# Ecology: Cool science that matters

Spring 2021, Period 10, LSC 201

**COURSE OBJECTIVES**

**To explore the central theories and principles in ecology, to survey the evidence that supports them, and to see how they apply to real-word environmental problems. Major topics will include:**

- *Limits to Distribution*. What determines where species do and do not occur?
- *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 species distribution and abundance?
- *Community Ecology*. What determines the structure, organization, and dynamics of groups of species? How are communities of species affected by disturbance?
- *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 become an expert in the ecosystem where you are currently residing and be able to apply ecological principles to your system and compare and contrast how your ecosystem functions with other ecosystems.**

**To learn the process of science:**

- Understand how ecologists gain and structure knowledge.
- 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 interpreting graphs and data, evaluating and manipulating simple mathematical models, and applying empirical data to evaluate theoretical predictions.
- Apply ecological principles to real-world environmental problems.

**STAFF & OFFICE HOURS:**

*Professor*: Caitlin Hicks Pries (Zoom/LSC 349); Office hours Wednesdays 12:30-1:30 pm & by appt.

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

*Graduate Assistants:* Erin Lane, 11:15-12:15 Wednesdays, LSC 20
Saima Shikesho, 2-3 pm Wednesdays, Steele 113A
Quin Shingai, 1-2 pm Wednesdays, LSC 102

**TEXTS and READINGS:**

Readings will be made available on Canvas. This term we will not be relying on any single textbook and will instead be reading scientific articles, websites, and excerpts from various textbooks.

**EXAMINATIONS:**

There will be a total of three exams. The two mid-term examinations will be held in class. The final exam will be held during our assigned examination period. The first two midterms will cover the material from

the previous classes and will not be cumulative. The final will be longer than the mid-term exams and half of it will cover the material not yet tested while the other half will contain comprehensive questions covering the whole term. The exams will cover materials from lectures, X-hours, and labs.

**LECTURE: Mondays, Wednesdays, and Fridays 10:10-11:15 am**
Your attendance at all lectures and X-hours is expected. Announcements are generally made at the beginning of class. Careful attention to lectures and participation in group activities are the most effective (and time-efficient) preparation for examinations. Many lecture periods will include small group activities such as brainstorming and problem solving, as well as lecturing by the professor. There will be occasional recorded lectures assigned as homework for you to watch prior to class. Some group activities you may be asked to complete after the lecture.

**X-HOUR DISCUSSIONS: Thursdays 12:15-1:05 pm**
Our X-period will consist of discussions of scientific articles from the primary literature. Prior to these class periods, you will be reading and taking notes on a scientific paper and coming up with questions.

**LABORATORIES: 2:30-6:30 Monday, Tuesday, Wednesday, or Thursday**
Attendance in all laboratories is mandatory. Labs meet in LSC 102 beginning with the first full week of class. Via previous correspondence with Craig Layne, the Lab Coordinator, you should already have been assigned to one of the laboratory sections. If not, please contact Craig immediately. Laboratories consist of field and laboratory activities such as sample collection and enumeration, experimental manipulation, data analysis, interpretation, and discussion. Come dressed appropriately for each week's laboratory: labs happen rain or shine, warm or cold.

**CLASSROOM POLICIES**:
We firmly believe that you need to engage with this course and the material to master it. This means completing the assigned reading, taking notes by hand during lectures, participating in the group activities and discussions, and completing the assignments that accompany lectures. We request that laptops are only out during the group activities in which their use is specified. If you need to use a device for notetaking, please check in with Prof. Caitlin during the first week of the term.

We will be taking advantage of the recording capabilities in the Life Sciences Center to record all class meetings. Lectures will then be made available to students via Canvas to help master the material. The cameras will generally focus on the front of the room, but your voices will be captured, and your images may be captured on a few dates during small group activities. By taking this course, you consent to being recorded (see RECORDING INFORMATION on last page of syllabus).

**DISCLAIMER**: We reserve the right to change the format during the course due to a COVID-19 outbreak. For example, if the professor must quarantine, lectures will be given online via recordings or zoom. If there is a large outbreak on campus, group activities might be moved to Zoom.

**SPECIAL NEEDS:**
Students requesting disability-related accommodations and services for this course are encouraged to schedule a phone/video meeting with Prof. Caitlin as early in the term as possible. This conversation will help to establish what supports are built into my online course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; student.accessibility.services@dartmouth.edu; SAS website; 603-646-9900) and to email me their SAS accommodation form. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

**CANVAS:**

We will make *extensive* use of the Canvas system in all aspects of this course. Please check Canvas regularly for announcements, lecture recordings, assignments, readings, and laboratory information including assignments. Furthermore, we will utilize the Discussions feature on Canvas as part of the Ecosystem Notebook series of assignments.

