Stream Ecology BIOL 4440/5440
Spring 2019

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Office Hours: Monday & Wednesday 9:00 - 10:00 or by appointment. See note below.
Time and Place: Lecture-Tuesday/Thursday 11:00 – 12:20, CHEM 106544 Room 338
Thursday Laboratory **–** 2:00 – 5:00, EESAT Room 359.
Required Text: *Methods in Stream Ecology Volume 1: Ecosystem Structure 2nd edition* by Hauer and Lamberti (editors). Supplemental materials will be provided as needed throughout the course.

Attendance: Attendance is expected in both the lecture and the laboratory.

Stream Ecology has only been recognized as a major sub-discipline of ecology and limnology in the past few decades. Methods for teaching it and which core components to emphasize have therefore not been widely agreed upon among stream ecologists. In this course, our goals are relatively broad and we hope to provide an awareness of many areas and issues. Additionally, the course will provide tools that can be applied to evaluate the ecology flowing waters. Because of our location, we will be biased in using examples from prairie streams and rivers; however, we will discuss characteristics of streams from other ecoregions to familiarize you with scales, patterns, and processes in the absence of direct experience.

There will be two over-arching concepts explored during the course:
Physical-Chemical Characteristics of Stream ecosystems
Biological Characteristics of Stream ecosystems

However, while there will be a few times when the class will discuss these concepts separately because of the interactions of abiotic and biotic factors in aquatic ecosystems most often the concepts will be integrated.

Goals: At the end of the semester, each student is expected to be knowledgeable and competent in the following areas:

1) Terminology in the field of stream ecology,
2) Equipment used in stream ecology,
3) Measurement of the physical, chemical, and biological qualities of streams, and how these attributes interact,
4) Ecological processes in streams and the processes vary over distance and time,
4) What those characteristics mean regarding stream health and proper resource management,
5) How and why major biological communities vary in a lotic system.

COURSE PHILOSOPHY

The course is structured to ensure that students taking the course develop a set of skills that will enable them to function as effective aquatic field biologists. By the end of the course, each student should be capable of:

1) Designing a field study (which includes generating testable hypotheses and choosing appropriate equipment),

2) Going into the field and conducting the field study,

3) Analyzing, interpreting, and writing up the results of the field study in a professional manner acceptable to either an employer, a research supervisor, or a professional journal. To achieve this end, the course includes a series of exercises, each of which builds upon the previous exercises.

COURSE APPROACH

This course is designed for graduate or advanced undergraduate students, with interest in stream ecology. The instructors assume that students taking this class are scholars. As such, students are expected to actively participate in the class.

Course Outline and TENTATIVE Schedule, i.e. this schedule will vary. The outline includes both lecture and laboratory topics to emphasize the connectivity. The Laboratory instructor will provide a more detailed laboratory syllabus. Unless specified chapters listed refer to readings in Hauer and Lamberti.

Date	Lecture Topics (Tues./Thurs.)	Laboratory Topics (Thursday 2-5)
Physical-Chemical Characteristics of Stream ecosystems		
Week of		
Jan 15	Introduction, overview and expectations for the class and History Stream Ecology Video River Webs – overview of stream functions and interactions. The Watershed and Community Structure a broad perspective **Readings**: Hauer & Lamberti Chapter 1. & Hynes, HBN. 1975. A Stream and its Valley (Assigned reading)	General Introduction. Good Laboratory Practices. Prep leaf packs for a long-term study of leaf breakdown. For background read the Introduction section found in Hauer and Lamberti, Methods in Stream Ecology 2st edition, Chapter 27- *Leaf Litter Breakdown* (pages 71-82). This chapter will be supplied. This will be a semester long project.
Jan. 22	Geomorphology - river forms and processes **Readings:** Chapter1 Riverscapes p. 3-19. Chapter 2 Valley Segments, Stream Reaches and Channel Units.	GPS, GIS – Mapping and Watersheds. **Readings:** Chapter. 1, Section 1.3 *Specific Methods*, 1.3.1 *Basic Method* 1: *Boundaries and Hydrography of the Catchment Basin.* pp. 13-19 & Chapter 2, Section 2.3, 2.3.1 *Basic Method: Valley Segment, Stream Reach, and Channel Unit Classification*.
Jan. 29	Physico-chemical properties of water.	Introduction to the basic physical-chemical methods we will be using in the class throughout the semester. How to measurement physio-chemical parameters including pH, Conductivity, DO, Alkalinity and Hardness using meters and titration techniques. Introduction to measuring Discharge Measurements and Stream Flow Analysis, and Habitat Analysis. Benthic macroinvertebrates examples will be available to examine.

