

# Freshwater Ecology

Session 3, 2019; Pymatuning Laboratory of Ecology  
June 24 – July 12

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## About the Course

Freshwater ecology is a holistic study of lakes, streams, ponds, marshes, and swamps. Because freshwater ecosystems provide society with a number of crucial services, aquatic ecology has emerged as an important discipline of environmental science. Ecologists have learned that aquatic ecosystems are highly integrated, with a number of strong and complex linkages. In order to understand how human activity will affect our drinking water, our recreation, and other values associated with lakes and streams, we must first understand the fundamentals of how aquatic ecosystems work.

In this course, taught at the Pymatuning Laboratory of Ecology in northwest Pennsylvania, students will explore the structure and function of aquatic ecosystems. We will conduct field investigations of streams, lakes, and marshes. Students will attend background lectures, conduct experiments and field surveys, participate in data collection and analysis, and gain experience in the interpretation and presentation of results. Students will also participate in an overnight field trip, and they will leave the course with a greater knowledge of and appreciation for Pennsylvania's rich aquatic resources. In this class we will cover the physical, chemical, and biological functioning of aquatic ecosystems. We will learn how to integrate mathematics, physics, chemistry, and biology in our study of aquatic ecosystems. In addition, we seek to expose students to current research in aquatic ecology, and we will emphasize how scientific knowledge is integrated with social values in addressing environmental concerns.

Topics Covered in this course will include:

- The physics of water
- Chemical limnology
- Quantitative methods for assessing water quality and sampling aquatic communities
- Physiological and behavioral ecology of aquatic organisms
- Trophic interactions and ecology of aquatic communities
- Water management issues
- Current research in aquatic ecology
- Current water quality concerns in Pennsylvania
- Professional opportunities in freshwater ecology



## Schedule 2019

- Mon. 6/24 Introduction to PLE, lab site tour. Course Introduction.  
Begin Part I: Ecology of Lakes and Ponds.  
Lecture: Introduction to the Actors: Plant and Invertebrate Diversity, Benthic Invertebrates in Food Webs  
Lab: Plant and Invertebrate Survey, Linesville Creek, Geneva Ponds.
- Tues. 6/25 Chemical and Physical Properties of Water, Light and Heat in Lakes, Thermo-Density Relationships and Lake Stratification, Hydrology and Climate, Lake Formation, Lake Morphometry  
Lab: Vertical Profiles, Temp., O<sub>2</sub>, pH, Cond., Light, Alkalinity  
Split class, Conneaut Lake and Pymatuning Reservoir
- Wed. 6/26 Salinity, pH, Dissolved Oxygen, ORP, Carbon cycling  
Lab: Longitudinal study of Pymatuning Reservoir
- Thurs. 6/27 Phosphorus cycling, Nitrogen cycling, Primary Productivity  
Lab: YSI Sondes, Pymatuning Reservoir, effects of lotus on the lake  
Phytoplankton standing crop, BOD
- Fri. 6/28 Glacial Lakes of Pennsylvania  
Lab: Kettle Lake Tour: Edinboro, LaBouff, Lake Pleasant
- Mon. 7/1 Perturbation and Recovery of an Aquatic Ecosystem: Case Study of Lake Erie  
Lab: Tour of Linesville Fish Hatchery, Presque Isle Field Trip
- Tues. 7/2 Food webs in lakes  
Lab: Sugar Lake, zooplankton and fish
- Wed. 7/3 **Test 1: 9:00 AM**  
Part II: Stream Ecology  
Physical and chemical properties of streams, Linesville Creek, Conneaut Creek.
- Thur. 7/4 Fireworks (No Class)
- Fri. 7/5 Aquatic Insect Assemblages in Streams  
Field Trip: French Creek
- Mon. 7/8 Food Web Interactions in Aquatic Ecosystems  
Lab: Watershed exports of N and P in the Pymatuning Basin
- Tues. 7/9 Allegheny River Field Trip Day I  
Trout streams of the Allegheny Plateau

- Wed. 7/10 Allegheny River Field Trip Day II  
Impact of oil and gas extraction on streams  
Marcellus Shale extraction and the fate of produced water  
Acid Mine Drainage and aquatic communities  
Return from field trip, 8:00 PM
- Thur. 7/11 Acid-Mine Drainage, Acid Rain  
Lab: Tour of Linesville Fish Hatchery, Meet PAFBC Biologists  
Lab: Finish Research Projects
- Fri. 7/12 **Test II: 9:00 AM**  
**Presentation of Research Projects: 1:00 PM**

### About the Course

**Daily Schedule:** We will begin lecture each day in the fish lab at 8:30 AM sharp, and we will generally conclude the day's activities by 5:00 PM. The van will leave the dining hall for the lab site at 8:15 AM. Please be on time. We may deviate from this schedule from time to time.

**How to Dress:** This is a course in aquatic ecology, and we will spend most of this course in the water, and sometimes in murky, muddy water. You will want to wear waders when you are electrofishing or working in very muddy ponds. You may borrow hip boots from PLE, or you may elect to purchase your own. It is generally most comfortable to wear shorts and old but sturdy shoes when performing field activities other than electroshocking or muddy ponds.

**Safety:** Nothing is more important than your personal safety. If you are uncomfortable with the water, wear a life jacket. Use caution and common sense when using the boats, electrofishing gear, etc.

**Grades:** You are responsible for all material covered in lecture, laboratories, and the field. In particular, you should know the names of the fish, amphibians, invertebrates, and aquatic plants we encounter. You may find that a field notebook is a useful tool. Final scores are calculated as follows:

Test I: 25%

Test II: 25%

Pop Quizzes (3) 20%

Projects 15%

Performance on other individual and group activities: 15%

Grades will be assigned as 90-100 = A, 80-89 = B, etc.

**Attendance:** I expect that each student will attend and participate fully in all 14 class meetings. Each day of unexcused absence from class will result in a 10% penalty to your final score. Any missed quizzes or tests can not be made up.

Document Sharing: We will use Google Drive to share documents for this course, and a link will be provided.

Class Projects: We will run the laboratory portion of the class as a series of research projects. Each day one person will be the designated “Data”, and this person will be responsible for recording all information collected that day. The data person will organize the results, and insert them into the class notebook. We will then start the next day with a brief presentation of the previous day’s project by “Data” and the class will spend a bit of time discussing the results. Because data collected early in the course may be used later in the course for independent projects, it is important that we carefully record and organize all data from our field trips. Indeed, a critical step in becoming a scientist is merely learning to write things down so that others can make use of your observations.

Independent Projects: Each student will participate in an analysis and presentation of data acquired by the class. Details will be announced in class. Presentations are scheduled for the final afternoon of the course. No paper required.

Attitude: Aquatic ecosystems are a source of endless fascination, and there is much yet to be learned about them. I expect the students in this course to approach the material with enthusiasm, and I trust that students who do so will perform well in this course. Work together as a team, help your classmates with the fieldwork, and help organize the data. This should be a fun course.