

Community Ecology (BSC 405 – Spring 2013)

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COURSE CONTENT: Community ecology is a broad topic, and different ecologists have very different views of what the proper definition of community ecology is. In this course, community ecology is defined as the branch of ecology dealing with multispecies assemblages and the processes that influence the number of species, their relative abundances, their patterns of resource use, and spatial and temporal changes in these assemblage properties. The course will emphasize a mechanistic approach to the topic, although holistic and descriptive approaches will be covered because of their historical importance. Community ecology as defined in this course includes both ecological and evolutionary questions.

I will make available on Reggienet (see above) PowerPoint lecture notes that you can print in the form of handouts to have with you during lecture. Those handouts by themselves are not an adequate summary of the content. They are an outline. Attending lectures, and taking detailed notes on the explanations of the concepts and data is essential for you to understand this subdiscipline. The handouts also cannot capture any discussion that occurs in class. I will also use the same Reggienet site to make available assigned readings, handouts, and other materials. You will be able to turn in your assignments electronically at the Reggienet site.

TEXTS:

Morin, P. J. 2011. *Community Ecology*, 2nd ed. Blackwell Science, Malden MA.

Chase, J.M., & Leibold, M.A. 2003. *Ecological Niches: Linking classical and contemporary approaches*. University of Chicago Press, Chicago IL

These two books provide an excellent introduction to modern community ecology. We will cover both texts extensively (see lecture outline with assigned readings).

I will make lists of relevant references from the primary literature available to you. I will make some **required reading assignments** from these lists. Assigned papers will be made available electronically. These lists will be valuable for further reading related to your grant proposals and laboratories (see below) and for future reference in your career as biologists and ecologist.

GRADE: You will be graded based on your performance on the following:

1.	Midterm exam	15%
2.	2 Laboratory research reports	20%
3.	Class discussion	10%
4.	Grant proposal	30%
5.	Cumulative take home final exam	25%

MIDTERM EXAM: There will be a relatively short in class exam given **Friday 8 March** during the lecture period. Questions will be short answer and an essay. Grading of essays will be in part based on the clarity with which you express your answers, hence it is not enough to know theory and data. You must be able to express your knowledge in a coherent answer to a question.

LABORATORY REPORTS: There are 2 laboratory projects in this course, each designed to teach you about the kinds of questions asked in community ecology, and also about some of the methods used. Because we are constrained to complete the laboratory projects within a semester, with rather limited scientific and logistic resources available, there have been some inevitable compromises in the duration, scale, and level of replication in these projects. Nonetheless, expect these laboratory projects to be lots of work. **In particular, the laboratory projects will require a substantial amount of effort outside of the laboratory period.**

Your reports should be written as a **report** for the journal *Ecology* (Instructions to Authors for that journal are at: <http://esapubs.org/esapubs/AuthorInstructions.htm> be sure to click the link in the table for “Reports” to get specific instructions for reports). They **must** be turned in on time (deadlines on the laboratory schedule). Figures should be of publication quality and appropriately labeled. There will be questions associated with each lab that will help direct the writing of your reports. **They are to be submitted electronically to my email.**

GRANT PROPOSAL: The subject should, of course, be related to the content of the course. Your project may be related to your thesis research, but if it is, it should represent a contribution made by the material covered in the course. In other words, it should not be the same project you would have done had you not taken Community Ecology. **I must approve all projects.** You should get a preliminary OK from me on the topic **before** you start on the preproposal.

It is vitally important for your proposal that you propose to **answer some questions** about a particular facet of community ecology. Proposals simply to gather numbers are **not** acceptable.

There are two parts to this assignment.

1) PRE-PROPOSAL. A written proposal, ≤ 2 single spaced pages in length (including references), is to be submitted **electronically to my email** by **22 February**. I will read your pre-proposals, make suggestions, and approve the direction of the proposal. In your pre-proposal, you should give a brief introduction to the topic and previous work, describe the question or hypothesis that you intend to address, the organisms that are the focus of the proposed work, and provide a brief, general description of the proposed experiments.

2) FINAL PROPOSAL. You will write a research proposal in the format of an NSF Doctoral Dissertation Improvement Grant (there are of course other agencies but I want to standardize the format). Instructions for preparing NSF proposals (format, content, necessary forms) can be found in NSF’s Grant Proposal Guide: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=pgg . Information specific to Dissertation Improvement Grants can be found in the program announcement: <http://www.nsf.gov/pubs/2005/nsf05607/nsf05607.pdf>

Given the nature of the course, you will almost certainly write a proposal for submission to Division of Environmental Biology (DEB), Ecological Biology Cluster. Examining their web pages (e.g., to see descriptions of the kinds of projects they fund) would be useful: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503665&org=DEB&from=home

The proposal is due **electronically to my email** on **26 April**. If you email draft your proposal (summary, project description, references), in the appropriate final form, by **Friday 19 April**, I will make editorial comments and suggestions for improvements and return the paper to you for revisions. The 19 April deadline is **strictly optional**. The revised version is to be turned in by the 26 April deadline.

