

# Ecology: Cool science that matters

Zoom for lectures, x-hours, and Matt: <https://dartmouth.zoom.us/j/4787688743>

## **COURSE OBJECTIVES FOR BIO 16**

**To explore the central theories and principles in ecology and evolution, and to survey the evidence that supports them. Major topics will include:**

- *Limits to Distribution*. What determines where species do and do not occur?
- *Behavioral Ecology*. How does the behavior of individuals evolve and what are the consequences for biological populations?
- *Population Ecology*. What determines the abundance, dispersion, age structure, and dynamics of biological populations?
- *Species Interactions*. What is the nature of species interactions such as competition, predation, parasitism, and mutualism? How do these interactions influence distribution and abundance?
- *Community Ecology*. What determines the structure, organization, and dynamics of groups of species?
- *Ecosystem Ecology*. How do energy and matter move through the biological and physical components of ecosystems? How do organisms and abiotic factors influence the function of ecosystems and the services they provide to society?
- *Applied ecology*. How do humans influence biological systems and vice versa?

**To participate in the process by which theories are conceived, tested, refined, and falsified.**

- Learn how to ask ecological questions, formulate hypotheses, generate predictions, design and conduct experiments, perform quantitative analyses, interpret data, and report findings.
- Become proficient in reading graphs, interpreting data, evaluating and manipulating simple mathematical models, and applying empirical data to evaluate theoretical predictions.
- Gain understanding of the structure of knowledge in ecology, biology, and the natural sciences in general.

## **STAFF & OFFICE HOURS:**

*Professors:* Matt Ayres (LSC 125); Office hours Tues 3-4 pm, Fri 3-4 pm, & by appt.

*Laboratory Director:* Craig Layne (LSC 121); Office hours by appt

*Graduate Assistants:* Kaitlin McDonald, Office hours to be announced  
Ridhi Chandarana, Office hours to be announced  
Michelle Irengbam, Office hours to be announced

## **TEXTS and READINGS:**

Many lecture readings will come from the following text:

*Ecology: The economy of nature*. Robert Ricklefs and Rick Relyea. 2013. 7<sup>th</sup> Edition.  
ISBN-10: 1429249951; ISBN-13: 9781429249959

The textbook readings are complementary to the lectures but will differ in structure and content.

Other readings will be announced in class and made available on Canvas

**CANVAS** All important class materials (e.g., readings and handouts) will be posted on Canvas.

**QUIZZES and EXAMINATIONS:** There will be four quizzes and a final examination. Quizzes will occur during x-hours (see schedule). The final exam will occur at the time scheduled for C section classes by the College. Quizzes and exams will be time-limited (50 minutes for quizzes and 2 hours for the final). Quizzes and the final exam will be open book, open notes, and open internet, but you may not consult with other students or other people. The exams will cover materials in lectures, X-hours, readings, and labs. Anticipate that 10-15% of quizzes and exams will be on material from readings or labs that was not explicitly covered in lectures.

**LECTURES:** M, W and F 10:10 to 11:15 in LSC 200; x-period TH 12:15-1:05

Your synchronous attendance at all lectures and X-periods is expected. Careful attention to lectures is the most effective (and time-efficient) preparation for examinations.

**LABORATORIES:** Monday 3-6 pm, Tuesday 3-6 pm, or Wednesday 3-6 pm

Synchronous participation in each week's laboratory activity is required. Via previous correspondence with Craig Layne, the Experiential Learning Facilitator (ELF), you should already have been assigned to one of the laboratory sections. If not, please contact us immediately. Laboratories consist of field and laboratory activities such as sample collection and enumeration, experimental manipulation, data analysis, interpretation, and discussion.

**SPECIAL NEEDS:** Students requesting disability-related accommodations and services for this course are encouraged to schedule a phone/Zoom meeting with me as early in the term as possible. This conversation will help to establish what supports are built into my course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; Getting Started with SAS webpage; [student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu); 603-646-9900) and to request an accommodation email be sent to me. We will then work together with SAS if accommodations need to be modified based on the learning environment. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

**WELL-BEING:** If you or someone close to you becomes ill, please speak with us and we will develop appropriate accommodations. Please talk to Craig Layne and your TA in advance if you are unable to attend a lab. Talk with Matt in advance if you think you will miss a quiz or exam. The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. Dartmouth offers resources to support your wellness, including:

Your undergraduate dean (<http://www.dartmouth.edu/~upperde/>);

Counseling and Human Development (<http://www.dartmouth.edu/~chd/>); and

The Student Wellness Center (<http://www.dartmouth.edu/~healthed/>).

