

Forest Ecology | FORS 330 | Course Syllabus

3 credits. Lecture format. Meets Tuesdays and Thursdays 11:00 AM – 12:20 PM

Instructor Team

Instructor: Dr. Tyler Hoecker

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Office hours: Tues. 9-11 am in CHCB 424

Prerequisites

One introductory biology, botany, or ecology course: BIOO 105N or BIOO 170N or BIOE 172N or BIOB 160N or BIOB 101N or FORS 240, and one introductory soils course: NRSM 210N or ENSC 245N.

Course Description

Ecology is the scientific study of relationships between organisms and their environment, interactions among organisms, and the cycling of material and energy through ecosystems. Forest ecology is concerned with the structure, composition, function, and dynamics of forests as complex adaptive systems, and forms the primary scientific basis of forest management. This course introduces foundational ecological concepts and considers their application to understanding and managing local, regional, and global forest ecosystems. Additionally, this is a writing-intensive course that emphasizes the development of scientific literacy and the skills needed to critically synthesize information.

Learning Goals

- Understand and explain:
 - how the physical environment regulates tree establishment, growth, and mortality
 - effects of environmental gradients on the distribution of species and ecosystems
 - dynamics of forest ecosystems over time and space
 - interactions and symbioses among forest species
 - cycling of nutrients and energy through forest ecosystems
 - impacts of global climate change on forests at multiple scales
- Critically evaluate and attribute multiple forms of knowledge about forest ecosystems, including peer-reviewed literature, natural history, Indigenous ecological knowledge, and technical reports
- Synthesize and communicate information on a complex forest ecosystem topic, including relevant ecological theory and implications for forest management, in a written report

Academic Integrity

Plagiarism, cheating, and other misconduct are serious violations of your contract as a student. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.

Plagiarism is presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement (definition from: <https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>). Please review the

information at this link; you are responsible for understanding what constitutes plagiarism. Not all examples of plagiarism are the same and will therefore be dealt with on a case-by-case basis. Because this is a writing-intensive course, plagiarism *will* be taken seriously and could involve partial or total loss of credit for an assignment, additional work, or formal disciplinary action.

Diversity, Equity, and Inclusion

The highest priority of this course is to create a learning environment where all students feel safe, heard, respected, and empowered by the opportunity to succeed. Behavior (including [microaggression](#)) that supports hate, discrimination or marginalization based on any aspect of identity will not be tolerated. Everyone is responsible for the effects of their behavior and language on others, even when harm was not intended. Please report any incidents to me and/or the [UM Title IX office](#). Know that as an instructor, [I am a Mandatory Reporter](#).

All students are expected to be familiar with and follow the [Student Code of Conduct](#) and the UM policy on [discrimination, harassment, sexual misconduct, stalking, and retaliation](#).

Disability Accommodations

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information as soon as possible. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

Covid-19

COVID remains a local and global health risk. We may have to make small or large changes to learning modalities, classroom policies, etc. in response to changes in the COVID situation. Until then, all course material will be delivered in person and in-person attendance is expected. I will strive for empathy and respect regarding COVID and ask that you do the same.

- Mask use is currently optional in the classroom.
- If you feel sick and/or are exhibiting COVID-19 symptoms, please do not come to class and contact the Curry Health Center at (406) 243-4330.
- If you are required to isolate or quarantine, you will receive support in the class to ensure continued academic progress.
- UM recommends students get the COVID-19 vaccine, including boosters. Please direct your questions or concerns about vaccines to Curry Health Center.

