

## **METHODS IN ECOLOGY (BIO 22): SUMMER 2013**

### **STAFF**

Professor: Samuel B. Fey (Life Sciences Center 105, 603-646-8944)  
Office hours:  
M & F by appointment (LSC 007E, or elsewhere on campus)  
W 1:35-2:30 pm (LSC 007, after class ends)

Laboratory Director: Craig D. Layne (LSC 121)

Teaching Assistant: Derek Lee (Steele 104)  
Office Hours: by appointment – please don't hesitate to ask for one!

### **COURSE OBJECTIVES**

This is an intermediate-level course offering hands-on experience with the three major approaches used by ecologists: observations, experiments, and theory/models. We will emphasize field studies, but also spend a week each on computer models and laboratory experiments. 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 the three major approaches used by ecologists (observations, experiments, and theory/modeling) and to develop an appreciation for the strengths and weaknesses of each approach
- Explore some of the questions ecologists ask about the natural world
- Go through the scientific process, many times, starting from an ecological question
- Demonstrate the importance of temporal and spatial scale in influencing the design, results, and conclusions of an ecological study
- Engender an appreciation for how the system in which a study is conducted, and the natural history of the organisms in that system, influence not only how the study is done, but also its results and conclusions
- 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
- Practice finding, reading, and appropriately citing scientific articles relevant to a particular research question
- Learn to collaborate designing, conducting, analyzing, and interpretation of ecological studies
- Practice giving and implementing feedback
- Hone your ability to communicate your results graphically, orally, and in writing

## **COURSE ORGANIZATION**

This is an immersive experience in ecological methodology. As such, your prompt attendance at all course meetings is required. If you need to miss a class, please let Prof. Fey know as soon as possible so that appropriate arrangements can be made. Unexcused tardiness or absences will be penalized.

**“Lectures”:** Mondays, Wednesdays, and Fridays, 12:30-1:35 pm, LSC 105

**x-Hours:** selected Tuesdays 1-1:50 pm (see calendar for details), LSC 105

**Laboratories:** Monday afternoon, 2-6 pm, usually in LSC 102 (every week, June 25-August 20). Please come to “lecture” on Monday ready to go straight to lab.

## **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 cited in preparatory and synthesis 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
6. Initiate discussions about the student-led final projects on grassland ecosystems during the

## GENERAL INFORMATION

### Course Website

We will make extensive use of Blackboard 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 check the Blackboard site regularly, but especially before each M-W-F class meeting.

### Resources

There is no required textbook for this course. Instead, we will rely on a variety of resources:

- Specific peer-reviewed articles that we either require or recommend, available through Blackboard. These will be announced on the class handouts/assignments; you will need to be logged in to Dartmouth Secure or through the VPN client to access these papers.
- Peer-reviewed articles that you track down on your own using library-based resources, such as ISI Web of Science: <http://isiknowledge.com/wos>. These may be available electronically, or you may need to track them down in print.
- Web-based resources accessed through portals like Google Scholar and Scirus. Note that most websites are not checked for accuracy, so please evaluate what you access this way critically! Peer-reviewed literature articles are the “gold standard” in this course.
- Books on statistics available through the Web or at our weekly computer sessions. We will provide you with sufficient background for all statistical analyses done in this course, but some of you may want to consult additional resources for more information.

### Help

**Methods in Ecology is a subject best learned by doing-** falling behind in the early weeks of this course will be fatal. Immerse yourself in the material. Do not be afraid to seek help early and often! Help can be obtained from the teaching staff during office hours or by appointment. Note that we strongly encourage you to work in groups for much of this course, since much can be learned from comparing how different people address the same problem. The instructions for each quantitatively graded assignment will clearly spell out when it is and is not appropriate to work with others (see also **HONOR PRINCIPLE**, below).

### Special Needs:

I am happy to accommodate students requiring disability-related accommodations. First, you will need to register with the Student Accessibility Services office (SAS), if you haven't already. Then, once SAS has authorized accommodations, please show me the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead. This should all happen by the end of the second full week of classes (July 5), to ensure that appropriate accommodations can be made. Please contact the SAS office if you have questions about whether you qualify to receive accommodations. All inquiries and discussions about accommodations will remain confidential.

## COURSE REQUIREMENTS

As stated above, this is an immersive experience in ecological methodology. We are asking you to work steadily throughout the term by 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 class participation. Each of these methods of assessment is explained in more detail below.

**Please note that late assignments will not be accepted except under extraordinary circumstances discussed with Prof. Fey before the assignment is due.**

### Out-Of-Class Preparation For Class Activities

To maximize productivity during our in-class time, you will come to most MWF class meetings having completed some sort of assignment. On Mondays and Wednesdays, the preparatory assignment will involve filling out worksheets that ask you to think about what we'll be doing in class that day. These can be either handwritten or typed, as you prefer; those with poor handwriting may want to choose the typed option.

Typically the Friday assignments will be more "intense" and weighted more heavily than the Wednesday assignments in calculating your final grade. For either assignment, you may also be asked to submit one or more of your answers online through our class Blackboard site or via email. Early in the term, we will indicate roughly how much time we think you should spend on each assignment so you know what we're expecting.