**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 e-mail Prof. Caitlin before the end of the second week of the term to discuss appropriate accommodations.

**MASKS:**
Please wear masks over your mouth and nose when in class, inside during labs, and in vehicles on the way to and from field sites. This is Dartmouth policy as of September 2021, and it helps protect the unvaccinated members of our community, such as the children of your professors or TA's.

**ILLNESS:**
If you are not feeling well, do not come to class or lab. You will be able to watch the lecture recording online. If you miss a group activity or discussion, please contact Prof. Caitlin for information on how to make up the work. If you become ill and cannot make it to an exam, please alert the Prof. Caitlin prior to the exam. If you will miss a laboratory due to illness, please alert your TA or Craig prior to the lab.

**HONOR PRINCIPLE:**
We take the Dartmouth Honor Principle very seriously (http://www.dartmouth.edu/judicialaffairs/honor/index.html). Violations have major consequences. In lab, you are encouraged to collaborate fully with fellow students while conducting research and interpreting data. However, as soon as you begin writing a lab report, the writing must be entirely your own. Please just ask if you have questions about the boundaries of collaboration. Everything you write must be entirely your own work. Exams are closed book and notes and must be completed individually. During exams, I suggest you bring a non-programmable calculator (one that will not store formulas). This is all you may use.

**EXAMINATIONS AND GRADING:**
For the overall course grade, the lecture and lab material will contribute 70% and 30%, respectively. The breakdown of lecture and lab grades will be as follows:

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| *Lectures* | Participation (includes in class group work, X-hour discussions and prep) | | 10% |
| | Nature Notebook | | 15% |
| | Midterm Exam 1 (10 lectures) | | 20% |
| | Midterm Exam 2 (9 lectures) | | 25% |
| | Final Exam (8 lectures + cumulative; ~1/2 cumulative) | | 30% |
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| | | | 100% |
| *Laboratories* | Deer Browsing Scientific Paper (initial and final submissions) | 30% | |
| | Forest Soil Respiration Slide presentation | 20% | |
| | Turtle Demographic Analysis, Figure, and Interpretations | 15% | |
| | Stream Invertebrate Composition Summary Report | 20% | |
| | Net Ecosystem Exchange Gap-fill Modeling and Estimation | 15% | |
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| | | 100% | |

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We will use a variety of approaches to assess your learning in this course, including online quizzes, group assignments, laboratory assignments, doing the assigned readings and annotation, working on your

Nature Notebooks, and course participation. Final letter grades will follow the guidelines in the online ORC, available at: http://dartmouth.smartcatalogiq.com/en/current/orc/Regulations/Undergraduate-Study/Requirements-for-the-Degree-of-Bachelor-of-Arts/Scholarship-Ratings. By department policy, the target median grade in all foundation courses is a B, indicative of good mastery of course material; student performance with a high degree of originality, creativity, or both; good performance in analysis, synthesis, and critical expression, oral or written; and working well independently. To earn scores with >90% of the points on individual assignments, students will need to demonstrate excellent mastery of course material; a very high degree of originality, creativity, or both; excellent performance in analysis, synthesis, and critical expression; and unusual effectiveness in working independently.

**MENTAL HEALTH:**

We recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding part of your life. There are a number of resources available to you on campus 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 encourage you to use these resources, to take care of yourself throughout the term, and to feel free to e-mail or attend Prof. Caitlin's office hours when needed.

