

Stream Ecology (BIOSC 1600)

This field course surveys the physical, chemical, and biological components of freshwater streams in an integrative manner to further understand and investigate the natural history and ecology of flowing waters. The course will introduce students to lotic systems in a context that moves from a broad watershed perspective to narrowly defined channel microhabitats to examine the underlying processes that produce the structural and functional characteristics of stream and river systems. Topics will include selected aspects of hydrology, fluvial geomorphology, water chemistry, taxonomy of common stream fauna, food webs, nutrient cycling, organism adaptation to the stream environment, and interpreting the effects of human activities on streams and rivers. Students will recognize that the processes acting in lotic systems are general in nature but the settings where they occur are often unique and can produce spectacular results. This course will draw upon local and regional examples to showcase the diversity of streams and rivers found in western Pennsylvania, their uniqueness, and threats to their ecological integrity. Stream sampling and assessment methods will be featured and utilized in field settings. Following the first week of class that introduces students to new material the class is primarily devoted to sampling on approximately 12 different streams located in Allegheny, Crawford, Erie, Forest, and Venango Counties. The streams display characteristics associated with local/regional geology and land use that produce a range of outcomes from relatively unspoiled conditions as observed in Salmon Creek in Allegheny National Forest to highly impacted conditions found in McClarens Run draining the Pittsburgh International Airport.

Textbook & Readings: There will be one required textbook:

Allan, J.D. and M.M. Castillio. 2007. Stream Ecology: structure and function of running waters. Second Edition. Springer, Dordrecht, Netherlands. 436 pp.

Required Field Notebook: Rite in the Rain No. 351 (4 5/8 x 7; 48 pages).

Additional Required Readings from:

Hauer, F.R. and G.A. Lamberti. 2007. Methods in Stream Ecology. Second Edition. Academic Press, San Diego, CA. 877 pp. (2 copies in Pymatuning Library).

Literature articles and other supporting documents provided as handouts.

Class Format

This class meets Monday through Friday 9:00 – 5:30. There will be exceptions for longer trips or scheduled activities with earlier departure times and later return times. Lecture will be based on book chapters and literature sources and will generally be followed by trips to local/regional streams to reinforce class material. Field exercises will be conducted in small groups but each student will be required to collect/record data and maintain a field journal. A small group project will be required including presentation of results at the end of the class session.

Due to the short time frame for the class and applied nature of the course students will be required to read materials and work on their own outside of the regular meeting time to keep up and on schedule. This is especially important during the first week of class as the reading load is considerable. This format allows a significant portion of time to be devoted to field exercises and travel to selected locations rather than time spent in class lectures. Students are encouraged to collaborate and utilize all the resources available at the lab including the library, computer lab and internet, and faculty.

Students are expected to participate in all field activities and the use of hip boots is mandatory during electrofishing exercises for safety reasons. Hip boots are supplied at the lab but sizes may be limited. Students are encouraged to bring their own hip boots if they have them or purchase them (~\$25). If students have chest waders they are encouraged to bring these as well for larger streams with deep pools. Insect repellent is also recommended at many field locations to minimize exposure to mosquitoes and ticks.

Grades

Students are responsible for all materials covered in lectures, laboratories, and in the field. Students will be required to recognize and know the common names of fishes and benthic macroinvertebrates. Final grades will be calculated from the following:

Quizzes: 20%

Student Participation/Attendance: 15%

Student Journal and Project: 15%

Lab Practical: 15%

Final Exam 35%

Grades will be based on those standards for the students' home institution.

Scheduled Activities

The schedule provided is preliminary in nature. The first week contains a significant portion of time devoted to lecture while the second and third weeks are primarily devoted to field exercises. Students need to understand that the class schedule must remain flexible to adapt to local/regional stream conditions. We will be working on small to medium sized streams that respond rapidly to storm events. Streams can not be sampled when discharge is elevated because data quality is compromised and conditions may be unsafe. Our sampling streams are distributed across five counties providing alternatives relative to the locations scheduled for a specific date (stream sampling locations suggested by students will be considered).

Course Applicability and Additional Information:

Stream Ecology at the Pymatuning Laboratory of Ecology is presented in a field-based applied context and will be particularly valuable to students in academic specializations including ecology, biology, fisheries, water resources, science education, environmental science/environmental studies, environmental planning, environmental engineering, and conservation.

Additional information specifically regarding course content etc. may be made to bcdickson@rogers.com. Other inquires should be made directly to staff at the Pymatuning Laboratory of Ecology.

Preliminary Class Schedule

Date	Topic	Resource	Location
July 14	Course introduction, student survey, equipment assignment Stream Ecology Overview/Local Field Trip		Linesville Creek
July 15	Hydrologic Cycle, Stream System Hierarchical Organization, Flow Variation, Fluvial Geomorphology	SE: Chapter 1-3	Lab
	Channel Unit Id., Field Indicators, Channel Measurements Floodplain/Riparian Characterization, Large Woody Debris Habitat Assessment Protocols (EPA/Ohio QHEI)	MSE: Chapters 1-4, 7 Handouts	Linesville Creek
July 16	Stream Classification, Erosion and Sediment Transport, Channel Evolution, Fluvial Processes/River Continuum	SE: Chapter 1-3 MSE: Chapters 1- 4, 7	Lab
	Substrate Characterization and Sampling Depth/Velocity Measurement, Discharge Measurement		Linesville Creek
July 17	Trophic Relationships, Species Interactions, Lotic Communities	SE: Chapter 8, 9, 10 MSE: Chapter 20-22; 25-26 Handouts	Lab
	Fish Community Sampling Protocols (EPA) Introduction to Electrofishing/Fish Identification		Cussewago Creek
July 18	Water Chemistry, Abiotic Environment, Nutrient Dynamics	SE: Chapter 4, 5, 11	Lab
	Water Sample Collection, Water Quality Analysis		Linesville Creek Conneaut Creek
July 21	Field Trip/Stream Assessment (Urban Influenced)		Sugar Creek Cussewago Creek
July 22	Field Trip/Stream Assessment (Reference System in Wallace Woods) Linesville Creek		
	Macroinvertebrates as Indicators of Environmental Quality Benthic Macroinvertebrate Sampling Protocols (EPA) Benthic Macroinvertebrate Sampling	MSE: Chapter 36 Handouts	Linesville Creek
July 23	Field Trip/Stream Assessment (Channel Modifications)		Conneaut Creek
	Benthic Macroinvertebrate Identification	MSE: Chapter 20-22, 25, 36 Handouts	Linesville Creek
July 24	Field Trip/Stream Assessment (Nutrient/Acid Limited System)		Salmon Creek L. Salmon Creek
July 25	Field Trip/Stream Assessment (Glaciated Systems)		Elk Creek Temple Run Trout Run
July 28	Field Trip/Stream Assessment (Hydrology Impacted and Stream Restoration Example)		McClarens Run Nine Mile Run
July 29	Primary Producers, Detrital Energy Sources, Stream Metabolism	SE: Chapter 6, 7, 12	
	Stream Data Synthesis and Project Development		
July 30	Field Trip/Stream Assessment (Acid Mine Drainage Influenced)		Scrubgrass Creek Bullion Run
July 31	Human Impacts/River Management Project Finalization and Presentations Course Review	SE: Chapter 13	
Aug 1	Lab Practical and Final Exam		Lab/Dining Hall
	*Alternative Field Trip (Regulated River)		Allegheny River at Kinzua Dam, Warren, PA