

## METHODS IN ECOLOGY (BIOL 22)

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**Instructor:** Jessica Trout-Haney (LSC 007)  
**Office hours:** Tues. 10-11:30 am, Wed. 2:00-3:00 pm, Fri. 2:30-4:00 pm  
or by appointment  
**Email:** jessica.v.trout-haney@dartmouth.edu

**Lab Director:** Craig D. Layne (LSC 121)

**Teaching Assistant:** Elliott Steele (LSC 102)  
Office Hours: Mon 11:50-12:50 pm, or by appointment

**Meeting Times:**     **Lectures:** Mon, Wed, Fri: 12:50-1:55 pm, LSC 105  
                              **Labs:** Mon 2:15-6:15 pm, LSC 102 (may not always use the entire time)  
                              **X-Hours:** selected Tues 1:20-2:10 pm, LSC 105 (see Canvas calendar)

**Course Description:** This is an intermediate-level course offering hands-on experience in ecological research methods and the statistical methods required to gain insight from ecological data. Prerequisite: Bio 16 (Ecology). If you have not taken introductory ecology, please contact the instructor as soon as possible, as this course assumes prior familiarity with that material and remedial help is not available.

### The goals of this course are to:

- Introduce ecological research methods in a variety of systems
- Introduce statistical methods commonly used in ecological research, and develop fluency in the use of statistical software
- Demonstrate the importance of temporal and spatial scale in influencing the design, results, and conclusions of an ecological study
- Engender an appreciation for natural history and its role in ecological research
- Explore the concept of “inference space”, the degree to which results from one study may or may not be broadly applicable to other times and places
- Provide repeated practice in linking the steps of the scientific process, from the development of an ecological question, through study design and data collection, to analysis and inference
- Improve your skills in finding, reading, and appropriately citing scientific articles relevant to a particular research question
- Gain skills in collaborative work: designing, conducting, analyzing, and interpreting ecological studies in a group context
- Practice giving and implementing constructive feedback
- Hone your ability to communicate your results graphically, orally, and in writing

**Attendance:** As this is an immersive experience in ecological research, attendance at all course meetings is required. *If you need to miss a class, please let me know as soon as possible so that appropriate arrangements can be made.* Unexcused tardiness or absences will be penalized.

### **Student Responsibilities**

1. Attend all course meetings: “lectures”, x-hours, and laboratories.
2. Actively participate in all class activities
3. Come to each class activity prepared (i.e., having done the required preparations for “lecture”, wearing appropriate clothing for lab, etc.)
4. Turn in all written assignments on time
5. Read and comprehend the papers and other readings cited in assignments
6. Actively try to make connections across assignments to build a big picture of how ecological knowledge is obtained and grows over time
7. Work effectively as a member of a research team
8. Seek help when needed through office hours, one-on-one appointments, email, or phone

### **Faculty Responsibilities**

1. Be organized and well-prepared throughout the course
2. Be knowledgeable about the course material
3. Stimulate interest in the course material
4. Explain course material clearly and efficiently
5. Answer student questions thoroughly
6. Be available for, and amenable to, consultations regarding the course & course material
7. Use methods of evaluation (e.g., worksheets, presentations, projects) that provide a representative test of student knowledge and understanding of the course material
8. Grade student work fairly and return it promptly
9. Be receptive to student suggestions for improvement

### **Teaching Assistant Responsibilities**

1. Attend all class activities
2. Serve as a liaison between students and the professor
3. Grade student work fairly and return it promptly
4. Coordinate data entry after each laboratory session
5. Be available for, and amenable to, consultations regarding all aspects of the course material

**Course Website:** We will make extensive use of Canvas to distribute digital materials for this course and for electronic submission of part or all of many assignments. Details will be discussed at our first few course meetings. **Each course participant should ensure that they will be emailed Canvas announcements immediately upon posting and should also check the site regularly for updates.**

### **Resources:**

1. JMP® Statistical Software. You will need access to JMP in order to analyze the data we collect in our weekly laboratory sessions. (If you do not have a laptop, please see Craig right away to make alternate arrangements.) The following links will take you to the download pages. **You will need to have JMP running on your computer prior to our June 26 x-hour. Please be sure to install JMP Pro (advanced), not JMP (basic).**