You are also expected to prepare for the laboratory sessions; for example, you should come to lab able to identify fish in the stream lab and local plants in the meadows lab, as described in the preparatory worksheets for those weeks.

After each lab, individuals or teams of students will be responsible for completing sample processing and having the data entered into appropriate Excel spreadsheets by 9 AM on Tuesday morning. Students will share responsibility for data entry in two ways:

- In weeks where we will pool data from the entire class to answer the research question, designated students will enter the data into pre-formatted Excel spreadsheets. Volunteers are encouraged; if necessary we will assign you to a week once class enrollment stabilizes. If you know that a particular week will be bad for you, please let us know and we'll do our best to accommodate your schedule. If you have a busy term, volunteer to help out early, during the stream or lake observations labs!
- In weeks where data will be collected and analyzed separately by groups of students, each group will be responsible for entering its data into Excel before the deadline.

All preparatory assignments will be graded on the following qualitative scale: A = exceeds expectations; AB = meets expectations; B = needs some improvement; BC = needs considerable improvement; C = inadequate; and E = missing. Taken together, these assignments will be worth 30% of your final grade.

### Synthesis Assignments

At the end of each unit, we will ask you to synthesize what you have learned by completing a synthesis assignment. These will typically be due at class on Friday as 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.

### Final Project

During the last three weeks of the term, we will ask you to complete an exercise that will put together much of what you've learned in this class (counting for 15% of your final grade). It will combine group and individual work, be graded on a numeric scale (in several discrete parts), and submitted by the start of our final class period. More details on this project will be provided in late July and early August.

### In-Class Performance

Bio 22 assumes active participation of all students throughout the term. We will assess how you're doing on in-class activities by assigning qualitative scores for a number of regular course activities. These scores will be worth 15% of your final grade.

What types of activities may be assessed? Almost everything we do during the term will be graded a few times. For example, students will share parts of their synthesis assignments with one another both by giving short oral presentations of their primary figures and by contributing to group discussions of the assignment. During lab, students are responsible for learning new skills and putting them into practice. Towards the end of class on Wednesdays, we may call on one or more groups of students to present their findings regarding Monday's lab data. Our Friday course meetings will consist of both small and large group discussions to formulate the exact questions, hypotheses, and sampling plans for the following week's lab. Not all presentations, discussions, and labs will be "graded", 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 at least once a week. We will try to provide you with grade sheets and detailed feedback after some assignments (e.g., planned presentations that you know about in advance), and you can ask about your cumulative in-class performance score at intervals during the term.

This is an ever-evolving mode of assessment for this course, so comments and suggestions are welcome throughout the term to improve how it is working!

### Class Participation

Finally, 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.
- Being a good "team player", as judged by the student and his/her classmates.

Detailed instructions on these evaluations will be provided during the last full week of classes.

### Summary: weighting of different assessment tools

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:

Method of Assessment	Contribution to Final Grade
Out-of-class preparation for class activities	30%
Synthesis assignments	35%
Final project	15%
In-class performance	15%
Class participation	5%
Total	100%

### **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. However, the actual writing of worksheet answers must be done independently.
- Use ideas from the class discussions, including the online website, 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:

- Access the online user generated content before you have completed your own preparatory assignment.
- Share electronic files for preparatory or synthesis assignments with classmates.
- Discuss the synthesis assignments with classmates outside of class time.
- Discuss the final project with teammates after the group presentations on August 22.

Other situations will be spelled out as the term proceeds, since it may not be possible to anticipate all such questions. If you have any questions about the Honor Principle, please contact Prof. Fey as soon as possible after the question arises

**DRAFT LAB SCHEDULE**  
(subject to change)

Lab Date	Topic and Location	Tips on Lab Attire
24 June	Lake Ecology @ Storrs Pond	Could be buggy, rainy, cold or hot. Sun exposure could be an issue. May want to bring a bathing suit.
1 July	Stream Ecology @ Blood Brook	Could be buggy, rainy, cold or hot. Bring socks to wear inside waders. Rain gear and bug spray highly recommended.
8 July	Forest Ecology @ Balch Hill Natural Area	Could be buggy, rainy, cold or hot. Ticks & poison ivy could be issues: long pants and boots/sneakers highly recommended. Bring rain gear and bug spray.
15 July	Experiments in aquatic ecology. Short-term predator-prey experiments, probably in the laboratory.	Probably indoors
22 July	Modeling in Ecology	Indoors
29 July	Acoustic Ecology with Laurel Symes. Outside TBA.	Could be buggy, rainy, cold or hot. Ticks & poison ivy could be issues: long pants and boots/sneakers highly recommended. Bring rain gear and bug spray.
5 August	Meadow Ecology: Introduction to Meadows at Hudson Farm	Could be buggy, rainy, cold or hot. Ticks & poison ivy could be issues: long pants and boots/sneakers highly recommended. Bring rain gear and bug spray.
12 August	Group projects at Hudson Farm and possibly other meadows	Could be buggy, rainy, cold or hot. Ticks & poison ivy could be issues: long pants and boots/sneakers highly recommended. Bring rain gear and bug spray.
19 August	Group projects 2- additional time for fieldwork as needed, then time for analysis and presentation.	