Biology 472, Spring 2015

Community Ecology

Course Description: Cr. 3. S. *Prereq: Biol 312*; The effect of interspecific interactions on the structure and dynamics of natural and managed communities; including concepts of guild structure and trophic web dynamics and their importance to the productivity, diversity, stability, and sustainability of communities. The implications of interspecific interactions in fisheries and wildlife management will be emphasized; illustrated with case histories of interactions between plants, invertebrates, and vertebrates.

Why Community Ecology?

No population or species exists in an ecological or evolutionary vacuum. And, certainly there are many and strong reasons to believe that each affects the others to greater or lesser degrees. Thus, it is improbable that we can understand or manage a population or species without deliberately accounting for those interactions. To do otherwise is akin to predicting the fate of a particular carbon atom without noticing that it happens to currently reside in the nose of a rhinoceros.

The flip side of this non-revelation is that, to understand anything, we must understand everything. We shall hope that this is not the case. This course is intended to land somewhere in the middle - attempting to bridge the gap between understanding just one population and understanding everything.

Or, as so often quoted (and none have said it better)...

*"It is interesting to contemplate an entangled bank, clothed in many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, **and dependent on each other in so complex a manner**, have all been produced by laws acting around us."* --- Darwin, **On the Origin of Species**

What I hope to accomplish

For any course, there is an infinite number of ways to teach and goals to be achieved. What I hope to do here is to show you ways of thinking, using community ecology as a vehicle. This means we will often be dealing with abstract or artificial examples to better illustrate concepts rather than performing detailed examinations of ecological minutiae.

Why? Science does not progress through a simple collection of facts. Science = understanding and understanding involves concepts, not facts. Even if you do not become a crackerjack community ecologist, you will always be well served by learning to see beyond the facts to the mechanisms and concepts that create them.

Students with Disabilities

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

Approximate Schedule of Topics

14 January ***An introduction to the notion of a community*** Morin – Chapter 1

21 January ***(-,-) Competition*** Chapters 2 & 3

Modes of competition: interference vs. exploitation
Competitive exclusion principle
Simple 2-species competition - Lotka-Volterra style
Estimating competition coefficients
Evolution and character displacement

Exam I Thursday, 29 January

Effects of heterogeneity
Effects of disturbance
Resource ratios

Exam II Thursday, 19 February

mid February(+,-) Predation, Herbivory, and Parasitism Chapters 4 & 5

Effects of functional and numerical responses
Predator-prey cycles

Exam III Thursday, 12 March

Parasite-host thresholds and epidemics
Effects of heterogeneity

mid March ***(+,+) Mutualism***

Plant-pollinator systems
Plant-herbivore "overcompensation"

Exam IV Thursday 9 April

mid April ***(?,?) Indirect Effects*** Chapter 6 & 8

Apparent competition and mutualisms
Trophic webs
Top-down vs. bottom-up regulation, etc.
Keystone species
Community assembly rules: guild structure, limiting similarities, HSS, null models, etc.
Evolutionary history of continental communities

Cumulative Final Exam- ***Thursday, 6 May 2013, 9:45-11:45 am***

Textbook - required

Morin, P. J. 2011. **Community Ecology, 2nd edition.**

Important books and in community ecology

Cody & Diamond. 1975. **Ecology and Evolution of Communities.**
Diamond & Case. 1986. **Community Ecology.**
Ricklefs & Schluter. 1993. **Species Diversity in Ecological Communities.**

Introductory textbooks

Begon & Mortimer. 1986. **Population Ecology: a Unified Study of Animals & Plants.**
Pianka. Any of many editions. **Evolutionary Ecology.**
Ricklefs. 1990. **Ecology.**

Grading

Exam I	50
Exam II	50
Exam III	50
Exam IV	50
Cumulative Final Exam	100
Homework and misc. quizzes	50
Total	350

How to "Think Critically?"

When confronted with a seemingly obvious cause-effect relationship, ask, "Is there any way the obvious could be wrong?"

1. When considering that a cause-effect relationship may exist, ask, "If this is indeed happening, what are the implications beyond the immediate phenomenon being observed? What are the extended consequences, what other processes must also be affected?"
2. If the cause-effect relationship really does exist, "What does this phenomenon require of the players, physiologically, ecologically, behaviorally, etc. and are these requirements reasonable? What processes (ecological or evolutionary) must be assumed?"

