



**FLATHEAD LAKE
BIO STATION**
UNIVERSITY OF MONTANA

Summer Session 2022

**BIOE 451 Landscape Ecology
Syllabus**

3 credits; Lectures, Labs, Field Work

Course dates: July 4–July 15, 2022

Instructor: Dr. Tyler Hoecker

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General note: The course schedule is subject to change

Prerequisites: One year of college-level biology, chemistry, and mathematics, and an ecology course (can be met via BIOE 342 Field Ecology at FLBS) or equivalents; or consent of instructor.

Course Description:

This course will introduce students to the physical and ecological processes that shape landscapes, how these biological and physical processes interact, and how they are responding to global change. We will examine how plants and animals are distributed across landscapes, how the physical template of the environment shapes species distributions and how biotic feedbacks can influence the physical environment. We will examine processes of pattern formation in the environment such as disturbance from fire and how landscape pattern can affect both physical and biological processes. Field trips will underscore concepts and allow data gathering and interpretation by students. Students are introduced to geospatial technologies such as Geographic Information Systems (GIS) and the use of R, a data analysis and visualization platform which has become the standard in the biological and earth sciences. Students will analyze and interpret data through analyses and written presentations.

Landscape ecology focuses on the causes and consequences of spatial patterns in landscapes, and originated from the recognition by ecologists that spatial heterogeneity in ecosystems can be quantified and should not be ignored. Landscape ecology examines concepts, theory, and methods for characterizing spatial heterogeneity, its effects on the dynamics of ecosystem processes, and how these may vary through time. The fundamental concepts of landscape ecology are the basis for decision-making in many contemporary problems in conservation science and resource management.

This course will be principally focused on exploring landscapes of the Northern Rockies firsthand. We will spend a great deal of time hiking through landscapes, discussing concepts, and at times collecting data. We will utilize geospatial technologies to assist with this process where appropriate but these technologies are not the focus of this course. The course will entail generally short lectures that introduce a concept, a field trip related to that concept, data collection, and a written lab assignment that reinforces the focal concepts presented. Much of this learning will occur out in the field so students should be prepared to take notes and ask questions while hiking. Along with a basic understanding of landscape ecology, students will gain exposure to the natural history of the Crown of the Continent Region. This will include basic knowledge of the geologic history, climate, disturbance regimes, and flora of the area. This information will be reinforced with daily quizzes.

Student Learning Objectives:

After taking this course students will be able to:

- 1) Identify and describe many of the physical, biological, and anthropogenic processes that influence the distribution of organisms in the Northern Rockies.

- 2) Identify common woody plant species of the Northern Rockies.
- 3) Describe basic concepts used in landscape ecology such as island biogeography theory, the importance of landscape connectivity for organisms, and the role of disturbance in ecosystems of the Northern Rockies.
- 4) Apply simple geospatial technologies to study landscapes such as conducting analysis within a GIS for problem solving.
- 5) Describe why broad landscape-scale approaches to monitoring ecosystems are important for contemporary conservation and resource management problems.

Required Text: A textbook is not required although Turner's (below) is a good general resource. Turner, M. G., R. H. Gardner, and R. V. O'Neill. 2001. Landscape ecology in theory and practice. Springer-Verlag, New York.

Reference Texts: Electronic and hard copies of reference readings will be provided by the instructor. This course will emphasize readings from the primary literature. A paper or two will be assigned to read, prior to each field trip, related to the concepts that will be emphasized during that field trip. Students are expected to read the assigned reading prior to the field trip.

