

PLANT BIOLOGY AND CONSERVATION

Degree Types: MS, PhD

The Program in Plant Biology and Conservation focuses on preparing students for future leadership positions in botanical science and plant conservation. In response to growing national and international threats to biodiversity and impending global mass extinctions, the program is designed to train future botanists who have the skills to meet and address this crisis.

Conducted jointly by Northwestern University and the Chicago Botanic Garden (CBG), the program offers master of science and doctoral degrees through The Graduate School at Northwestern University. Advanced courses are taught by Northwestern professors and CBG scientists in a range of topics, including conservation biology, genetics, ecology, evolution, plant science, data science, environmental policy and more. Some courses are taught at the Chicago Botanic Garden.

Additional resources:

- Department website (<https://www.plantbiology.northwestern.edu/>)
- Program handbook(s)

Degrees Offered

- Plant Biology and Conservation Bachelor's/MS (<https://catalogs.northwestern.edu/tgs/plant-biology-conservation/plant-biology-conservation-bach-mast/>)
- Plant Biology and Conservation MS (<https://catalogs.northwestern.edu/tgs/plant-biology-conservation/plant-biology-conservation-ms/>)
- Plant Biology and Conservation PhD (<https://catalogs.northwestern.edu/tgs/plant-biology-conservation/plant-biology-conservation-phd/>)

Plant Biology and Conservation: MS - Thesis

The Chicago Botanic Garden and Northwestern University offer a research thesis track Master of Science in Plant Biology and Conservation. Students receive a strong foundation in plant ecology, evolution, and conservation and can choose to specialize in a variety of research areas. Students typically take between two to two and a half years to complete the degree, with all coursework completed in year one and research emphasized in year two. In this program, students should be able to:

- Design an original research project
- Write and defend a thesis research
- Contribute original research to the scholarly community
- Articulate broader impacts of research

Plant Biology and Conservation: MS - Internship

The Chicago Botanic Garden and Northwestern University offer an internship track Master of Science in Plant Biology and Conservation. Students receive a strong foundation in plant ecology, evolution, and conservation and can choose to specialize in an area of interest through an internship. In this program, students will be able to:

- Design and complete an internship learning experience
- Build professional networks
- Create and submit an original product from the internship

Plant Biology and Conservation: PHD

In collaboration with the Chicago Botanic Garden (<http://www.chicagobotanic.org/research/>), Northwestern University offers a Ph.D. in Plant Biology and Conservation. Graduates of the program have strong theoretical and methodological foundations in ecology, conservation, and evolutionary biology, together with the in-depth knowledge required to be able to identify and articulate the frontiers of scholarship and applied science within their area of specialization. In this program, students should be able to...

- Design and complete a comprehensive multipart original research project
- Contribute original research to the scholarly community
- Articulate broader impacts of research
- Write and defend a thesis research

Plant Biology and Conservation Courses

PBC 401-0 Plant Evolution & Diversity Lab (1 Unit)

Modern systematics emphasizing application and major themes in the evolution of vascular plants. Taught with BIOL SCI 350-0.

PBC 402-0 Plant Population and Community Ecology (1 Unit)

The purpose of this class is 1) to introduce students to the scope of the science of ecology at more complex levels of organization, and 2) to develop sophistication in understanding community and ecosystem ecology literature through the exploration of both classical and recent literature. Taught with BIOL SCI 349-0.

PBC 405-0 Ecosystem Ecology (1 Unit)

Concepts and principles of ecosystem ecology, with an emphasis on terrestrial ecosystems under the context of global change. Mass and energy flows through living and non-living ecosystem components as well as their environmental controls.

PBC 410-0 Plant-Animal Interactions (1 Unit)

This course explores interactions between plants and animals, including antagonistic ones (e.g., herbivory), mutualistic ones (e.g., pollination, seed dispersal, ant-plant associations), and interactions among multiple species and across trophic levels. Through survey of the primary literature, we will investigate the causes of the interactions and their consequences for individual organisms, populations, communities, and entire ecosystems. Finally, we will examine how these various interactions are responding to global change, including habitat destruction and climate change.

