ecosystems and biomes; intellectual underpinnings include evolutionary theory, systematic biology, population biology and ecosystem science. Conservation biology seeks ways to integrate biological principles with social, economic and political perspectives to achieve conservation goals.

Ecology and Evolution

This integrative study area allows students to investigate the relationships of organisms to their environment and those factors that affect their distribution and abundance. Both the practical and theoretical applications of ecology are emphasized through courses and research.

There are four major areas in ecology: organismal ecology, population-evolutionary ecology, community ecology and systems ecology. In consultation with the student's steering committee, courses are chosen from these areas, as well as other disciplines. Specific research may encompass any of the four major areas of ecology and entail the study of the distribution and abundance of organisms, community structure including trophic relationships, diversity, succession and ecosystem properties, such as patterns of energy transfer and biogeochemical cycling.

Entomology

Graduate study opportunities prepare students in the basic aspects of insect life and the role of insects in relation to humans and their environment.

The wide range of effects stemming from insect activity, from the beneficial to the deleterious, allows for a variety of research subjects in which insects play a major role. Thesis topics may concern insects that affect forests, shade trees and wood products, those relating to the health and well-being of humans, those playing key roles as parasites and predators of pest species, and those serving as food for many birds and vertebrate animals. Current research areas include population dynamics of forest defoliators, pheromone communications in beetles and moths, evolution of chemical communication, effects of forest practices on stream benthic insects, natural control of insects in forest systems and biochemistry of insect detoxification mechanisms.

Environmental Biotechnology

Environmental Biotechnology is defined as a branch of biotechnology that addresses environmental problems, such as the genetic rescue of a species, the removal of pollution, renewable energy generation or biomass production, all by using biological processes for the protection and restoration of the quality of the environment.

The tools of biotechnology are having ever increasing applications to conserving our natural environments. Examples include the restoration of species and ecosystems, phyto- and microbial-remediation of polluted soils and water, making cleaner, more efficient and recyclable products, and increasing our understanding of how the environment works at molecular and cellular levels. The study of environmental biotechnology provides opportunity in a broad range of specialties fundamental to the understanding of plants, animals, and microbes and their interaction with other organisms and environments.

Indigenous People & the Environment

Indigenous people are the stewards of fully 4% of the land area of the United States and represent some 700 distinct communities possessing detailed knowledge of the biota of their homelands. Native American land holdings in North America collectively contain more wildlands than all of the National Parks and Nature Conservancy areas in North America. Globally, Indigenous people inhabit areas with some of the highest remaining biodiversity on the planet and are actively being engaged as partners in biodiversity conservation. Issues of sustainable development, resource management and ecological restoration all include Native American stakeholders. Federal agencies are required to consult with tribes on a government-to-government basis on a host of scientific and natural resource policies. Thus, our ESF graduates have a high probability of encountering issues involving Indigenous cultures and TEK.

However, the majority of scientific professionals and educators have little understanding of the value of TEK or its cultural context. Exposure to TEK has a legitimate role in the education of the next generation of biologists, environmental scientists, and natural resource managers. TEK has value not only for the wealth of biological information it contains, but for the cultural framework of respect, reciprocity and responsibility in which it is embedded (Kimmerer 1998, Pierotti and Wildcat 2000). The Center for Native People and the Environment has developed a series of integrated educational offerings that will enrich our curriculum with coursework and allied programs that increase student's awareness of TEK and Native American perspectives on the environment.

Microbiology

Graduate study opportunities exploring the role and diversity of microbes in clinical, industrial, and environmental realms.

Our understanding of microbes' central role in host health & physiology, biogeochemical processes, and global change continues to expand. ESF's Microbiology program provides a basic education in the core disciplines of microbiology, but relies heavily on student-driven cutting-edge research. Depending on the major professor, training will include basic microbiological, molecular, and computational techniques to answer current questions in microbiology. Current research areas include, but are not limited to, pathogenic microbiology, microbial ecology, virology, bacteriology, microbial diversity and physiology, host-microbe interactions, and vector-borne diseases. Graduate degrees in microbiology better prepare students for a wide range of clinical, industrial, or environmental microbiology occupations.