Course and Field Supplies/Equipment: (*available for purchase at the FLBS Bookstore) This field course requires a lot of hiking both on and off trail. Students must be prepared for the rigors of steep terrain, inclement weather, and field data collection. **We will hike up to 18 miles in a single day over steep terrain. Additionally, we will camp away from the Bio Station.** Students must be prepared for spending time in the field. It is important that students adequately prepare for field trips by making certain they have the appropriate equipment and resources for the trip. Weather in the N. Rockies is highly variable and can change quickly so students should always carry layers for warmth and rain gear. Students should bring the following supplies:

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| - Rite in the Rain field notebook with pencils* | - Personal mess kit – plate, cup, silverware |
| - Hiking boots & hiking socks (wool, not cotton socks) | - Headlamp and extra batteries |
| - Good water shoes for fording streams and rivers | - Insect repellent and sun screen |
| - Day pack | - Laptop computer (recommended) |
| - Field clothing for overnight trips | - Bear spray (optional) |
| - Warm jacket and rain gear | - First aid kit (optional) |
| - Sun hat for field use | - Map of Glacier Park trails and day hikes (optional) |
| - Lunch pack-up re-sealable container(s)* | - Camera, memory chip, film, binoculars (optional) |
| - Hot/cold mug* | - Hip boots or waders (optional) |
| - Water bottles to hold 2 liters of drinking water* | - Handheld GPS (optional) |
| - Personal tent, sleeping bag and sleeping pad | |
- **REQUIRED Overnight Field Gear and Other Items to Bring Checklists:** <http://flbs.umt.edu/urls/lists>

Evaluation and Grading:

- 1) Participation in class and discussion – 10%
- 2) Daily Quizzes – 30%
- 3) Written assignments and oral presentation (graduate students) – 60%

Graduate Increment:

Students taking this course for graduate credit must complete two additional assignments:

- Develop and present a short lecture (~15 minutes) to be given in the classroom or in the field that illustrates concepts from one of the assigned readings or an additional topic per consent of the instructor.
- Deliver an oral presentation (~15-20 minutes) related to their graduate research project highlighting where possible there exists linkages with Landscape Ecology.

Course Policies:

Students are expected to review and adhere to the University of Montana Student Code of Conduct at this link: https://www.umt.edu/student-affairs/community-standards/um_student_code_of_conduct_2021-2020.pdf 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 who have not already completed the University of Montana online Prevention Education Programs: AlcoholEdu and Sexual Assault Prevention for Adult Learners must complete these programs at this link: <https://www.umt.edu/student-affairs/programs/> (NetID and password required).

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/Lab/Field Work
3-Jul-2022 (M)	<i>Lecture and discussion</i> What is a landscape and what is landscape ecology? Fieldtrip - FLBS Station Grounds: Plant ID, orienteering <i>Reading- Readings</i> -Turner 1989, Korner 2007
4-Jul-2022 (T)	Fieldtrip – Jewel Basin or TBD: vegetation communities along an elevation transect. Vegetation and site characteristic sampling. Readings – Swanson et al. 1988; Dobrowski 2011
5-Jul-2022 (W)	Lecture and discussion The Physical Template: climate, topography water, soils. Lab 1- Extrapolating climate -MTCLIM and vegetation communities along an elevation transect. (due Monday) Reading - Yu and Lei 2001
6-Jul-2022 (Th)	Fieldtrip - Wild Horse Island Lecture and discussion Island Biogeography and landscape conservation Readings – Schwartz et al. 2009; Littlefield et al. 2019
7-Jul-2022 (F)	Lecture and Discussion. Climate change, landscape connectivity, conservation in Seeley Swan Valley.
10-Jul-2022 (M)	Fieldtrip - Nyack Research Natural Area. Landscape dynamics of an alluvial floodplain. Camp at Two Medicine Lake Readings – Pederson et al. 2005
11-Jul-2022 (T)	Fieldtrip - Pitamakan Pass. Geology, regional climate, glacier dynamics, climate change. Camp at Two Medicine Lake Readings - Reice 1994; Davis et al. 2019
12-Jul-2022 (W)	Fieldtrip- West Glacier NP: Fire and disturbance as an agent of landscape pattern formation. Avalanche Creek. Return to FLBS. Readings – Turner et al. 1993

13-Jul-2022 (Th)	Lecture and discussion - Disturbance regimes and landscape equilibrium Lab 2 - Intro to GIS and Disturbance in GNP (due Friday)
14-Jul-2022 (F)	Lab 2 Report writing Course review

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 so we can discuss an accommodation.