PBC 415-0 Spring Flora (1 Unit)

This course takes a field-based approach to learning the process of identifying major components of the local flora in an evolutionary context. Understanding vegetative and reproductive structures of plants, and use of this knowledge to identify plants with taxonomic keys is emphasized. Ecological interactions, and related conservation issues are also covered.

PBC 418-0 Soils and the Environment: The Earth's Critical Zone (1 Unit)

This course investigates the principles of soil science as they relate to everyday experience, with the aim of students gaining an understanding of the morphological, physical, and biological properties and processes in soils with vocabulary sufficient to communicate with others in soil science and management. Students should develop an appreciation

of the importance of the role of soils in ecosystems. Taught with ENVR_SCI 390-0.

PBC 420-0 Field Methods in Plant Conservation (1 Unit)

The science of plant conservation broadly encompasses the knowledge of many ecological field techniques. This course is designed to give students a real understanding of and hands-on experience in plant conservation practices with conservation practitioners in the greater Chicago area. Students will be exposed to a broad range of conservation issues, learn how they are being addressed, conduct relevant field projects, analyze the data, and interpret the results. Every other class meeting will be an all day trip to a field site. The alternating class meetings will deal with the analysis of the data collected. On field days, be sure to dress appropriately for the weather.

PBC 425-0 Molecular Ecology (1 Unit)

The aim of this course is to explore the relevance of Evolutionary theory and modern molecular lab techniques to Ecological Research. Ecology is “the study of the distribution and abundance of living organisms and how they are affected by interactions with other organisms and their environment”. Evolution has played an important role in determining a species, and a populations, origin, distribution and the intraspecific and abiotic interactions they experience, and these factors will go on to affect the future evolutionary trajectory of that species or population. Hence in this course we will explore important evolutionary concepts in reference to ecological processes and biological concepts.

PBC 430-0 Conservation Genetics (1 Unit)

In this course we will learn how basic evolutionary and genetic principles inform the conservation and management of wildlife, game, and plant populations. We will read and discuss current research in the primary literature, examine case studies of current practices, and engage in group problem-solving and computer simulation exercises. Taught with BIOL_SCI 332-0.

PBC 435-0 Biostatistics (1 Unit)

This is an applied statistics class geared toward students interested in biology, ecology, and environmental science, and others are welcome. The course goal is for students to be able to use the skills, experience, information, and software learned in class after class. During the course, students will learn many approaches and techniques for solving diverse statistical problems. Student will use the software R for all quantitative methods practiced in class. R is a very flexible and powerful program that scientists and statisticians can use for any statistical problem they encounter.

PBC 450-0 Field and Laboratory Methods in Plant Biology and Conservation (2 Units)

This course is aimed to provide students with the knowledge, critical thinking, and practical skills to design, execute, and analyze plant biology and conservation research in order to help find solutions to real conservation problems. As this often requires the mastery of many skill sets across disciplines, the course is team taught and includes hands on training in topics such as experimental design, sampling methods, managing data, soil analyses, pollinator and breeding studies, DNA extraction, PCR, and DNA fingerprinting.

PBC 451-0 Critical Topics in Ecology and Conservation (1 Unit)

This course provides students with the conceptual and theoretical framework within the field of plant biology (especially ecology) and conservation. This is a seminar style class based on reading and discussion of works ranging from historical literature to recent studies including topics such as conservation policy, economics of conservation, climate change, invasive species, habitat fragmentation, and applied conservation case studies. Taught with BIOL_SCI 339-0.

PBC 470-0 Special Topics in Plant Biology and Conservation (1 Unit)

This seminar-style course will focus on a wide range of rotating current topics in the field of conservation science and practice. Taught with ENVR_SCI 390-0.

PBC 499-0 Independent Study (1-3 Units)

Graduate students will work with an instructor of their choice conducting independent literature, lab, or field research.

Prerequisites: Permission of instructor.

PBC 519-0 Plant Biology and Conservation: Responsible Conduct of Research (0 Unit)

This course prepares students to become ethical, reflective, and responsible members of the research community while addressing contemporary issues in science and their societal implications. Students must complete online training before the first class is held.

PBC 590-0 Research (1-4 Units)

This course will allow students in our new PhD program to sign up for research credit once they have completed a set of core basic courses. Students will be working on their independent research projects while taking this course.