



## Summer Session 2024

### BIOB 439 Stream Ecology Syllabus

3 credits; Lectures, Labs, Field Work

Course dates: 15–26 July, 2024

Location: FLBS, Ecology West Classroom

Instructor: Dr. Robert Hall

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**Prerequisites:** One year of college-level biology, chemistry, and mathematics, and an ecology course (can be met via BIOE342 Field Ecology at FLBS) or equivalents; or consent of instructor.

#### Course Description:

Stream Ecology (BIOE 439) is the study of the physical, chemical and biological processes in streams. F.-A. Forel coined limnology as the “oceanography of lakes”. Here we will do the same for streams and rivers by studying the ecology of streams rather than simply ecology in streams. This goal requires student integrating across scientific disciplines to learn principles, concepts and methods of stream ecology in a field, lecture, laboratory, and discussion settings. Daily participation, examinations, and written and oral reports of independent or group studies as directed by the professor are required.

After a year indoors, I have changed this course to include a larger and more immersive field experience, a 3-night float trip on the Middle Fork Flathead River. Much of the initial lectures and discussions will occur on the river, probably associated with early morning and evenings leaving the day free for travel and fieldwork. We will use this trip to examine composite productivity of a larger river network by sampling 1-2 tributaries, the main river in 2 spots corresponding to upwelling and downwelling zones, and a floodplain springbrook.

**Text:** None, but lots of required readings on Dropbox.

#### Student Learning Outcomes:

##### *Course Learning Objectives*

- 1) Engage students in stream ecology concepts such as the interactions of physical, chemical, and biological processes through lectures, discussions, readings, and field investigations.
- 2) Students collect and analyze data and present written findings from field research, working both independently and as a team.

##### *Expected Learning Outcomes*

After completing this course, students will be able to:

- 1) Identify and explain ecological relationships pertaining to a variety of stream organisms and environments. Students accomplish this task using terms, concepts, and models familiar to professional stream ecologists.
- 2) Evaluate and communicate ideas from stream ecology literature.
- 3) Conduct a quantitative and repeatable study design that addresses a research question of relevance in stream ecology.

#### Graduate Increment:

Students taking this class for graduate credit will take the lead in data analysis and modeling for jointly led

class project. They will present to the class methods and models for leaf litter breakdown and ecosystem metabolism.

### Evaluation and Grading:

Participation (daily)	24%	A $\geq$ 94% A- 90–93%
Short papers (4)	16%	B+ 87–89% B 84–86% B- 80–83%
Research paper (1)	30%	C+ 77–79% C 74–76% C- 70–73%
Final exam (1)	30%	D+ 67–69% D 64–66% D- 60-63%
		F <60%

Participation is based on discussions, attendance and short exercises that you will do, we will discuss, but won't become a full blown paper. Short papers are 1 pagers turned in on new papers in the field. Description for these is on Dropbox. Final paper is a group research report that you will write about the field data that we collect in the course.

### Course and Field Supplies/Equipment: (\*Available for purchase at the FLBS Bookstore)

- Rite in the Rain field notebook\*
- Pencils\*
- Hot/cold mug (or else you use the Bowl of Shame!)\*
- Water bottle\*
- Lunch pack-up container (re-sealable)\*
- Bear spray\*
- bug spray
- Wading shoes or sandals
- Flashlight (headlamp) and batteries
- Laptop computer with MS Excel or RStudio
- Personal first aid kit
- Mess kit (bowl, fork, plate)
- sunscreen / sun protection.
- tent, groundcloth, pad, sleeping bag

### - Required Overnight Field Gear and Other Items to Bring Checklists: <http://flbs.umt.edu/urls/lists>

**Computers:** We will do lots of data analysis and writing in this course. You are free to use the software of your choice. I use R (via RStudio) for data and graphing, LaTeX for difficult writing (papers), and MS Word for easy writing (this syllabus), and Excel for arranging data. You are welcome to use Excel, any other spreadsheet program, R, Matlab, MS Word, open office, R Markdown, etc. For those who don't like paying money, RStudio and LaTeX are free and have cloud options (RStudio Cloud, Overleaf). You will use Overleaf for your paper because it allows for easy collaboration. I will set up the format so that all you have to do is type in the words. One of the exercises (stream metabolism) requires R, but we can use my computer. Please hand in the 1 page papers as an actual piece of paper (note use of singular. 1 page, not 2. The final paper should be as .pdf and I will mark it up electronically so each person in the group has access.

### Course Policies:

Students are expected to review and adhere to the University of Montana Student Code of Conduct and adhere to the Flathead Lake Biological Station Code of Conduct form signed during student registration. Students must also abide by the FLBS Rules and Regulations and the Safety Orientation Checklist. Students must complete the University of Montana online Prevention Education Programs: AlcoholEdu and Sexual Assault Prevention for Adult Learners.

**Schedule:** The schedule may change prior to first day of class and while class is in session due to location availability and field conditions.

Note: Make sure you pack your brown bag lunch each day at breakfast!

Date	Lectures – Labs – Field Work
Monday	08:00 Lecture: Intro to geomorphology & hydrology 10:00 –Data and donuts 11:00 Lecture: Carbon Cycling, metabolism, detritus, C budgets 12:00 Lunch 13:00 Lecture: Bugs/Algae 14:00 Trip prep 17:30 Dinner
Tuesday	08:30 Load trucks and boats 10:00 leave for Essex 12:00 Lunch and launch 17:00 Arrive at Nyack 18:30 Dinner 19:30 Boix Canadell paper Discussion
Wednesday	06:45 reveille 09:00 launch 12:00 Lunch 13:00 Sample constrained reach somewhere along way 17:00 camp 19:00 Dinner
Thursday	06:45 reveille 08:00 Lecture: Nutrient Cycling 10:00 Hike to Movie Road for downwelling river samples 12:00 lunch 13:30 Hike to Beaver Brook for floodplain spring stream samples and so set up river reach for Monday experiment 16:00 Maybe RCC lecture 19:00 dinner
Friday	06:45 reveille 09:00 Break camp, launch 10:00 Sample upwelling reach somewhere along way 12:00 Lunch 13:00 enter canyon 13:30 watch kayakers swim Bonecrusher? 16:00 take out 17:00 Burritos 19:00 return to FLBS

Date	Lectures – Labs – Field Work
Monday	08:30am Pack for nutrient experiment 10:30am Return to Nyack, NO <sub>3</sub> addition experiment 16:00 Maybe chemistry if NH <sub>4</sub> works, enter and go over salt data and nitrate data 17:30pm Dinner
Tuesday	08:30 Lecture RCC and Stream Food webs 11:00 Wallace discussion 12:00 Lunch 13:00 Data and sample analysis 17:30 Dinner
Wednesday	08:30 Giersch discussion 09:00 Samples and data 12:00 Lunch 13:00 Data and writing 17:30 Dinner
Thursday	08:30 Metabolism analysis 11:00 Lecture: Bioassessment 12:00 Lunch 13:00 Data and writing 17:30 Dinner
Friday	08:30 Lecture: Dams 09:30 Kennedy Discussion 10:30 Finish and submit paper by 12:00 12:00 Lunch 13:00 Chill 15:00 Final exam

Students with disabilities may request reasonable modifications by contacting the instructor. The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and the Office for Disability Equity. The University does not permit fundamental alterations of academic standards or retroactive modifications. If you have a disability that adversely affects your academic activities, please let us know at [summersession@flbs.umt.edu](mailto:summersession@flbs.umt.edu) so we can discuss an accommodation.