Learning Outcomes

Students completing this course will be able to:

- Explain how global climate and regional landforms shape the distribution of forest types and species at multiple scales
- Understand the attributes of forests that are represented by structure, pattern, and composition and how they relate to ecosystem function
- Understand the factors controlling water balance in forest ecosystems
- Anticipate the dynamics of a forest stand over time based on competition and mortality
- Summarize primary productivity, including photosynthesis, and its controls
- Describe biogeochemical cycling forest ecosystems
- Understand the role of disturbance processes in forests, describe the disturbance regime concept generally and specifically for various forest systems

- Explain the process of tree regeneration and key limiting factors
 - Describe paleoecological perspectives, insights, and methods
 - Describe relationships between spatial patterns and ecological processes
 - Describe the characteristics and importance of mycorrhizal fungi in forests
 - Understand causes of climate change and potential climate change scenarios
 - Describe observed effects of climate change on forests and disturbances, and anticipate future impacts of climate change on forests
 - Relate forest attributes to wildlife habitat
 - Describe relationships between forests and aquatic ecosystems
 - Describe biodiversity and consider its relationship to ecological function
 - Categorize various forms of forest stewardship, their relative strengths and weaknesses
 - Relate Indigenous ecological knowledge with other ways of knowing
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- Synthesize complex scientific information in concise and accessible writing
 - Access, read for comprehension, and correctly attribute peer-reviewed literature
 - Engage with ecologists by reading their work and articulating relevant questions
 - Apply ecological theory to forest management challenges

Writing Outcomes

FORS 330 meets the WA Franke College of Forestry and Conservation's distributed advanced writing requirement.

Approved Writing Course learning outcomes:

- Use writing to learn and synthesize new concepts
- Formulate and express written opinions and ideas that are developed, logical, and organized
- Compose written documents that are appropriate for a given audience or purpose
- Revise written work based on constructive feedback
- Find, evaluate, and use information effectively and ethically
- Begin to use discipline-specific writing conventions
- Demonstrate appropriate English language usage

Advanced Writing Requirement in the Major learning outcomes

- Identify and pursue more sophisticated questions for academic inquiry
- Find, evaluate, analyze, and synthesize information effectively from diverse sources
- Manage multiple perspectives as appropriate
- Recognize the purposes and needs of discipline-specific audiences and adopt the academic voice necessary for the chosen discipline
- Use multiple drafts, revision, and editing in conducting inquiry and preparing written work
- Follow the conventions of citation, documentation, and formal presentation appropriate to that discipline
- Develop competence in information technology and digital literacy

Writing Center

The Writing and Public Speaking Center provides one-on-one tutoring to students at all levels and at any time in the writing process. Visit now. Visit often. We're ready when you are.

www.umt.edu/writingcenter.

Course Schedule and Assignments

Late Assignment Policy

Students participating in official University activities will be allowed extensions on assignments and make-up opportunities with terms established on a case-by-case basis and following University policy. Excused absences for non-University activities (e.g., family emergency, medical emergency) will be considered on a case-by-case basis, according to University policy. **Requests for extensions are more likely to be granted when they are made well in advance of the assignment deadline. If you are struggling to complete an assignment, please ask for help before the deadline!** If no arrangements are made in advance, the overall grade of the assignment will be diminished by 20% for each day late.

Assignment	Due Date	Points
Introduction email	Sept. 1	5
Content Quiz 1	Sept. 20	10
Content Quiz 2	Oct. 6	10
Synthesis 1: Topic Idea	Sept. 29	10
Mid-term Evaluation	Oct. 20	10
Writing Workshop Attendance	Oct. 25	5
Synthesis 2: Proposal	Nov. 8	50
Content Quiz 3	Nov. 15	10
Synthesis 3: Complete Draft & Peer Review	Nov. 22	20
Synthesis 4: Revised Draft	Nov. 29	60
Content Quiz 4	Dec. 13	10
Synthesis 5: Final Report	Dec. 15	0
Final Evaluation	Dec. 20	10
Total (lowest quiz score dropped)		200

Readings

Reading is essential for learning and applying ecology, thus, reading assignments are an important component of this class. Readings are drawn from recent and foundational papers and two textbooks (see below). Assigned textbook chapters will be scanned, but I encourage interested students to rent or purchase the book. **Assigned readings are subject to adjustment; please check Moodle regularly for changes.**

Content Quizzes

Your understanding of material presented in readings and lectures will be assessed with four quizzes. Besides motivating you to spend time with course material and attend class, these quizzes will also ask you to reflect on *how* you are learning.

