



Flathead Lake  
Biological Station



UNIVERSITY OF MONTANA

Summer Session 2017

## BIOE 342 Field Ecology

5 credits: Lectures, Labs, Field Work

Course dates: June 26–July 21, 2017

Instructors: TBA and Eric Richins, Faculty – Wildlife and Fisheries, Salish  
Kootenai College

<http://flbs.umt.edu/>

**Prerequisites:** One year of college-level biology, chemistry, and mathematics or equivalents; or consent of instructor.

### Course Description:

Ecology is the study of biophysical controls on the distribution and abundance of biota, including human influences. Prerequisites: One year of college-level ecology, biology, chemistry, and mathematics. The course provides detailed study and discussion of ecological phenomena including: behavior and life cycles of organisms; population, community and landscape dynamics; biodiversity and productivity; biophysical processes (e.g., climate change, nutrient cycles, herbivory, predator–prey interactions) and organization (e.g., genomes, ecosystems, biomes, ecoregions) across space (local to global) and time scales; and ecological economics and human ecology. Natural history observations, ecological principles and results of scientific studies are used to explain biological patterns, processes, responses and complex interactions as influenced by changing environmental conditions. Lectures build upon the laws of thermodynamics, evolution, trophic dynamics and other unifying principles to present ecology as a key discipline of the natural world and essential to human well-being. This course is conducted outdoors regardless of weather, including all lectures and lab exercises, so those ecological phenomena can be examined in real time and real life. All day and overnight trips, mainly by foot, will be conducted throughout the course, taking students into the full range of aquatic and terrestrial environments near the Biological Station and the adjacent mountain areas, including Glacier National Park. Students are expected to take detailed notes and conduct directed measurements that will require analysis and interpretation through written and oral presentations and written reports edited by the professor. Meets writing requirement.

**VERY IMPORTANT NOTE**—To enjoy this course and to learn the content fully, you must be: in good physical condition, able to hike up to 10+ miles a day in strenuous conditions at altitude (sometimes off established trails), and properly equipped for a great deal of hiking. If you are unsure about your hiking skills, please contact [flbs@flbs.umt.edu](mailto:flbs@flbs.umt.edu).

**Required Books:** (Books are available for purchase at the Biological Station Bookstore. Alternatively, you may wish to rent textbook(s) or purchase electronic textbook(s) prior to your arrival.)

Molles Jr., M. C. 2012. *Ecology: Concepts and Applications* (6th Edition). WCB/McGraw-Hill. (Paperback)  
Kershaw, L., A. MacKinnon and J. Pojar. 1998 or newest. *Plants of the Rocky Mountains. Lone Pine Field Guide*. Lone Pine Publishing, Renton, WA. ISBN 1-55105-088-9.

**References:** 1) Electronic and hard copies of supplementary reference materials will be provided by instructors and FLBS. 2) Wilson, E. O. 2003. *The Future of Life*. Vintage Books, Division of Random House, Inc., New York, NY. ISBN 0-679-76811-4 Paperback.

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

- Rite in the Rain field notebook (8.5 X 11)\*
- All Weather permanent ink pen and a few pencils\*
- Hot/cold mug\*
- Water bottle\*
- Resealable lunch pack-up container(s) & mess kit\*
- Wading shoes or sandals
- Broken in hiking boots; layered outer wear
- **REQUIRED Overnight Gear and Other items to bring checklists:** ([Click to view](#))
- Binoculars & camera (optional, but great scenery)
- Bear spray\*
- Laptop computer with MS Excel, MS Word and (good stats package—optional but very useful)
- Rain gear including umbrella (optional, but very useful in drizzle)
- Personal first aid kit

**Student Learning Outcomes:**

After taking this course students will be able to:

- 1) identify and describe the ecological processes that that determine the distribution and abundance of organisms and their ecosystems within the landscapes of the Northern Rockies;
- 2) to identify common plant and animal species of the Northern Rockies,
- 3) understand basic tenets of ecology, such as trophic dynamics, evolution, life history energy balance, competition and habitat-niche relationships;
- 4) apply experimental designs and systems thinking to test hypotheses and build conceptual modes of biophysical processes that define ecology as a discipline; and,
- 5) understand the vitally important role of ecology in sustaining ecosystem services that influence human well-being.