*Macintosh:* <http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-mac>

*Windows:* <http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-windows>

2. **Dana Library:** If you find you need more reference reading, you'll find most ecology books at "Dana Library," which requires that you identify the book you need in the library catalog, then request that the book be delivered from storage.
3. **Peer-reviewed articles:** Required readings will be available on Canvas. Those you track down on your own can be found using library-based resources such as ISI Web of Science: <http://isiknowledge.com/wos>. **Note:** you will need to be logged in to Dartmouth Secure (on campus) or through the VPN client (off campus) to access Web of Science and related papers. We will have a class session to develop the skills you'll need to find peer-reviewed papers for the preparatory and synthesis assignments.

**Late assignment policy:** Other than for special circumstances that are documented (e.g., a medical issue accompanied by a note from Dick's House), late assignments will be docked 10% per day late up to a maximum of 40%. Please contact me as soon as possible if you anticipate an issue submitting an assignment on time.

**Getting help with material:** The Bio 22 teaching staff are always here to help you during office hours or by appointment. Do not be afraid to seek help early and often! Falling behind in the early weeks of this course is dangerous. This is a subject best learned by hands-on experience and you will learn the most by immersing yourself in the material. Also note that we strongly encourage you to work in groups for many assignments, as it is important to ask questions of each other, share ideas about design and analysis, communicate thoughts and reasoning with each other, and learn how different people address the same problem. The instructions for each quantitatively graded assignment will layout when it is and is not appropriate to work with others (also see the **HONOR PRINCIPLE**, below).

**Special Needs:** I encourage any students with disabilities to arrange for accommodations that might be helpful. Please meet with me as early as possible in the term to discuss possible accommodations. If you are already working with the Student Accessibility Services (SAS) office, please bring your original Services and Consent Form and/or a letter on SAS letterhead to the meeting. If you are new to accommodations, you will need to register with the SAS office and obtain authorization first (see [dartmouth.edu/~accessibility](http://dartmouth.edu/~accessibility)). All inquiries and discussions will be kept confidential by the teaching staff.

**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. 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/>)

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

Please use these resources and to feel free to come speak with me about any related issues that may impact your coursework.

**Religious holidays:** I understand that students may wish to take part in religious observances during the term. If you have a religious observance that conflicts with your participation in the

course, please come speak with me before the end of the second week of the term to discuss appropriate accommodations.

**Assignments & course requirements:** As this course takes an immersive approach to learning ecological methodology, we are asking you to work steadily throughout the term. This includes spending several hours preparing for each course meeting. Your performance in the class will be assessed continuously through daily preparatory assignments, your performance during class meetings, weekly synthesis exercises, a final project, and ongoing class participation. Each of these methods of assessment is explained in more detail below.

### 1. Out-Of-Class Preparation

***Advance preparation is essential to this course running smoothly.*** To maximize productivity during our in-class time, you will come to most MWF class meetings having completed some sort of assignment. You may also be asked to take a short quiz or to submit one or more of your answers online through our class Canvas site.

After each lab, individuals or teams of students will be responsible for completing sample processing and having the data entered into Excel spreadsheets by 9 AM on Tuesday morning.

All preparatory assignments will be graded on the following *qualitative* scale: Excellent, well above expectations (4 of 4); Above expectations (3.5-3.75); Good, meets expectations (3-3.5); Needs improvement (2.5-3); Inadequate (2); < 24 hours late (1) and > 24 hours late (0). Taken together, these assignments will be worth 25% of your final grade, beginning with the second unit. The first unit will be recorded as pass/fail.

### 2. Synthesis Assignments

At the end of each unit, we will ask you to synthesize what you have learned by completing a synthesis assignment. These are typically due at the start of class on Monday as typed documents complete with embedded figures and captions. The questions on these assignments will ask you to analyze your findings from that week's lab and to integrate what you've learned with the course goals, including thinking about follow-up questions, hypotheses, and studies to test those hypotheses. These assignments will be graded on a numeric scale (i.e., out of 20 pts, 40 pts, etc.) and be worth 35% of your final grade. All assignments will be included in this calculation.