For more details in thinking critically, check out:
http://www.criticalthinking.org/pages/critical-thinking-where-to-begin/796

Grading scale for AECL 472 —

I have characteristically curved grades in this course, providing at least a C average. HOWEVER – while middle-of-the-road scores are relatively common, the very best scores can be few and far between. If the "average" student illustrates better than acceptable knowledge of community ecology concepts, the average will be correspondingly higher. The best answers will decipher a hypothetical situation presented in an exam and illustrate, not only the "correct answer" but also a deeper understanding of the concepts involved. Memorization and reiteration will only get you to the middle of the pack in general.

The **VERY BEST** answers will show the ability to synthesize a number of concepts to explain a novel situation. For example, if I provide a hypothetical community, the best answer will reason through the consequences of adding another species with a given set of characteristics. That reasoning will be well justified in stating any assumptions that might be included in your best estimate. It will also suggest, briefly, the likely consequences if the assumptions are not true (i.e., reasonable alternatives will be suggested). The best answer will also be very logically organized and well written (grammar and English count).

Good, but not exceptional answers will have at least one reasonable outcome that is logically organized and adequately supported. Writing complete sentences with reasonable clarity will be expected.

Acceptable answers will cover all the basic or most substantial parts of the complete answer. There should be at least some indication that the author has some understanding of the concept and is not just reiterating memorized facts. The most important parts of the supporting rationale for the answer will be present. There should be at least no ambiguity to your writing (I should be able to read your answer with little difficulty).

Poor answers will have the basic outcome present, but missing details and little or no suggestion of the rationale for WHY this is outcome is to be expected. Poorly written answers that are difficult to follow logically, or legibly, with poor spelling, grammar and punctuation will be treated accordingly.

Unacceptable answers are those that are impossible for me to decipher, will fail to answer the question being addressed, and will show no understanding of the situation.

Before each exam or upon request, I will provide examples of these types of answers for hourly and final exams. However, these same general principles will apply to homework assignments and discussion of key topics.

Subject: On thinking outside the box – or – how a truly bright student thinks

The following concerns a question in a physics degree exam at the University of Copenhagen:

“Describe how to determine the height of a skyscraper with a barometer."

One student replied:

“You tie a long piece of string to the neck of the barometer, then lower the barometer from the roof of the skyscraper to the ground. The length of the string plus the length of the barometer will equal the height of the building."

This highly original answer so incensed the examiner that the student was failed immediately. He appealed on the grounds that his answer was indisputably correct, and the university appointed an independent arbiter to decide the case. The arbiter judged that the answer was indeed correct, but did not display any noticeable knowledge of physics.

To resolve the problem it was decided to call the student in and allow him six minutes in which to provide a verbal answer which showed at least a minimal familiarity with the basic principles of physics. For five minutes the student sat in silence, forehead creased in thought. The arbiter reminded him that time was running out, to which the student replied that he had several extremely relevant answers, but couldn't make up his mind which to use.

On being advised to hurry up the student replied as follows:

"Firstly, you could take the barometer up to the roof of the skyscraper, drop it over the edge, and measure the time it takes to reach the ground. The height of the building can then be worked out from the formula H =0.5g x t squared. But bad luck on the barometer.

Or if the sun is shining you could measure the height of the barometer, then set it on end and measure the length of its shadow. Then you measure the length of the skyscraper's shadow, and thereafter it is a simple matter of proportional arithmetic to work out the height of the skyscraper.

"But if you wanted to be highly scientific about it, you could tie a short piece of string to the barometer and swing it like a pendulum, first at ground level and then on the roof of the skyscraper. The height is worked out by the difference in the gravitational restoring force
T = pi * square root (l /g).

"Or if the skyscraper has an outside emergency staircase, it would be easier to walk up it and mark off the height of the skyscraper in barometer lengths, then add them up.

"If you merely wanted to be boring and orthodox about it, of course, you could use the barometer to measure the air pressure on the roof of the skyscraper and on the

ground, and convert the difference in millibars into feet to give the height of the building.