Stream Biota		
Feb. 5	Stream biota - who, what, where. Challenges and challenges and solutions to life in moving fluids: **Readings**: Chapter 8 Hyporheic Zone, Chapter 14 Meiofauna, 14.1 Introduction, Chapter 15 Macroinvertebrates	**Lab Field Trip**: Discharge Measurements and Stream Flow Analysis, Habitat Analysis, Physio-chemical measurements. Collection of macroinvertebrates from different habitats will be made for later analyses in the laboratory.
Feb. 12	Energy Sources in Streams **Readings: Introduction to** *Chapter 11 Benthic Stream Algae: Distribution and Structure, Chapter 12 Biomass and pigments of Benthic Algae and Chapter 13 Macrophytes and Bryophytes* **Opportunity #1 - 14 February**	Review of techniques for analysis of the data from Field Trip 1 (Handouts). Measuring Primary Production techniques Chapter 12 Biomass and Pigments of Benthic Algae.
Feb. 19	Energy Sources in Streams, Continued	**Field trip-** Energy in Streams. Measuring Primary Production in Streams. Introduction to leaf drift, Hauer and Lamberti Chapter 26 Course Particulate Organic Matter: Storage, Transport and Retention, pp 55-69. This Chapter is in Volume two o Hauer and Lamberti and will be provided.
Feb. 26	Biotic – Abiotic interactions - community structure and species diversity	Benthic Macroinvertebrates. Introduction to identification, adaptations to habitats. Begin to process macroinvertebrates (Hauer and Lamberti Chapter 15 (pp. 297-319)
Mar. 5	Biotic interactions – trophic relationships … functional feeding groups and food webs **Readings:** Chapter 18.1-18.1.2, pp 379-381. *Invertebrate Consumer-Resource Interactions.* Chapter 20 Trophic Relationships of Macroinvertebrates, pp 413-433 **Opportunity #2. – March 7**	Trophic Relationships of Macroinvertebrates Functional Feeding Groups Predator-Prey Interactions *Trophic Relationships of Macroinvertebrates using* from benthic macroinvertebrate collections) **Readings:** Chapter 20 Trophic Relationships of Macroinvertebrates, pp 413-433
Mar. 12	Spring Break March 11-17	Spring Break
Mar. 19	Macroinvertebrate Dispersal – the role of insect assemblages in the stream and terrestrial communities Chapter 21 Macroinvertebrate Drift, Adult Insect Emergence and Oviposition..	**Field trip –** Tentative Laboratory: Sampling Fish Communities – Rob Cook EPA Hauer and Lamberti, Chapter 16, Fish Assemblages.
Mar. 26	Fish Assemblages **Readings**: Hauer & Lamberti Chapter 16	Lab prep for overnight trip. Leaf \pack processing. (Hauer and Lamberti Chapter 30 pp 711-713).

Apr. 2	Goals for the overnight field trip. Introduction to sampling techniques, methods and what to consider when collecting. .	**4 April - Overnight lab measuring 24 hours cycles. (Turner Falls or other suitable site) alternative date will be**
Apr. 9	Indicators of Macroinvertebrates of Biotic Environmental Quality. **Opportunity #3 – April 11**	Alternative overnight if needed. Tentative Field trip- Macrophytes – LAERF
Apr. 16	Modification of Running waters by humankind: Evaluating Stream Health:	Laboratory groups meet – activity preparation of samples, data and analysis for group presentation. Instructors available for assistance
Apr. 23	Modification of Running waters by humankind: Evaluating Stream Health;	Lab groups meet for last opportunity to continue synthesizing and organizing for presentation.
Apr 30	Conservation of streams: a prospectus on the future	**May 2nd Lecture and Lab combined -Group presentations … A synthesis of what you learned in lab. What does it all mean?**
May 7	**Final Exam**	

Readings: In addition to chapters in Hauer and Lamberti Methods in Stream Ecology, additional reading materials will be assigned during the semester. These materials will either be made available as pdf files through the canvas or downloading from UNT's library holdings. At times, you may be required to search the scientific literature for additional information, using resources other than the internet.

Grading: The grade you earn in Stream Ecology is an average of your Lecture grade and Laboratory grade. The Lecture grade is composed of examinations (85%) and participation (15%). There are three lecture examinations and a final examination. All examinations (lecture and final) are equally weighted and will be averaged to determine the lecture portion of your grade. Participation points are based on class attendance, participation in both lecture and laboratory. The final Stream Ecology grade is calculated by averaging your lecture and laboratory scores. Usually, a short quiz is given daily at the beginning of the class. This quiz is NOT GRADED and is used for attendance. The quiz provide the student insight into their understanding of subject material, insights into concepts and questions about subjects that may be included in the opportunities

Final Stream Ecology grade = (lecture percentage + laboratory percentage) / 2

A = 89.5 – 100
B = 79.5 – 89.4
C = 69.5 – 79.4
D = 59.5 – 69.4
F = 59.4 and below

Although I do not anticipate any reason to modify this grading plan, I reserve the right to do so if circumstances warrant. I will inform the class if modifications to the grading scale are necessary.

STUDENT RESPONSIBILITIES

Your responsibilities are to attend all the lectures and labs, ask questions, prepare ahead for class and laboratories, participate actively in the lab, complete assignments on time, and express yourself creatively and concisely in your work.

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 winter and early spring season in Texas may be cold! You will need foot wear that can get wet, rain gear, and warm clothes. UNT has some chest waders in a variety of sizes (some with holes and fungal cultures with species unknown to science). I strongly encourage each student to acquire his or her own pair of hip boots or chest waders.

Laboratory attendance is mandatory. You cannot master stream ecology from a book. We have designed this course to be as much *hands on* and with as many practical experiences as possible. There will be times when lecture and laboratory will be combined or we might have lecture in the lab or during part of the lab. If you anticipate not being able to participate in the laboratory, I suggest that you drop the course.

ADDITIONAL COURSE POLICIES

1. My office is open to students. If you cannot meet during my scheduled office hours contact me we will find a time to meet. If you have any problems with the course come see me right away. I will within reasonable limits work with you to help you through the course. However, I cannot help you raise a failing grade during the last weeks of the course. In fairness to the other members of the class, I cannot assign individual extra credit work to pull up required course work.

2. If you do not understand something in class--raise your hand and ask a question! More than likely, other students are having the same problem. There is no such thing as a stupid question.

3. Cheating and Plagiarism are forms of academic dishonesty that will not be tolerated. If a student is caught cheating it will result in a 0% for that test or assignment. A second act of cheating will result in an "F" for the course. There will be writing assignments in the laboratory and lecture that will require original literature research; plagiarism (copying and pasting from scientific works or internet resources without proper citations) is considered cheating.

Disability Accommodation:

"The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the Office of Disability Accommodation website at http://www.unt.edu/oda. You may also contact them by phone at 940.565.4323."