## WEEK BY WEEK SCHEDULE:

| Week | Date | Lecture Topic | Readings* | Ecosystem Notebook | Laboratory Activity | Laboratory Assignment Due** |
|---|---|---|---|---|---|---|
| 1 | 13-Sep | What is Ecology? | | | Introductions, Syllabus, and Logistics | |
| | 15-Sep | Soils and Global Change: Research Lecture | Hicks Pries et al. 2017 | | Forest Walk | |
| | 16-Sep | X-hour: How to read a scientific paper | Schlesinger 1974 | | | |
| | 17-Sep | Biomes and Ecosystem Notebooks | Ch 6, webpage linked on Canvas | | | |
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| 2 | 20-Sep | Climate | Ellison et al. 2017 | EN 1: Intro | Deer Browsing I | |
| | 22-Sep | Climate cont'd | | | | |
| | 23-Sep | X-hour: Primary Literature Discussion | Spracklen et al. 2012 | | | |
| | 24-Sep | Soils: The foundation of terrestrial ecosystems | end of Ch 5; Amundson et al. 2015 | EN 1 responses | | |
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| 3 | 27-Sep | Limits to Distribution I: Abiotic | Assisted colonization papers | EN 2: Climate | Deer Browsing II | |
| | 29-Sep | Limits to Distribution II: Dispersal and Species Interactions | | | | |
| | 30-Sep | X-hour: Primary Literature Discussion | Pedrosa et al. 2019 | | | |
| | 1-Oct | Limits to Distribution III: Habitat and Niche Selection | | EN 2 responses | | |
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| 4 | 4-Oct | Population Ecology I: Abundance and Growth | *Primer of Ecology*, p 2-14 | | Forest Soil Respiration I | Deer Browsing Scientific Paper Initial Submission |
| | 6-Oct | Population Ecology II: Abundance and Growth cont'd | *Primer of Ecology*, p 26-31, 45-47 | | | |
| | 7-Oct | No X-hour | | | | |
| | 8-Oct | **Midterm Exam I** (material through Oct 4) | | | | |
| | recorded | An Introduction to the Central Limit Theorem | | | | |
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| 5 | 11-Oct | Population Ecology III: Life Histories and Life Tables | | | Forest Soil Respiration II | Forest Soil Respiration Slide Presentation |
| | 13-Oct | Population Ecology IV: Population Dynamics | *Primer of Ecology*, p 14-23, 32-35, 38 | | | |
| | 14-Oct | X-hour: Literature Discussion | Regher et al 2007 | | | |
| | 15-Oct | Metapopulations | | EN 3: Life Histories | | |
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| 6 | 18-Oct | Species Interactions I and II: Herbivory and Predation | Why is the world green? Paper | EN 3 responses | Sea Turtle Demographic Dynamics | Deer Browsing Scientific Paper Final Submission |
| | 20-Oct | Species Interactions III: Competition | *Primer of Ecology*, p 126-133 | | | |
| | 21-Oct | X-hour: Primary Literature Discussion | TBA re: mutualism | | | |
| | 22-Oct | Species Interactions V: Disease Ecology | Litinova et al. 2017; Glass and Barnes 2007 | | | |
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| 7 | 25-Oct | Community Ecology I: Biodiversity | TBA | EN 4: Species Interacti | Stream Invertebrate Composition I | Demographic Analysis, Figure, and Interpretations |
| | 27-Oct | Community Ecology II: Food Webs | Estes et al. 2016 | | | |
| | 28-Oct | X-hour: The Yellowstone Story Debate | Yellowstone Papers (Wolf vs Willow) | | | |
| | 29-Oct | **Midterm Exam II** (material through Oct 25) | | | | |
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| 8 | 1-Nov | Community Ecology II: Disturbance and Succession | Chang and Turner 2019 | EN 4 responses | Stream Invertebrate Composition II | |
| | 3-Nov | Ecosystems I: Energy=Food | Ch 6 from *Hubbard Brook: The Story of a Forest* | | | |
| | 4-Nov | X-hour: Primary Literature Discussion | Leclare et al. 2020 | | | |
| | 5-Nov | Ecosystems II: Energy=Food cont'd/Carbon Cycle | NASA webpage | | | |
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| 9 | 8-Nov | Ecosystems III: The Carbon Cycle cont'd | | | Carbon Net Ecosystem Exchange (NEE) | Stream Invertebrate Composition Summary Report |
| | 10-Nov | Ecosystems IV: The Nitrogen Cycle | Battye et al. 2017 | | | |
| | 11-Nov | X-hour: Primary Literature Discussion | Vitousek and Farrington 1997 | | | |
| | 12-Nov | Ecosystems V: The Phosphorus Cycle | Elser and Bennett 2011 | EN 5: Carbon Balance | | |
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| 10 | 15-Nov | Biodiversity and Ecosystem Function | Tilman et al. 1996; Meta-analysis | EN 5 responses | No Lab | Carbon NEE Gap-fill Modeling and Estimation |
| | | Review Session TBA | | | *All readings available on Canvas | |
| | | **Final Exam** | | | **See Canvas for instructions and specific due dates | |

**RECORDING INFORMATION:**

(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.