**Grading:**

Exams and Grading

- 1) **Participation/Professionalism for 20% of grade**, based on attendance, attitude, preparedness and
  - a) Field notebooks—thoroughness, legibility, content of questions and observations. *Important because not just you, but fellow students will be partly relying on data you record.* Field notebooks turn in by 5 PM Thursday July 13, will be returned to your mailbox by Friday July 14 noon. Field notebooks are also due last day of class. Average of mid-course and end of course grade.
  - b) Journal article mini seminars—informal small group presentation and discussions based on published papers assigned by the instructor and relevant to the field trips. You will be graded on your role in co-leading one or 2 discussions as assigned, and on participation in other discussions.
- 2) **Brief Written Field reports: One due per week/ 1<sup>st</sup> week is Lichen Lab**, after that choose which field trip and sites(s) or aspect of field observations and sampling from that week you want to focus on. Introduction (importance of problem, identify research question), Methods, Results (must include field data and analysis of it, including one or more tables, graphs; photographs also where they provide information specific to the field study), Discussion and Conclusions (include shortcomings and next steps to improve or expand results), Literature Cited (3 or more citations), and a 50-word Abstract. Total *ca.* 4–6 pages single spaced, plus any figures or photographs you include. **Your three best report grades will be averaged to total 30% of grade.**
- 3) **Independent research project report and Powerpoint presentations:** Initial project idea verbally discuss with TBA and Eric Richins by Thursday June 28. Each student is required to present a 5-minute Power Point Proposal in class afternoon of Thursday July 13. Written report and 5-minute summary

power point presentation due 4<sup>th</sup> week of class (there may be an interim deadline for drafts to Eric prior to this); **30% of grade** (based on powerpoint proposal, final written report and final powerpoint summary).

4) **Final Exam**—last class day. **20% of grade**

### **Course Policies:**

The goal in this class is for students to thoroughly understand ecology in a functional process context through observation and directed analyses in the Crown of the Continent Ecosystem. We will learn common plants and animals of this region, how they interact along complex biophysical gradients and how ecosystems like this one provide goods and services that are essential to human well-being.

Please note – the course is taught entirely outside, regardless of weather, Monday through Thursday, often using 10 hours or more per day. We will hike some every day and on some days we will hike all day, studying ecology as we go. Students must be prepared. If you are absolutely certain that you can hike at least 10 miles and maybe can do 18 miles in the mountains with a light pack in a day, you will really enjoy this course. If you are not sure of your hiking skills in the rough terrain of mountain landscapes, but you like to exercise and are really committed to learning Ecology in this marvelous field setting, Eric and TBA will teach you how to enjoy hiking as a part of the ecological experience.

#### Analysis and writing assignments based on in-class data collection

Each student is required to complete directed analysis of data collected by the class and produce written reports. The instructors will evaluate and discuss reports with each student to improve writing skills. So, special attention is paid to how reports are prepared. All reports should generally follow formatting for the journal *Ecology*. See Moodle Day 1 for a link to the *Ecology* webpage with instructions for authors. In short, include a title, a short abstract less than 150 words, Introduction, Methods, Results, Discussion, Literature Cited, Tables and Figures. The results section will include graphical presentation of the analyses and statistical interpretation of the data. Handouts are provided in electronic format on Moodle with information on how to conduct the work and with questions that should be addressed in the write up. The objective of these reports is to introduce the student to scientific method in ecology, proper approaches to data collection and analysis and conduct of scientific writing. Reports typically are 3–5 pages in length, including graphics.

Each week you will be assigned a report or an alternative assignment as planned by the instructors.

#### Projects

Each student is required to conduct an independent research project on an ecological phenomenon. The project may be observational or experimental, but must be empirical. A written proposal or study plan approved by the instructors is required prior to conduct of the study, by the end of week one (prior to start of Field Day 5). Draft project reports are due prior to the start of the first day of the 4<sup>th</sup> week of the course. Example reports from previous classes are available for perusal on the Moodle course interface under Day 1. Instructors will edit the reports and return them to the student for revision. Final reports are due on the last day of the course when each student also will make a PowerPoint presentation to the class describing his/her project in scientific terms. The purpose of independent projects is to provide hands-on experience in planning, conducting and conveying ecological research.