We invite you to use these resources and to speak with the course staff at any time about strategies for succeeding in Bio 16 even as you are managing other challenges in your life.

**ACADEMIC HONESTY:** From the Dartmouth College Student Handbook: "Students who submit work that is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth." The complete text of the Academic Honor Principle is available at: <https://students.dartmouth.edu/community-standards/policy/academic-honor-principle>. Please read it carefully; you are responsible for abiding by the Dartmouth Honor Principles. Any violations of the Honor Principles within the context of Biology 16 will be referred to the Community Standards and Accountability Office and can result in a hearing before the Committee on Standards. Students found responsible for violating the honor principle can be suspended for multiple terms or, in the most extreme cases, separated from the College. The Dartmouth honor principle applies to all work in this class. In lab, you are encouraged to collaborate fully with fellow students while conducting research and interpreting data. However, lab reports must be written entirely on your own. Please just ask if you ever have questions about the boundaries of collaboration in Bio 16.

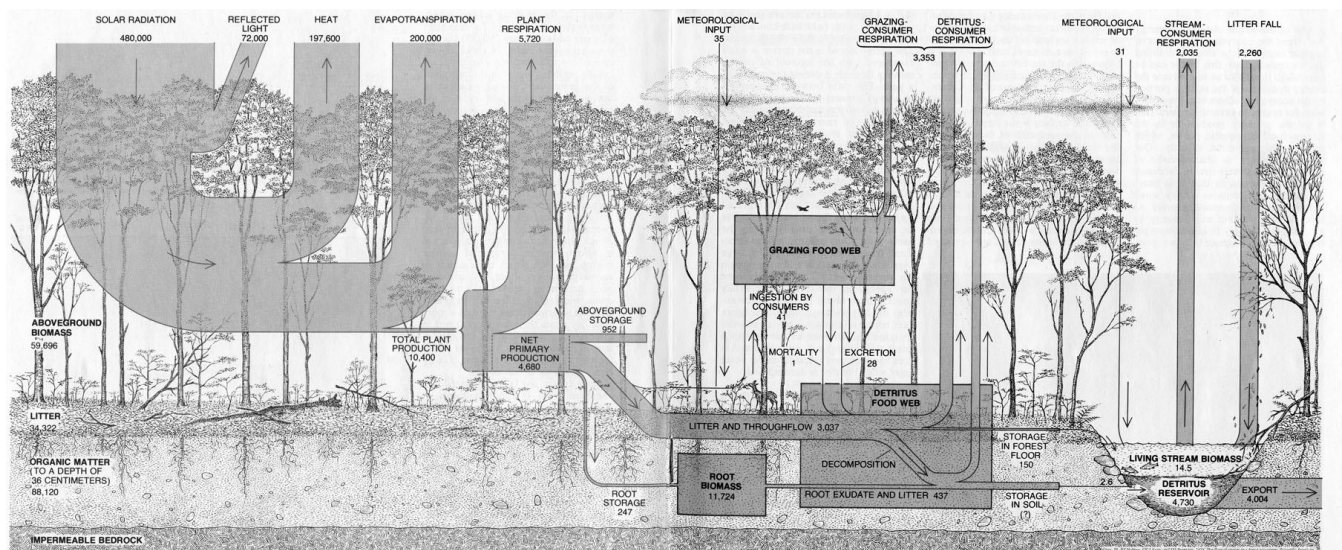
**RELIGIOUS HOLIDAYS:** Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

**EXAMINATIONS AND GRADING:**

For the overall course grade, the lecture and lab material will contribute 67% and 33%, respectively. The breakdown of lecture and lab grades will be as follows:

<i>Lectures</i>	Quiz 1	15%
	Quiz 2	15%
	Quiz 3	18%
	Quiz 4	18%
	Final exam (comprehensive)	34%
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		100%
<i>Laboratories<sup>a</sup></i>	Deer browsing	16%
	White pine weevils	16%
	Stream bioindicators	16%
	Sea turtle demography	16%
	Acorn weevils	20%
	Carbon exchange eddies	16%
		-----
		100%

<sup>a</sup> Laboratory point allocations may be adjusted as the term progresses. Instructions, expectations, and due dates/times for each lab assignment will be discussed in lab meetings and available in Canvas



Classical depiction of a temperate forest ecosystem derived from studies of the Hubbard Brook Experimental Forest near Mt. Moosilauke. Taken from: Gosz, J. R., R. T. Holmes, G. E. Likens, and F. H. Bormann. 1978. The flow of energy in a forest ecosystem. *Scientific American* 283:92-102.

