



E546: STREAM ECOLOGY Spring 2004

Lecture: 1:00 – 2:15 Wed SPEA 270
Lab: 8:00 am - 12:00 Fri SPEA 272

Web page:

<http://www.spea.indiana.edu/joneswi/e546/>

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Mon 2:00 - 5:00 pm
(other times by appointment)

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I. GENERAL COMMENTS AND COURSE GOALS

This is an advanced limnology course that will explore the important patterns and processes characterizing stream ecosystems. We will take a holistic approach that will include: physical, chemical and biological stream characteristics; watershed patterns; and stream processes (trophic dynamics, colonization and dispersal dynamics, community dynamics, and responses to change). In the lab we will examine these patterns and processes in local streams. Students will participate in a somewhat independent, group stream analysis project, which will include: land use analysis, physical stream measurements, stream hydrology, chemistry, and biology. Stream habitat and biological data will be analyzed using EPA's Rapid Bioassessment Protocol.

II. PREREQUISITES

Students should already have the following skills:

- Basic plankton, macroinvertebrates and fish identification.
- Experience in proper use of dissolved oxygen meter, pH meter, and conductivity meter.
- Basic wet chemistry skills and experience in the analysis of alkalinity, SRP, and turbidity in freshwater samples.

Students may meet this requirement by having previously taken E455: Limnology or a limnology course at another university that included a full laboratory.

III. TEXT

Allen, David J. 1995. Stream Ecology: Structure and Function of Running Waters. Chapman and Hall Publishers.

IV. STUDENT RESPONSIBILITIES

Your responsibilities are to attend all the lectures and labs, ask questions, prepare ahead for class and laboratories, participate actively in your lab group, complete assignments on time, and express yourself creatively and concisely in your work. I will do my best to be clear, organized and fair.

We will be using chemical reagents in the lab that may react adversely with your clothing should you spill on yourself. Therefore, wear casual clothes to the lab. **Stream fieldwork in January - March will be cold!** You'll need foot wear that can get wet, rain gear, and warm clothes. SPEA has chest waders in a variety of sizes but I strongly encourage each student to acquire his or her own pair of chest waders.

Laboratory attendance is mandatory. Late assignments will be penalized 10 points for each day past the due date. No make-up examinations will be given in this course! Should you have an unexcused absence from an exam, your grade will be zero. Consult the Indiana University Academic Handbook for a description of the few circumstances for which incompletes or excused absences from tests are appropriate.

V. COURSE EVALUATION AND GRADING

Your course grade will be based on a mid-term examination, laboratory exercises and reports, classroom participation, and a final group project. Final grades will be based on the following percentages:

Classroom participation/attendance	+/-
Midterm Takehome Exam (Wed, Mar 3)	20%
Lab Reports/Exercises	50%
Final Project:	
Oral Presentation	10%
Written Presentation	20%

VI. ADDITIONAL COURSE POLICIES

1. My office hours are set aside for your use--use them! If you have any problems with the course come and see me right away so we can correct them before you fall too far behind. During office hours, I promise to be in my office (or lab) and drop anything else I'm doing to answer your questions.

2. If you don't understand something in class--raise your hand and say so! Chances are that other students are having the same problem. There is no such thing as a dumb question. Comments, debate, and alternative views are encouraged in my class--let me and your classmates know what you think of the topic at hand.
3. Cheating and Plagiarism are forms of academic dishonesty that cannot be tolerated in university education. Taking material from a book or magazine without citing it and taking material from another student's paper are but two examples of plagiarism. Please refer to the *Code of Student Ethics* for other examples and a description of the University's policies for dealing with plagiarism. You should also understand that I follow procedures described in the *Code* in handling any case of academic dishonesty.

VII. COURSE TOPICAL OUTLINE

1. Hydrologic cycle and stream hydrology.
2. Riparian Zones and Watersheds
3. Channel structure and formation (fluvial geomorphology).
4. Physical factors important to biota.
5. Stream chemistry.
6. Autotrophy in streams.
7. Organic matter.
8. Heterotrophic processes.
9. Fish.
10. Predation.
11. Herbivory.
12. Competitive interactions.
13. Drift
14. Nutrient spiraling.
15. Human influences on streams.