Molecular Biology and Ecology

Graduate students in this integrative program develop and apply molecular biological methods to address questions in Ecology.

Students in this graduate area conduct interdisciplinary research using molecular tools to address important ecological and evolutionary questions. Students work with their faculty advisor to develop research projects, often combining both laboratory and field work. Areas of research at ESF cut across several disciplines, and include phylogenetics, biogeography, phylogeography, population genetics, genomics, conservation genetics, animal and plant diseases, immunology, and biodiversity. Coursework requirements developed with the major professor and steering committee, and are tailored to individual student project and career goals.

Mycology and Forest Pathology

The study of Mycology and Forest Pathology provides opportunity in a broad range of specialties fundamental to the understanding of fungi and their interaction with other organisms, and for specializations in forest pathology.

Graduate students in this program are provided with advanced preparation in the biology of fungi and in the concepts and practicalities of forest pathology. Current research interests include; taxonomy and systematics of fungi; mycorrhizal ecology; biology of parasites and symbionts; growth, developmental biology, and ultrastructure of fungi; disease resistance in trees; genetic engineering; plant-pathogen interactions; fungal phylogenetics; molecular ecology; biodiversity and conservation of fungi.

Students in this graduate area use a range of tools to address important questions pertaining to the above. Students work with their faculty advisor to develop research projects, often combining both laboratory and field work. Coursework requirements are developed with the major professor and steering committee and are tailored to individual student project and career goals.

Plant Science

Plants, as the base for ecological food chains, serve as the structural and functional foundation of natural and managed systems. The study of plant science and biotechnology provides opportunity in a broad range of specialties fundamental to the understanding of plants and their interaction with other organisms and for specializing in plant biotechnology.

Emphasis is on forests and related plant systems. Current research interests include dynamics of plant communities as affected by humans and the environment; mechanisms of plant succession; epidemiology of forest and urban tree diseases; taxonomy, physiology, growth and ultrastructure of fungi; heritability of wood properties and disease resistance of trees; biochemistry and physiology of plant stress response; photosynthesis; mycorrhizae; plant reproductive biology; genetic engineering; transformation; molecular evolution; phylogenetics; taxonomy; plant-pathogen interactions, tissue culture and study of ancient DNA.

Wildlife Ecology and Management Ecology

Study in this area provides students with advanced preparation in biological concepts of wildlife populations as they relate to resource management. M.P.S. students will undertake a professional experience in wildlife management or policy, or a synthesis course in wildlife management planning. M.S. and Ph.D. students will address important research questions in wildlife science, typically aimed at supporting resource management agencies in their decision making.

The work of a wildlife biologist is diverse and often includes monitoring the status of wildlife populations, restoration of declining or extirpated species or populations, managing sustainable harvests of game species, identifying and managing threats to wildlife and their habitat, mitigation of human-wildlife conflict, and communicating wildlife issues and regulations with the public. Graduate education is rapidly becoming a universal prerequisite to employment as a professional wildlife biologist. A major strength of our program is the diversity of our research partners, including the U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Geological Survey, the New York State Department of Environmental Conservation, and many other state agencies. Graduate students working on agency-funded projects typically network with representatives from these agencies, which often opens up career opportunities. Certification by The Wildlife Society is supported by our faculty, and also enhances career opportunities because many state and federal agencies, and consulting firms give hiring preference to those who are certified. Graduates with an advanced degree in Wildlife Ecology and Management from ESF are employed worldwide, with nearly 100 percent placement shortly after graduation.

* ***Special Course Codes*** *(Code indicates course meets certain program or accreditation requirements. Ignore if there is no relevance to this program of study.)* ***G*** *= General Education Course (GenEd),* ***E*** *= Engineering,* ***ES*** *= Engineering Sciences,* ***M*** *= Mathematic,* ***NS*** *= Natural Sciences,* ***PE*** *= Professional Education,* ***S*** *= Summer-only*