#### Outside of Class

Use Friday–Sunday periods to read, review and work on assignments and projects. You cannot do well in this course without reading the text. We will cover many of the major topics in the book during the first two weeks and then reinforce them by repeatedly revisiting concepts and processes as we encounter them during our field day jaunts. Students are expected to take notes in the field, make directed measures (focused field

studies) and in the evenings work in groups to analyze and present the data (group work products). Some of the focused field data will be analyzed individually and presented to the professor as written reports.

Hiking on the off days is encouraged because there is so much to see around FLBS, but conduct your trips in the context of the course content.

#### Use of Wireless Internet at FLBS:

A reliable secure wireless connection to the Internet is available in selected areas. An online learning interface (Moodle) is used to provide electronic versions of many of the course assignments and supplementary readings for the Field Ecology course.

**Schedule:** (Tentative to be revised late Spring 2017)

**We follow this schedule rain or shine; topics may vary depending on what we encounter in the field.**

#### WEEK ONE

Monday, June 26:

8:15 AM-10, Introductions, orientation, syllabus discussion, grading basis, field trip logistics and prep. Field notebook format and content. Intro to topics in ecology we'll be covering.

SEMINAR 10-11am. Clint Muhlfeld, USGS

11am-noon Kerry Foresman Mammal ecology lecture,

1pm Small mammal trap grid setup and documentation, FLBS grounds

Tuesday, June 27:

6-7:30 AM Mammal trap check

7:30 AM Pack lunch and vehicles

8:15 AM leave for Bison Range trip with Cons. Ecol.

9:30 AM Bison Range talk Germaine White, CSKT

10:30 AM, Amy Lisk USFWS, weeds, biocontrol

Afternoon stops in return: Crow Cr reservoir -reservoir productivity and effects

Frissell property (Polson) top down predator effects and weed invasion. Return FLBS ca 5pm.

7-9pm Mammal trap check

Wednesday, June 28:

6-7:30 AM mammal trap check.

7:30 AM Pack lunch etc.

8:30 AM leave on *Jessie B* for Wildhorse Island Day trip.

Pack field guides, meter tapes, diameter tapes, increment borers, PCV quadrats, flags for vegetation sampling, insect sweep nets, Return from Wildhorse Island. AM: Lichen Lab with Eric. LUNCH: discussion of independent project ideas. PM: Forest-grassland vegetation gradient sampling

4 PM Return departure

7-9 PM Mammal trap check

7-9 PM Mammal trap check

Thursday, June 29:

7:30 Pack lunch etc.

8:30 *Jessie B*. Flathead Lake sampling day trip with Jim Craft.

Bring jars, preservative for plankton sample preservation. Return ca. 3:30.

3:30pm-5 pm Mammal trap check and dismantle grid, 7-9pm if needed.

Friday, June 30:

7:30 AM Pack lunch etc.

8:00 AM-Noon

## WEEK TWO

Monday, July 3:

7:30 AM Pack lunch

8 AM: Pack vehicles for 2-nighter to Two Medicine, Glacier NP.

Pack tent, sleeping bag, flashlight and headlamp, daypacks, water bottles, personal items for 2 nights camping.

Data analysis: Wildhorse I. & Mammal sampling.

10 AM Lichen Lab report from Wildhorse trip are due

10 AM SEMINAR Cody Youngbull

11 AM Depart for Two Medicine w Cons Ecol. LUNCH en route.

PM: Joe Giersch, USGS: stream insect diversity and endemism near Logan Pass. Set up camp, Two Medicine Group Site. DINNER IN CAMP. Discuss project reports due Thursday and independent projects due 4<sup>th</sup> week.

Tuesday, July 4:

7:30 AM pack lunch

8:30 AM Glacier East side w Conservation Ecology class, Grizzly bear habitat sampling,

4-5 mile hike. Late afternoon, intro to fire ecology at forest-grassland interface at St. Mary or small stream trout sampling with Clint Muhlfeld, USGS.

PM Camp at Two Medicine

Wednesday, July 5:

7:30 AM pack lunch

8:30 AM Decamp after breakfast. Possible 8:30-10:30AM small stream trout sampling with Clint Muhlfeld, USGS.