Your project will be graded based on the following criteria:

- a) Meeting pre-proposal and proposal deadlines.
- b) Quality of the question/hypothesis posed in the proposal.
- c) A competent review of the subject and existing knowledge, placing the research in context.
- d) Clear design of experiments, sampling, etc. to answer the question.
- e) Realistic match of the research plan with the questions.
- f) A realistic budget.
- g) Addressing both of NSF’s funding criteria (Intellectual merit, Broader impacts)
- c) Following the format requirements for NSF grants.




FINAL EXAM: This will be a **cumulative, take home** exam that will be due during exam week at the scheduled exam time (not yet known.) You will have a choice of several essays. I will tell you more about the details (e.g., the time you will have available to work on it) as the time gets closer,. Again, you must be able to express your knowledge in a coherent answer to a question.

LECTURE OUTLINE

(the instructor reserves the right to change the lecture plan at any time)

Topic	Assigned reading in:	
	Morin 2011	Chase &Leibold 2003
INTRODUCTION		
Hierarchical organization in ecology	pp. 1-14	
What is community ecology supposed to explain?	pp. 21-28	
Methods in community ecology		
PATTERNS		
Species Diversity: Concept (or non-concept)	pp. 14-23	
A diversity of indices		
Diversity & Stability, Diversity & Productivity	pp. 283-318	
Species-area relationships, Biogeography, Meta-communities	pp. 251-280	
PROCESSES: COMPETITION		
Interspecific competition	pp. 24-27	
Traditional models (brief review)	pp. 27-33	
Resource competition models	pp. 33-46	pp. 19-36; 45-47
Experimental data on competition	pp. 58-85	Ch. 4, 6
Different kinds of resources		Ch. 5
Evolution in response to competition - character displacement	pp. 46-57	Ch. 7, 10
Null Hype: Null models in community ecology	pp. 85-89	
PROCESSES: PREDATION		
Predation and parasitism	pp. 90-93	
Traditional models (brief review)	pp. 120-135	
Resource based predator-prey models		pp. 47-50
Experimental data on predation	pp. 93-119	pp. 62-64
Keystone species effects	pp. 90-119	pp. 36-45; 47-50
Direct and indirect effects, Indirect mutualism, Trophic cascades	pp. 186-212	p. 36
PROCESSES: DISTURBANCE		
Disturbance & Stress		pp. 37-40
Nonequilibrium coexistence	pp. 283-300	Ch. 6
PROCESSES: MUTUALISM		
Mutualism	pp. 171-186	
Population models of mutualism	pp. 166-171	
Conditional mutualism		
PATTERNS REDUX		
Succession	pp. 319-339	Ch. 8
Assembly	pp. 215-237	
Ecological niche	pp. 46-57	Ch. 1,3
Unified Neutral Theory of Community Ecology		Ch. 11
APPLIED COMMUNITY ECOLOGY		
Disease, biological control, conservation	pp. 91-93; 340-348	
PUTTING THINGS TOGETHER		
Patterns in food webs	pp. 136-165	
Hypotheses for the patterns		

LABORATORY SCHEDULE

Date	Laboratory Topic	Assignment Due (before 5:00 PM)
Jan. 17	<i>No laboratory</i>	
Jan. 24	Competition among mosquitoes : Intro & Set up	
Jan 31	Competition among mosquitoes : Count	
Feb. 7	Competition among mosquitoes : Data Check	
Feb. 14	 Introduction to modeling: <i>Stella</i>	
Feb. 21	 Interaction of competition & predation: Simulations with <i>Stella</i>	Pre-proposal (22 Feb.)
Feb. 28	 Interaction of competition & predation: Simulations with <i>Stella</i>	
Mar. 7	Competition among mosquitoes : Measuring & Data Check	MidTerm (08 Mar.)
Mar. 14	<i>Spring break – no laboratory</i>	
Mar. 21	<i>Steve out of town – non laboratory</i>	
Mar. 28	Competition among mosquitoes : Analysis	Models (<i>Stella</i>)
April 4	<i>OPEN</i>	
April 11	<i>OPEN</i>	Competition
April 18	<i>OPEN</i>	
April 25	<i>No laboratory</i>	Proposal (26 Apr.)
May 2	<i>No laboratory</i>	

 **Computer Laboratory.** Bring your laptop.