### 3. Field Notebooks and Natural History Assignments

Keeping a good notebook is an essential skill for field ecology. You will be asked to keep a field notebook for the duration of the class. In addition to taking notes for labs, you will also have a natural history assignment that will require you to go out on your own several times during the summer, to make observations and take notes. Notebooks will be periodically collected for grading. A short weekly Canvas assignment related to natural history will also be part of this grade. The notebooks plus the Canvas assignments will add up to 10% of your grade.

### 4. Final Project

During the last two weeks of the term, we will ask you to complete an exercise that will integrate much of what you've learned in this class (15% of your final grade). It will combine group and individual work, be graded on a numeric scale (in several discrete parts), with the final portion

due during the final exam period: **Saturday, August 24 at 3pm**. There is no final exam for this course. Instead, you will present your final projects during the scheduled final exam period.

### 5. In-Class Performance

We assess your performance based on in-class activities by assigning qualitative scores for a number of regular in-class activities. These scores will be worth 10% of your final grade. Not all presentations, discussions, and labs will be “graded” (we will always be explicit about which ones are), but you should assume that a member of the teaching staff is taking note of the quality of your contributions to our in-class activities.

### 6. Class Participation

This course requires active participation of all students throughout the term. Class participation will count for 5% of your final grade, based on:

- Attendance, timeliness, politeness, and appropriate dress, as judged by the student and the teaching staff. Tracking of attendance will occur on ten random days throughout the term.
- Being a good “team player” in group activities.

### **Grade allocation:**

Your final grade will be based on the total number of points earned relative to other students in the class, summed across the different methods of assessment and weighted as follows:

<b>Method of Assessment</b>	<b>Contribution to Final Grade</b>
Out-of-class preparation for class activities	25%
Synthesis assignments	35%
Final project	15%
Field notebook /Natural history assignments	10%
In-class performance	10%
Class participation	5%
<b>Total</b>	<b>100%</b>

### **Honor Principle**

The Dartmouth Honor Principle applies to all work you submit for a grade in this course. Consequently, all work you turn in must be your own unless the assignment is explicitly identified as a group activity. We will work hard to make these identifications clear and consistent, but when in doubt, err on the side of caution and don't collaborate!

You are allowed to:

- Discuss the preparatory assignments with classmates, so long as ideas from others are acknowledged appropriately. In this context, “discuss” means face-to-face contact, not communication via email or the web. For example, a group of 2-3 students might get together to look for references that might be appropriate for a Friday prep assignment, divvy up the most interesting-looking papers among group members, and then compare notes on what they've found in those papers. Alternatively, they might meet to compare notes about

data analysis plans for a Wednesday prep assignment. However, all actual writing of worksheet answers must be done independently.

- Use ideas from the class discussions in a synthesis assignment, so long as they are appropriately acknowledged.
- Share electronic files associated with data analysis (e.g., Excel graphs, JMP output, model output) or group presentations (e.g., PowerPoint shows).

You may not:

- Share electronic files for preparatory or synthesis assignments with classmates (except for group data analysis, as described above).
- Discuss the synthesis assignments with classmates outside of class time.
- Discuss the final project individual synthesis assignment with teammates.

When in doubt, please ask!

**FIELD EXPERIENCE SCHEDULE***(Subject to change; see Canvas calendar for updates)*

<b>Date (Mondays)</b>	<b>Topic and Location</b>
24 June	Field trip to Hubbard Brook: <i>Introduction to field data collection</i>
1 July	Vernal pool leaf bags
8 July	Bird morphology & flight mechanics
15 July	Meadow pollinator ecology
22 July	Root mycorrhizae and soil respiration
29 July	Organic Farm: Zooplankton migration mesocosm experiments
5 August	Lake aerosols – mechanisms of bacterial and toxin transport
12 August	Group Projects – Week 1 Data collection
19 August	Group Projects – Week 2 Data collection and/or indoor group work, depending on progress

**Final Presentations:****Saturday, August 24 at 3:00 PM**

\*This course does not have a final exam, but you are required to be present at this scheduled exam time for your final project presentations.