This intercollege program emphasizes the properties of ecosystems by focusing attention on interactions of single organisms, populations, and communities with their environment. It is designed to give students an advanced understanding of ecological theory and hypothesis testing and is complementary to other environmental programs that emphasize the human role in ecosystems.

The program is administered by a committee drawn from faculty members in several departments and colleges of the University. This committee and its chair are appointed by the dean of the Graduate School. The instructional staff is composed of participating faculty in those departments offering graduate courses in fields closely allied to ecology.

## Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply/). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (http://gradschool.psu.edu/graduate-education-policies/).

GRE scores are not required for admission. Applicants should have a strong science background, including chemistry through organic chemistry, mathematics through calculus, physics, and biology. A limited number of such courses can be made up while the student is pursuing graduate studies.

Students with a background in another discipline that has potential value to original ecological work will be seriously considered. A junior/senior grade-point average of 3.00 or better (on a 4.00 scale) is required.

Students are strongly urged to choose their research interests and initiate communication with the relevant faculty member(s) before applying for admission. A student will not be admitted without the commitment of a faculty member to serve as the student's research adviser. Teaching and research assistantships are available only through the student's faculty adviser.

The following are required:

1. three or more letters of recommendation regarding the student's academic and professional promise;
2. a concise one-page statement describing the student's goals both within the program and in professional life.

Specific inquiries about the Ecology Program may be directed to the program chair. Applications received by December 15 will have prefered consideration for assistantships and fellowships for fall semester admission.

## Degree Requirements

### Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (http://gradschool.psu.edu/graduate-education-policies/)

In addition to Graduate Council requirements, the instructional program includes:

- two graduate core courses in ecology (one each in two of the three core areas: population ecology, community/ecosystem ecology, and physiological ecology),
- an advanced 3-credit statistics course,
- two credits of colloquium,
- a minimum of six thesis credits,
- breadth courses selected by the student in consultation with the research adviser and research committee,
- and a thesis research project directed by the student's adviser. A non-thesis option is available for the M.S. degree, at the adviser's discretion.

### Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (http://gradschool.psu.edu/graduate-education-policies/)

In addition to Graduate Council requirements, the instructional program includes:

- three graduate core courses in ecology (one each in three core areas: population ecology, community/ecosystem ecology, and physiological ecology),
- two advanced 3-credit statistics courses,
- 4 credits of colloquium,
- breadth courses selected by the student in consultation with the research adviser and Ph.D. committee,
- a minimum of 15 thesis credits,
- and a thesis research project directed by the student's adviser.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by strong performance in two semesters of one foreign language or the equivalent. Both the qualifying and comprehensive examinations will be written and oral.

The Ph.D. committee is selected by the student and his/her adviser and approved by the Graduate School. The committee has the responsibility for determining the course program and research acceptable in satisfying degree requirements.

## Options

Five options for specialization are offered, for both the M.S. and the Ph.D.:

1. Conservation Biology
2. Microbial Ecology
3. Quantitative Ecology
4. Physiological Ecology
5. Watershed Stewardship

Students are not required to select an option. Each option entails extra course requirements plus a thesis directed by an ecology faculty member in the option.

The Conservation Biology option is concerned with problems of maintaining the rapidly disappearing diversity of organisms and their habitats, and the global reservoir of genetic diversity that these organisms represent.

The Microbial Ecology option includes basic aquatic and soil microbial ecology and applications to recycling of materials and release of genetically engineered organisms.

The Quantitative Ecology option includes mathematical and statistical modeling and applications of statistics to experimental design and data analysis.

The Physiological Ecology option is concerned primarily with the function and performance of organisms in their environment.

The Watershed Stewardship option is intended to provide enhanced educational opportunities for students with an interest in water resources management who are enrolled in the Intercollege Graduate Degree Program in Ecology at the University Park campus. The objective of the Graduate Option in Watershed Stewardship is to educate students to facilitate team-oriented, community-based watershed management planning directed at natural resources conservation and environmental problems encountered in Pennsylvania communities, especially non-point source water pollution. The Graduate Option in Watershed Stewardship requires 22 credits of graduate course work:

- 12 credits of breadth courses
- 2 credits of Watershed Stewardship Seminar courses (FOR 591A and FOR 591B or LARCH 510)
- 8 credits of Watershed Stewardship Practicum I and II courses (FOR 570 and FOR 571 or LARCH 817 and LARCH 550).

Breadth courses will consist of three graduate credits of course work from each of four subject matter areas: (1) water resources science, (2) social science, public policy and economics, (3) humanities, and (4) communications and design. In the watershed stewardship practicum courses, students work in teams with community, government, and business leaders to analyze and understand natural resources and ecological issues and creatively synthesize appropriate solutions in the form of a written watershed management plan.

**Dual-Titles**

**Dual-Title Ph.D. in Ecology and Biogeochemistry**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-title-graduate-degree-programs/).

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry dual-title degree program. Students must apply and be admitted to the graduate program in Ecology and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Biogeochemistry dual-title program.

Refer to the Admission Requirements section of the Biogeochemistry Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/biogeochemistry/). Doctoral students must be admitted into the dual-title degree program in Biogeochemistry prior to taking the qualifying examination in their primary graduate program.

Students in the Biogeochemistry dual-title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty.

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Ecology, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in Biogeochemistry, listed on the Biogeochemistry Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/biogeochemistry/).

All students must pass a qualifying examination that includes an assessment of their potential in the field of biogeochemistry. A single qualifying examination that includes biogeochemistry will be administered for admission into the student’s Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Ecology and must include at least one Graduate Faculty member from the Biogeochemistry program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for Ph.D. committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/), the Ph.D. committee of an Ecology and Biogeochemistry dual-title Ph.D. student must include at least one member of the Biogeochemistry Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in Biogeochemistry, the member of the committee representing Biogeochemistry must be appointed as co-chair. The Biogeochemistry representative on the student’s Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their Ph.D. committee and reflects their original research and education in Ecology and Biogeochemistry. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

**Student Aid**

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (http://gradschool.psu.edu/graduate-funding/) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (http://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/) set by The Graduate School.
Courses
Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Ecology (ECLGY) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/eclgy/)

Learning outcomes
Master of Science (M.S.)
1. **Know**: demonstrate knowledge of core principles and primary literature in their specialty area including comprehension of methods, results, and data analysis in the specialty area.
2. **Apply/Create**: demonstrate ability to design and carry out a major research project in the discipline, including synthesis of previous work in the field, and assembling findings into a written work.
3. **Think**: demonstrate ability to critically analyze work by others in their specialty area.
4. **Communicate**: demonstrate ability to convey scientific ideas and results in clear, concise and original writing as well as in formal oral presentations.
5. **Professional Practice**: demonstrate comprehension of and commitment to ethical standards in the discipline.

Doctor of Philosophy (Ph.D.)
1. **Know**: demonstrate knowledge of core principles and primary literature in their specialty area including comprehension of methods, results, and data analysis in the specialty area.
2. **Apply/Create**: demonstrate ability to design and carry out a major research project in the discipline, including synthesis of previous work in the field, and assembling new findings into a written work that advances understanding in the field.
3. **Think**: demonstrate ability to critically analyze work by others in their specialty area.
4. **Communicate**: demonstrate ability to convey scientific ideas and results in clear, concise and original writing as well as in formal oral presentations.
5. **Professional Practice**: demonstrate comprehension of and commitment to ethical standards in the discipline. Demonstrate the ability to teach key concepts.
6. **Teach**: demonstrate the ability to teach key concepts of the discipline to students.

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