Late AM head for Swan Valley for Porcupine Creek wetland complex sampling -

Late PM Return to biostation

Thursday, July 6:

7:30 AM pack lunch

8 AM Classroom day.

8:30-10AM- free work time and individual conferences on independent project proposals. Lab tasks for project reports (divide according to interests and report topics): Mammal trapping data analysis, invertebrate ID from Swan samples; Wildhorse Island vegetation gradient analysis, or Flathead L. data analysis. *PLEASE CLOSELY NOTE MULTIPLE DEADLINES TODAY (Class Field Project Report, Field Notebook, and 5-minute Independent Project Proposal) AND ALLOCATE YOUR WORK TIME ACCORDINGLY.*

4-5 PM Each student to present a 5 minute Power point talk on his or her independent project proposal.

5 PM First class project report and your field notebook are both due at 5PM. Field Notebooks will be returned to your mail boxes on Friday 6/24; if you need specific data form your notebooks - during this time, please photocopy before turning in.

Friday, July 7:

7:30 AM Pack lunch etc.

8:00 AM-Noon

## WEEK THREE

Monday, July 10:

7:30 AM Pack lunch and vehicles:

10 AM SEMINAR: Diana Six University of Montana

11:30 Depart to Mission Creek ecological restoration site in Moiese.

Bioremediation in artificial wetlands, effects of sedimentation on riverine fishes, invertebrate assemblages above and below an effluent pollution source on Mission Creek, compare behavior of two black bird species in an artificial wetland.

5 PM Return to Biostation

7 PM Pack up canoes for tomorrow

*Directed field notes: Bird behavior events and quantifying invertebrate response to stream pollution*

Tuesday, July 11:

7:30 AM Pack lunch and vehicles

8:30 AM Leave for waterfowl protection areas

Waterfowl ecology and reintroduction with Janene Lichtenberg- Wildlife Faculty at Salish Kootenai College

Lunch at Water Fowl Foundation with John Jarvis

Learn how to do point counts and transects for birds

5:00 PM Return to biostation

6:30 PM lecture Subsidies and river invaders

*Directed field notes: Bird counts from both techniques*

Wednesday, July 12:

7:30 AM Pack lunch and leave ASAP for river with boats

Noon Launch on River trip to Lower Flathead River with Landscape Ecology, Serial discontinuum concept, ecology of large rivers, optimal foraging theory

5:00 PM Return to biostation

7:00 PM wash boats

7:30 lecture Domestication of plants, animals, and us

Thursday, July 13:

7:30 AM Pack lunch and cars

8:30 AM Drive to Lake Seed Inc: Agroecosystems

Potato production: Maximum yield farming and feeding the masses

Plant cloning and genetic engineering

Pest control: biocontrol and other alternatives to herbicides and pesticides

Organic food alternatives

How are we going to feed all these People?

5:00 PM Return to biostation

Friday, July 14:

7:30 AM Pack lunch etc.

8:00 AM-Noon

#### WEEK FOUR

Monday, July 17:

7:00 AM pack vehicles and camping gear

7:30 AM pack lunch

10:00 AM SEMINAR Jim Elser

11:30 AM leave for Nyack Floodplain

Landscape dynamics of an alluvial floodplain with Solomon Dobrowski Landscape Ecology class

Evolution in a disturbed landscape, flood disturbance ecology, flood plain forest ecology, spatial subsidies, connectivity of rivers and forests

PM Camp at Two Medicine Lake

After dinner Lecture: Using community data to look back at 14,000 years of climate and fires effects on the Greater Yellowstone Ecosystem.

Tuesday, July 18:

5:30 AM breakfast and pack lunch

6:30 AM leave for Pitamakam-Dawson Loop Hike 18 miles

Climate change, environmental gradients, regional climate, glacier dynamics

River continuum concept continued at high elevations

Dinner at Mexican restaurant

PM Camp at Two Medicine Lake

Wednesday, July 19:

6:30 AM breakfast and pack lunch

7:30 AM Leave Two Medicine Lake

11:00 AM launch on River trip on North Fork Flathead River

5:30 dinner at biostation

7 PM One-on one help with project presentations

Thursday, July 20:

7:30 AM pack lunch and vehicles

8:30 AM leave for drive up Forest Service road near Blue Bay In-depth look of fire ecology: Rick Everett, Salish Kootenai College

Hikes in multiple fire severities, community ecology in a fire-dominated system, the effects of fires on streams

12:30 Lunch at biostation

1:30 PM Begin final presentations on student projects

7:00 PM Final Exam

Friday, July 21:

7:30 AM Pack lunch etc.

8:00 AM-Noon