“But since we are constantly being exhorted to exercise independence of mind and apply scientific methods, undoubtedly the best way would be to knock on the janitor's door and say to him 'If you would like a nice new barometer, I will give you this one if you tell me the height of this skyscraper'."

- The student was Niels Bohr, the only Dane to win the Nobel Prize for Physics

The Quiz…. ***Names*** ***are optional*** _____

1. What is your major?

2. How many semesters until you graduate (counting this one)?

3. Imagine your life on the morning of 13 January 2025. What will you do on that day?

4. What ecological phenomenon is the coolest, most spectacular, or most intriguing thing you have ever seen or heard about?

5. What one (or more) thing(s) should I, as instructor, know about you?

6. What do you want to know about me?

Leading and contributing to a discussion

Being able to present your ideas to others is the most important skill you can have in any career. How else will you be able to contribute to anything? To this end, how might you become better at this? The following is advice that will help you prepare yourself for discussing the topics that we will address in this course.

Advice for contributing (constructively) to a discussion

Many of you may find discussion sessions to be either fairly easy or very difficult. For those of you that tend not to contribute substantially to discussion, you should keep in mind that the *discussion counts for about 30% of your total grade*. For those of you that find it difficult to speak (you know who you are), I assume that you find it difficult to speak out for one of two major reasons. If you follow the two-part process below, you may be able to minimize these obstacles. Those of you that do find it easy to speak up, may also find the suggestions below useful in improving the quality rather than the quantity of your contributions.

Part A, after reading the article, you may feel that you have nothing to say or nothing to ask. This is can be remedied by carefully thinking about what you've just read and answering a few questions. If you take a few minutes to write out answers to the following questions, you will find that you have more to say than you think. It is important that you actually write them out in complete sentences on paper. Then bring them with you to class.

1. What is the take home message of the article? In two sentences, what is the point of the article?
2. What part of that message is the most controversial, do you agree with the author, and WHY or WHY NOT?
3. What part of the message do you agree with (there must be some portion that you can go along with? Why?
4. If you were rewriting the article, what parts of it would you change? What is the reason for the change?
5. How does that take home message relate to other things we have talked about in class, other things we have read, things you have learned in other courses or read in other places?

Part B, you might feel that you have things to say (and with your list from Part A, you now have several right in front of you), but you have difficulty interjecting them into the discussion. There are several mechanisms to do this. To prepare yourself for this, scan through your list frequently before and during the discussion. Then jump into the discussion in one of the following ways:

1. Be first to speak up. That way, you don't have to interrupt or change the direction of the discussion. By being first, you have more control of the conversation and can ensure that everyone discusses the most interesting topics (that you've already determined in Part A).

2.

Learn to interrupt. While often not considered polite in its rudest forms, interrupting (skillfully) is a VERY valuable social skill. If you listen to any conversation, you will notice that the most influential people interrupt frequently and others are rarely offended. Something as simple as "Hold on a second I don't agree, I think...." is a great way to get your ideas out in front of folks before the discussion moves on to other topics. Or, "Yes, I agree but, I think you have to consider...", or try, "No, I think ...." Sooner or later, you MUST learn to do this.

3. Frequently, there are momentary pauses in any conversation or discussion. When these occur, step in immediately with one of the statements, ideas, or questions from Part A. Do not be afraid to change the direction completely or go back to something that was covered earlier, but which you feel needs more coverage.
4. Respond to other individuals in the room. Do not wait for the instructor to introduce a new question. Respond directly to the other person. Sometimes, when teaching this class, I feel that I am having 14 simultaneous but independent conversations with each student. Not all discussion has to go through me. Indeed, none of it should in the ideal world.
5. **Stop by after class and tell me that you really find it difficult to get involved in the discussion, but you are prepared and have things to say, if only you could find a way to get them out. I can assist you by simply creating an opportunity for you to speak by asking something like "Well John Doe, what do you thing about Jane Doe's idea?" Obviously, this method is quite contrived, and artificial, but it will help you get used to speaking to the group. After a few sessions, your confidence may improve substantially and you may find it much easier to jump in on your own.**

DO NOT LET YOUR SELF FALL INTO A RUT. BE PROACTIVE AND GET OFF TO A GOOD START!