**LECTURE MATERIALS:** With each lecture unit, we will provide a handout with a skeletal outline of the material that is meant to make it easy for you to take notes while still being able to listen and see visualizations. Our powerpoint files are typically visualizations rather than words and are not designed for taking notes nor as a primary source for your studying. We will provide the powerpoint files and lecture recordings on Canvas after lectures so that you can use them as a resource for studying, but we highly recommend that you create your own well organized resource of lecture notes (following the structure of the lecture handout) to aid your studying.

## Bio 16: Ecology. Lecture schedule. Winter 2021

18-Jan-21

Day	Date	Lecture Topic	Readings <sup>a</sup>	Lab activity
Fri	8-Jan	Science, ecology, research		No lab
Mon	11-Jan	Global change and food security	Ch 1, 7	Inaugural zoom lab meeting: drawing inferences from data
Wed	13-Jan	Global change and food security	Ch 2-3	
Thu	14-Jan	X-hour <sup>b</sup> : Kaitlin McDonald, Ridhi Chandarana, Michelle Irengbam		
Fri	15-Jan	Global change and food security		
Mon	18-Jan	No class. MLK day.		Deer browsing effects
Wed	20-Jan	Limits to distribution I: Physical & chemical factors	Ch 4	
Thu	21-Jan	X-hour: <b>Quiz 1</b>		
Fri	22-Jan	Limits to distribution II: Species interactions		
Mon	25-Jan	Limits to distribution III: Habitat selection & the niche	Ch 9	Acorn weevil seed predation I
Wed	27-Jan	Limits to distribution IV: Dispersal		
Thu	28-Jan	X-hour <sup>b</sup> : <a href="#">Melissa DeSiervo</a>		
Fri	29-Jan	Behavioral Ecology I: Sexual selection.		
Mon	1-Feb	Behavioral Ecology II: Optimal foraging, group decisions	Ch 10	Pine weevil brood site selection
Wed	3-Feb	Population ecology I: Dispersion & abundance	Ch 11-12	
Thu	4-Feb	X-hour: <b>Quiz 2</b>		
Fri	5-Feb	Population ecology I: Dispersion & abundance, cont.		
Mon	8-Feb	Population ecology II: Life tables & population structure	Ch 13	Stream bioindicator assemblages
Wed	10-Feb	Population ecology II: Life tables & population structure, cont.		
Thu	11-Feb	X-hour <sup>b</sup> : <a href="#">Ashley Lang</a>		
Fri	12-Feb	Population ecology III: Life history theory	Ch 8	
Mon	15-Feb	Poulation Ecology IV: Dynamics		Sea turtle population dynamics
Wed	17-Feb	Poulation Ecology IV: Dynamics, cont.		
Thu	18-Feb	X-hour: <b>Quiz 3</b>		
Fri	19-Feb	Community Ecology I: Competition	Ch. 16	
Mon	22-Feb	Community Ecology II: Mutualisms.		Acorn weevil seed predation II
Wed	24-Feb	Community Ecology III: +/- interactions, herbivory	Ch 14-15	
Thu	25-Feb	X-hour <sup>b</sup> : <a href="#">Fiona Jevon</a>		
Fri	26-Feb	Community Ecology III, cont.: Predation, parasitism, coupled dynamics		
Mon	1-Mar	Community Ecology III, cont.: Predation, parasitism, coupled dynamics		Ecosystem carbon exchange
Wed	3-Mar	Ecosystem ecology I: Energy and productivty	Ch. 21	
Thu	4-Mar	X-hour: <b>Quiz 4</b>		
Fri	5-Mar	Ecosystem ecology I: Energy and productivty, cont.		
Mon	8-Mar	Ecosystem ecology I: Energy and productivty, cont.		No lab
Wed	10-Mar	Ecosystem ecology II-III: Elements and nutrients, Water		
Sun	14-Mar	FINAL EXAM: comprehensive (8-10 am -- Sorry!)		

<sup>a</sup> From textbook. Other readings as assigned.

<sup>b</sup> Talks on current research by Dartmouth scientists

## LABORATORY SCHEDULE

WEEK	ACTIVITIES	ASSIGNMENTS DUE
11 January	Inaugural Zoom Lab Meeting	
18 January	Deer Browsing Effects	
28 January	Acorn Weevil Seed Predation I	<i>Deer Browsing Figure and Interpretations</i>
1 February	Pine Weevil Brood Site Selection	<i>White Pine Weevil Presentation</i>
8 February	Stream Bioindicator Assemblages	
15 February	Sea Turtle Population Dynamics	<i>Bioindication Calculations and Interpretations</i>
22 February	Acorn Weevil Seed Predation II	<i>Sea Turtle Pop Dynamics Figure and Interpretations</i>
1 March	Ecosystem Carbon Exchange	<i>Acorn Weevil Figures and Interpretations</i>
8 March	No Lab Activity	<i>Eddy Identifications and Net Ecosystem Exchange Estimation</i>