- Your lowest quiz score will be dropped, for a total of three graded quizzes.
- You will have 30 minutes during class to complete the quiz. You are allowed access to resources during this time. **Bring your laptop to class on the day of the quiz.**
- During the rest of the class period, we will review and discuss the questions.

- Unless you have an established accommodation, requests to take quizzes outside of the designated class period, due to an excused absence, must be made one full week in advance (for example, a request for a quiz on Sept. 8 must be made on Sept. 1).
- **An absence on the day of the quiz without prior arrangements will result in a 0/10.**

Self-Reflection and Instructor Evaluation

An important goal of undergraduate education is to learn not only discipline-specific content, but how to educate yourself and engage with information to build knowledge. The process of 'meta-cognition', or reflecting on your own thinking, is an effective way to build this skill. You will have two graded opportunities to practice self-reflection about your progress and success in class. Reflection is the act of looking back at your previous work and honestly assessing ways that you were successful or could improve. I will provide specific guidance as these assignments approach.

I will also invite you to provide feedback on my performance as an instructor in the middle of the semester. The department will also require evaluations at the end of the semester. Both will be anonymous. I appreciate your constructive feedback. Feedback that is honest, specific, respectful, and mindful of your own effort in the course is the most useful.

Course Schedule

Week	Date	Topic	Required Reading	Optional Reading	Guest	Laptop?	Notes/Deadlines
1	30-Aug	Introduction	Syllabus				
1	1-Sep	Scaling, ecosystem attributes, state factors	Perry Ch. 9 (156-170)	Chapin Ch. 1			
2	6-Sep	Forests and the climate system	Chapin Ch. 2 (skip 'The Ocean')				Introduction Email due before class
2	8-Sep	Climatic controls on forests					Michell is traveling
3	13-Sep	Walk up Sentinal	Lawler et al. 2015	Perry Ch. 5			Meetings 5/6 may swap pending weather
3	15-Sep	Water balance in forests	Stephenson 1998	Chapin Ch. 4			
4	20-Sep	Content Quiz # 1 / Formative Review				YES	
4	22-Sep	Stand development: Competition, mortality, gap dynamics	Perry Ch. 12 (short)		Dr. Andrew Larson		
5	27-Sep	Photosynthesis and forest productivity	Perry Ch. 15	Chapin 134-155			
5	29-Sep	Nutrient and energy cycling	Perry Ch. 18				Topic Idea due on Moodle before class
6	4-Oct	Disturbance and succession	Turner 2010				
6	6-Oct	Content Quiz # 2 / Formative Review				YES	
7	11-Oct	Paleoecology (long-term forest dynamics)	Higuera et al. 2021		Dr. Philip Higuera		Tyler is traveling
7	13-Oct	Fire in the Wilderness	TBD		Mark Kreider, M.S.		Tyler is traveling
8	18-Oct	Accessing, reading, attributing peer-reviewed literature		Perry Ch. 7		YES	
8	20-Oct	Landscape ecology	Turner 1989				Mid-term Evalutaiton due on Moodle before class
9	25-Oct	Writing Workshop - UM Writing Center			Dr. Catherine Filardi	YES	Participation worth 5 points

9	27-Oct	Mycorrhizal fungi and networks	Selosse et al. 2006	Perry Ch. 19			
10	1-Nov	Climate change impacts on forests	McDowell et al. 2020				
10	3-Nov	Forest-riparian ecotone			Michelle Fillion		
11	8-Nov	Ecosystem resilience					Proposal due on Moodle before class
11	10-Nov	Indigenous ecological knowledge	Berkes et al. 2000	Knight et al. 2022	Dr. Nina Fontana		
12	15-Nov	Content Quiz # 3 / Formative Review				YES	
12	17-Nov	Biodiversity and conservation					
13	22-Nov	Topic Synthesis Peer Review					Bring TWO printed copies of Complete Draft and a pen to class
13	24-Nov	Thanksgiving - No class meeting					
14	29-Nov	Stewardship: restoration, adaptation, management					Revised Draft due on Moodle before class
14	1-Dec	Meet the investigator: Sensitivity of forest productivity to microclimate	Hoylman et al. 2019		Dr. Zach Hoylman		
15	6-Dec	Meet the investigator: Simulating forest ecosystems and disturbance dynamics	Hansen et al. 2021		Dr. Winslow Hansen		
15	8-Dec	Meet the investigator: TBD					
Finals	13-Dec	Content Quiz # 4 online, no class meeting					
	15-Dec	No class meeting					Final Topic Synthesis Report due on Moodle before 11 am
	20-Dec	No class meeting					Final Self-Reflection Due