** I expect students to be prepared for each lecture by reading the appropriate material in the text beforehand. Additional articles will be assigned throughout the semester for additional background and discussion.

Laboratory Schedule – 2004

- Jan 16 Lecture/discharge measurement equipment (272 lab)
- Jan 23 Basin characteristics mapping (272 lab)
- Jan 30* -Reach orientation and physical measurements; measure discharge; collect total suspended solids and alkalinity samples, set out Hester-Dendy samplers (field).
-Filter TSS samples; measure alkalinity (375 lab)
- Feb 6 -Substrate characterization (field)
-Fecal coliform filtering/preparation demonstration (375 lab)
- Feb 13* -Collect water samples for: TP, NO₃/NH₄, SRP, alkalinity, fecal coliform; measure dissolved oxygen, temperature & conductivity (field).
-Analyze SRP, alkalinity and pH; filter NO₃/NH₄; set up TP digestion (375 lab)
- Feb 20 -Plankton collection for genus, chlorophyll a, and TP determination (field)
-Chlorophyll and TP preparation; plankton identification/quantification (375 and 272 lab)
- Feb 27 -Retrieve Hester-Dendy samplers; D-net sweeps; qualitative picks (field);
-Continue plankton identification (272 lab)
- Mar 5* Macroinvertebrate identification (272 lab)
- Mar 12 No scheduled lab; set out 2nd set of Hester-Dendy samplers (field)
- Mar 19 Spring Break
- Mar 26* Fish sampling (field)
- Apr 2 Group project work
- Apr 9 Retrieve 2nd set of Hester-Dendy samplers, collect macros (field)
- Apr 16 Group project work
- Apr 23 Group project work
- Apr 30 Group projects oral presentations (272 lab)

* Indicates that a laboratory report will be prepared for this material

Group Project Expectations

The bulk of your group project work will be conducted independently of structured class time. Our goal in lab is to introduce you to field and laboratory techniques that we want you to use in gathering data for your stream reach. Then, you (the group) will collect the additional data needed to meet the needs of your group project assignment and, more importantly, to meet your own needs in understanding the physical, chemical and biological dynamics of your stream reach in particular and Stephens Creek in general.

You should do the following at minimum:

1. Collect at least 5 discharge measurements including at least one major runoff event from your stream reach within the Stephens Creek basin. Your instantaneous discharges should be compared with the continuous discharges from the datalogger at the base station on Brummett Creek for a discharge-discharge relationship. (Students will work up the datalogger data as well.) If 5 discharge measurements do not yield a suitable relationship, you may need to measure more, especially to fill in over the entire range of discharges. From the equation of your curve, you can then calculate continuous discharge at your site as a function of the base station datalogger data. Prepare a daily discharge hydrograph for your site and compare it to the base station hydrograph.
2. Collect and analyze TSS and alkalinity each time you measure discharge. Consider the relationship between these parameters and discharge.
3. Collect two sets of stream water nutrient data (see parameters from Feb 13 lab):
 - One set during low flow (hopefully Feb 13)
 - One set during a runoff event. It's best to collect samples before the peak of the hydrograph so you'll likely be sampling in the rain! Keep close check on projected rainstorms.

NOTE: we expect students to prepare their own sample bottles, schedule field equipment, wash their used bottles, and help with reagent preparation.

4. Analyze the algae data comparing it with substrate, reach conditions and water quality.
5. Analyze the macroinvertebrate and fish data using a biotic index (we will introduce this in lab/lecture; students should download all or parts of the revised EPA Rapid Bioassessment Protocol manual at:

<http://www.epa.gov/owow/monitoring/rbp/>

Your analysis will include **two sets** of macroinvertebrate data.

6. Integrate your earlier lab work (mapping, site map, substrate characterization, reach morphometry, etc.) into your group report.
7. Prepare both a written and oral group report. I expect that final group written reports will be of sufficient style and quality to be presented at a scientific meeting. Therefore, include extensive use of any pertinent literature. All members of the group will get the same grade on their final written report unless there are extenuating circumstances. A component of the oral presentation grade includes evaluation of each individual's oral presentation so grades will be more individualized here.

** You may wish to plan ahead and take color photographs during the semester to incorporate into your final oral presentation as overheads or slides.