Community Ecology
(BSC 405 – Spring 2019)

INSTRUCTOR: **Steven Juliano** **sajulian@ilstu.edu**
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WEB PAGE: **https://about.illinoisstate.edu/sajulian/pages/default.aspx**
LECTURE: **MWF 3:00 - 3:50 PM MLT 215**
LAB: **Th 1:00 – 3:50 PM SLB 431**
REGGIENET: https://reggienet.illinoisstate.edu/portal/site/87bda87a-843f-4c98-acec-ebbc00a6749b/tool/3453a52b-14fd-4a00-b917-5b3db504d332?panel=Main

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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:
Chase, J.M., & Leibold, M.A. 2003. *Ecological Niches: Linking classical and contemporary approaches.* University of Chicago Press, Chicago IL. ISBN 9780226101804

This book provide an excellent introduction to modern community ecology. We will cover this book extensively (see lecture outline with assigned readings).

I will make lists of relevant references from the primary literature available to you and from other books. I will make some **required reading assignments** (see lecture schedule below**)** 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.

SOFTWARE:
NetLogo. https://ccl.northwestern.edu/netlogo/ Version 6.0.4

This modeling software will be used for one lab. It is free. You should download a copy to your computer (laptop or desktop; Windows, Mac, or Linux). You can download multiple copies if you need them (e.g., a desktop and a laptop).

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

1.	Midterm exam	15%
2.	2 Laboratory research reports	20%
3.	Proposal reviews and 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 (yep, only two), 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 or work. **In particular, the laboratory projects will require a substantial amount of effort outside of the laboratory period**. See the Laboratory Schedule (Separate hand out) for details.

Your reports should be written as a **report** for the journal *Ecology* (Instructions to Authors for that journal are at: https://esajournals.onlinelibrary.wiley.com/hub/journal/19399170/resources/author-guidelines-ecy). See instructions for reports under **Types of contributions.** They **must** be turned in on time (deadlines on the laboratory schedule, below). 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 via Reggienet.**

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 **Must** 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 via Reggienet** by **15 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 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 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: https://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/gpg_index.jsp

Given the nature of the course, you will almost certainly write a proposal for submission to Division of Environmental Biology (DEB), Population and Community Ecology 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 via Reggienet** on **18 April**. The Following week in lab (**25 April**), we will have a Proposal Peer Review session, where each of you will be responsible for providing review comments and constructive criticism on 3-4 proposals, and to lead small-group discussion on one proposal. Your individual written critiques and the summary for the proposal on which you led the discussion will be due **electronically Via Reggienet on 2 May.** I will provide you with some guidelines for how to review research proposals before you turn in your proposal.

Your proposalt 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, and a realistic budget.
f) Addressing both of NSF's funding criteria (Intellectual merit, Broader impacts)
g) 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: Chase &Leibold 2003	Other (More TBA)
INTRODUCTION		
Hierarchical organization in ecology		
What is community ecology supposed to explain?		Velend 2016 (excerpts)
Methods in community ecology		
PROCESSES:COMPETITION		
Interspecific competition		
Traditional models (brief review)		Ellner et al 2019
Resource competition models	pp. 19-36; 45-47	Miller et al. 2005
Experimental data on competition	Ch. 4, 6	Gurevitch et al. 1992
Different kinds of resources	Ch. 5	
Evolution in response to competition - character displacement	Ch. 7, 10	Tyreman et al. 2008
Null Hype: Null models in community ecology		
PROCESSES: PREDATION		
Predation and parasitism		
Traditional models (brief review)		
Resource based predator-prey models	pp. 47-50	
Experimental data on predation	pp. 62-64	
Keystone species effects	pp. 36-45; 47-50	Coloma et al. 2019 Bohannon & Lenski 2000
Direct and indirect effects, Indirect mutualism,Trophic cascades	p. 36	Knight et al. 2005 Croll et al. 2005
PROCESSES: DISTURBANCE		
Disturbance & Stress	pp. 37-40	
Nonequilibrium coexistence	Ch. 6	
PROCESSES: MUTUALISM		
Mutualism		Siefert et al. 2019
Population models of mutualism		Holland & DeAngelis 2010
Conditional mutualism		Morris et al. 2007
PATTERNS		
Species Diversity: Concept (or non-concept)		
A diversity of indices		
Diversity & Stability, Diversity & Productivity		Tilman 1996; McCann 2000; Grman et al. 2010
Species-area relationships, Biogeography, Meta-communities		Ricklefs & Bermingham 2004 Kadmon & Allouche 2007
Succession	Ch. 8	
Ecological niche	Ch. 1,3	Adler et al. 2007
Unified Neutral Theory of Community Ecology	Ch. 11	
APPLIED COMMUNITY ECOLOGY		
Disease, biological control, invasive species, conservation		Elderd et al. 2019 Dobson et al. 2006 Zhang et al. 2019

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LABORATORY SCHEDULE

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The instructor reserves the right to change anything on this schedule as necessary

Date	Laboratory Topic	Assignment Due (before 11:59 PM)
Jan. 17	***No laboratory***	
Jan. 24	Competition and predation among mosquitoes: Introduction	
Jan 31	Competition and predation among mosquitoes : Set up	
Feb. 7	Competition and predation among mosquitoes : 1st Count	
Feb. 14	Competition and predation among mosquitoes : Adults	Pre-proposals
Feb. 21	💻 Introduction to modeling: *NetLogo* (Bring your laptop)	
Feb. 28	💻 Modeling resource competition, ecological drift, & predation	
Mar. 7	💻 Modeling resource competition, ecological drift, & predation	MidTerm (8 Mar.)
Mar. 14	***Spring break – no laboratory***	
Mar. 21	Competition and predation among mosquitoes : Data analysis	Modeling
Mar. 28	**Open**	
April 4	**Open**	Comp. & Pred.
April 11	**Open**	
April 18	How to peer review proposals	Proposal
April 25	Proposal Peer review	
May 2	**Clean up the lab & environmental chamber**	Prop. reviews

💻 **Computer Laboratory.** Bring your laptop.