Topic Synthesis Report

The goal of this course is to build your knowledge of fundamental concepts in forest ecology, develop your ability to critically evaluate information, and gain practice synthesizing knowledge. A semester-long project, culminating in **a comprehensive written synthesis of a topic of your choice**, will help us meet these goals. This assignment accounts for 70% of your grade and spending time on each component is key to be successful in this class.

Choose a contemporary topic in forest ecology

Choose a forest ecology topic from the provided list on which to focus your report. These topics are relevant to management and/or represent gaps in our understanding of forest ecosystems. If you have a concept in mind that is not listed, let's discuss it.

Formulate a research question focused on your topic

Develop a compelling question focused on your topic that can be answered by reviewing and synthesizing published information *and* is important for understanding and managing forest ecosystems. This question will take some time to develop.

Build your report using iterative feedback

You will complete and receive feedback (including a score) on a series of five components that provide a model for how technical writing about complex topics can be approached. These assignments are graded individually and together become your final report. They are summarized here, but I will provide more details as we approach them.

You will be evaluated on these components:

1. Topic Idea. A **500-word description of the topic** you're considering. Describe your topic using a set of keywords, consider initial questions you have about the topic, and explain how it is relevant to forest ecology and/or management. **Due on Moodle before class on Thursday Sept. 29 10 points.**
2. Proposal. Your proposal will include **a research question, an outline of your report, and an annotated bibliography**. We will have a writing workshop to learn about developing these components. You will receive feedback on your proposal from the instructor team. **Due on Moodle before class on Tuesday Nov. 8 50 points.**
3. Complete Draft & Peer Review. Using your proposal, develop **a complete draft of your report**. This should be 10-15 pages. You will receive feedback on this draft from two peers. Peer review is an essential part of the scientific process and is important for improving the clarity and effectiveness of our writing. **Bring TWO printed copies to class on Tuesday Nov. 22. 20 points.**
4. Revised Draft. Using feedback from your peers, revise your complete draft. This draft should be no more than 10 pages, excluding references and figures. **Due on Moodle before class on Thursday Nov. 29. 60 points.**
5. Final Report. This is the final version of your report, which may or may not differ from your Revised Draft. With this draft you can earn more points up to the full 60 possible points from Pt. 4. **Due on Moodle before class on Thursday Dec. 15. Variable points.**

Possible topics

Marine-derived nutrients in forests	CO ₂ fertilization / water-use efficiency
Nitrogen and/or phosphorous cycling	Pollinators and forests
Biodiversity (patterns, functions, conservation)	Wildlife habitat
Carbon cycling	Managing forests for multiple objectives
Climate change mitigation and/or adaptation	Ecosystem services (generally or specifically)
Forest restoration	Protected areas / conservation
Indigenous ecological knowledge	Decomposition, heterotrophic respiration, soil
Herbivory	Habitat loss and/or habitat fragmentation
Invasive species	Woody encroachment / interactions between forest and rangeland
Animal-dependent dispersal	Forest/landscape genetics/genomics
Assisted migration	Adaptive silviculture
Species distributions and climate change	Forest understories (i.e., non-tree species)
Forest insects (e.g., bark beetles)	Ecosystem resilience
Forest pathogens (e.g., whitepine blister rust)	Elevational or latitudinal treelines
Forest-aquatic interactions	Plant functional traits
Prescribed fire, cultural burning, or wildland fire use	Postfire forest recovery
Wood anatomy and drought tolerance	Synthesis of knowledge of a threatened species