Summer Session 2025

BIOE 458 Forest and Fire Ecology
Syllabus

3 credits; Lectures, Labs, Field Work
Course dates: July 28–August 8, 2025
Instructor: Dr Andrew Larson & Josh Beisel
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Prerequisites: Two completed semesters of college-level coursework (sophomore standing); or consent of instructor.

Level: U/G offered for undergraduate and graduate credit (see graduate increment page 2)

Course Description
This course introduces students to aspects of population, community, landscape and ecosystem ecology, including the interactive biophysical attributes and processes of forest ecosystems. Students observe and learn about plant distributions and plant community structure, including principles of plant ecology, ecophysiology, and ecological disturbances, especially wildfire. Energy and materials transfer and feedbacks are used to describe complex interrelationships driving the dynamics of these systems, including both natural and human components as modifiers of systems dynamics. Students learn how data are collected to maximize information used to answer scientific questions. Field trips and field laboratory exercises are complemented with quantitative analysis of student-collected data, including tree demographic analysis, community composition and structural change, and analysis of net primary productivity and forest carbon stocks.

Student Learning Objectives
After completing this courses students will have acquired the skills and knowledge to:
- Evaluate of alternative ecological hypotheses based on interpretation of quantitative analyses.
- Explain feedbacks between forests, rivers, and floodplains.
- Apply mensuration techniques to quantify ecosystem structure.
- Describe patterns and explain mechanisms of forest succession following high-severity disturbance.
- Describe the core principles of experimental design and explain the basis for each principle.
- Compare interspecific and intraspecific competition, and facilitation.
- Identify and differentiate between woody plant species based on diagnostic characteristics.
- Generalize relationships between plant population density and ecosystem productivity and carbon storage across plant communities.
- Explain the disturbance regime concept.
- Interpret biotic and physical limitations to tree establishment and survival.
- Explain plant adaptations to fire, and apply information about plant traits to predict ecosystem response to wildfire.
- Compare and explain the roles of topography, weather and fuels in regulating fire behavior.
- Compare how climate variability regulates wildfire activity in fuel moisture-limited vs. fuel amount-limited ecosystems.

Required Texts
Readings are taken from the primary literature and will be provided.

Course and Field Supplies/Equipment (*available for purchase at the FLBS Bookstore) 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. Note: **Students will be camping overnight.** Food and cooking equipment are provided.

- Field notebook ("Rite-in-the-Rain" all-weather type)*
- Plenty of pencils, regular or mechanical; permanent ink pens*
- Hot/cold mug – useful at FLBS and for drives to field sites*
- Laptop computer
- Comfortable hiking boots that you're willing to get wet
- Pack suitable for day trips
- Packable water bottles (total cap ≥ 2 qts)
- Lunch pack-up container (resealable plastic)
- Mess kit, cooking gear and utensils
- Sunscreen, sun hat and sunglasses
- Compact personal hygiene kit for field use
- Binoculars (optional)
- Flashlight or headlamp and batteries
- 30 ft of rope for hanging food and pack out of bears' reach
- Cooking stove and fuel (optional)
- Drinking water purifier or filter (optional, but desirable)

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

Student Learning Outcomes
- Introduction to sampling techniques for plant community research and monitoring
- Accurate use of traditional (compass, diameter tape) and modern (laser rangefinder, GPS) equipment
- Introduction to fundamentals of experimental design
- Understanding of physical environmental limitations to plant establishment, growth, and survival.
- Knowledge of plant disturbance adaptations and implications for community resilience to wildfire and other disturbances
- Identification of woody plant species of the Northern Rockies.
- Knowledge of forest-river interactions and feedbacks including large wood and floodplain succession

Evaluation and Grading
Participation: 30%
Final oral exam: 35%
Data analysis and research paper: 35%

Graduate Increment
Students taking this course for graduate credit must complete two additional assignments:
- Develop and present a field lecture and associated activity (e.g., vegetation measurements, data presentation or analysis, including a student assessment device) that elaborates and illustrates concepts from one of the assigned readings.
- Deliver an oral presentation and defense of their final research project.

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 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 before the course using your UMT NetID and password.

Class Schedule (2025 Updates Pending): This tentative schedule is subject to change dependent on location conditions and availability.

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

Date	Location	Topic and activities
Monday	Napa Point	Map and compass use, intro field methods, species distributions along environmental gradients, white bark pine ecosystems.
Tuesday	Glacier NP	Fire behavior; high-severity fire effects; forest structural development and succession; coarse woody debris.
Wednesday	Varies year-to-year	Net primary productivity, biomass accumulation, forest carbon storage. **Overnight camping.**
Thursday	Varies year-to-year	Long-term experiment re-measurement: tree recruitment, growth and mortality; surface fuel dynamics; experimental design. **Overnight camping**
Friday	Varies year-to-year	Frequent-fire forests; plant functional traits and disturbance adaptations.
Monday	FLBS	Subalpine forests and alpine tree line.
Tuesday	MF Flathead	Forest-stream interactions, large woody debris & fluvial wood; floodplain succession; density-dependent growth and mortality; self-thinning. **Overnight at Nyack**
Wednesday	FLBS	Data analysis: Tree demography, forest carbon stocks and net primary productivity. **Overnight at Nyack**
Thursday	Swan Valley	Culturally modified trees; Native American use of fire; old-growth forests.
Friday	FLBS	Final exam/paper; graduate student presentations.

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.