Your laboratory scores comprise 33% of your overall course score and will be based upon your level of accomplishment with the lab assignments. Instructions, expectations, and due dates/times for each assignment will be discussed in laboratory meetings and available on Canvas. The following weighted contributions of each assignment to your course score may be adjusted during the term to reflect changes in relative workload:

Lab assignment	%
Deer Browsing	16
White Pine Weevils	16
Sea Turtle Demography	16
Stream Bioindicators	16
Acorn Weevils	20
Carbon Exchange Eddies	16
Total	100

## SOME SUGGESTIONS FOR SUCCESS IN BIO 16

- In general, strive to understand all basic concepts. Then the details will come more easily.
- For theories and concepts presented in lecture:
  - Understand their relevance to the broader topic
  - Identify the patterns and processes that can be explained
  - Understand assumptions and postulates
  - Understand the nature of supporting evidence. Be able to explain specific examples of relevant evidence from lectures and readings.
  - Be able to define and correctly use relevant terminology
  - Know and be able to use any essential equations
  - Recognize any important limitations on applicability
  - Be able to apply the theory or concept to explain new facts and generate predictions regarding unfamiliar systems
- For examples presented in lecture:
  - Understand their relevance to the broader topic
  - Understand central conclusions and important theoretical implications
  - Be able to interpret any figures or tables. How do data support central conclusions?
  - Understand relevant natural history details. Be able to define and use relevant terminology
  - Be able to extend conclusions to similar biological systems
  - Be able to interpret similar data from unfamiliar systems
  - Be able to suggest alternative examples, not discussed in class, that illustrate the same principle
- Understand how theories and concepts relate to one another.

Continually ask yourself, why is this concept important?

### While in lecture:

- Use the lecture fully. For most students, this is the most time-efficient way to master the subject. Do not miss lectures. Much of the lecture material is not covered in the texts.
- Concentrate. If the pace seems slow, challenge yourself with points from the list of bullets above (e.g., relationships among theoretical concepts, alternative examples of the same principles). If the pace seems fast, stay focused on the concepts and the relevance of the concepts, and plan to assimilate the details later.
- Organize your thinking in terms of (1) theories and concepts and (2) details and examples that are relevant to the theories and concepts.

### Outside of lecture

- Review your lecture notes several times beginning within a day of each lecture. For each theory and example, work through the list of bullets identified above. Use the textbook index to look up relevant passages and efficiently clarify points from the lecture. Try studying with a colleague. Use your TA and the instructors to resolve questions.
- Read all required readings once before lecture and at least once more after lecture. Use the readings to (1) clarify lecture material and (2) to expand the lecture material. As you read, ask yourself:
  - What are the theories that are being presented? What are the postulates? How does this theory and its presentation compare to the lecture material?
  - What new examples were given? How do the examples relate to the theories and concepts being discussed in the text and in lecture?

### In exams

- Read each question carefully and understand it fully. Ask the instructor if you are uncertain.
- Think before you write. Identify the key points that your answer should contain and then communicate them clearly and unambiguously. Use graphs and equations as appropriate. Answer questions fully but efficiently. Do not omit key points but do not use any more words than necessary.

## NOTIFICATION TO STUDENTS REGARDING RECORDINGS DURING BIO 16

### (1) Consent to recording of course and group office hours

- a) I affirm my understanding that this course and any associated **group** meetings involving students and the instructor, including but not limited to scheduled and ad hoc office hours and other consultations, may be recorded within any digital platform used to offer remote instruction for this course;
- b) I further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and distribution of any of these recordings in whole or in part without prior written consent of the instructor may be subject to discipline by Dartmouth up to and including expulsion;
- b) I authorize Dartmouth and anyone acting on behalf of Dartmouth to record my participation and appearance in any medium, and to use my name, likeness, and voice in connection with such recording; and
- c) I authorize Dartmouth and anyone acting on behalf of Dartmouth to use, reproduce, or distribute such recording without restrictions or limitation for any educational purpose deemed appropriate by Dartmouth and anyone acting on behalf of Dartmouth.

### (2) Requirement of consent to one-on-one recordings

By enrolling in this course, I hereby affirm that I will not under any circumstance make a recording in any medium of any one-on-one meeting with the instructor without obtaining the prior written consent of all those participating, and I understand that if I violate this prohibition, I will be subject to discipline by Dartmouth up to and including expulsion, as well as any other civil or criminal penalties under applicable law.