WFSC 525 - Conceptual Foundations in Wildlife Ecology

Instructor:  Dr. Courtney J. Conway  
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Schedule: 3:30-4:45pm, Tues and Thurs; Bio Sci East room 314

Readings: selected readings from the primary literature

Objectives:
1. To understand concepts and processes in ecology.
2. To understand how to effectively determine proximate and ultimate causation.
3. To provide students with the conceptual tools needed to critically evaluate scientific studies.
4. To provide students with the conceptual tools needed to develop an ecological question, identify all possible alternative hypotheses that address ultimate causation, design predictions that elucidate underlying ecological processes and mechanisms, and construct an appropriate experimental design to test competing hypotheses.

Prerequisites:  
Graduate standing or permission from the instructor.

Grading Criteria:

Written critiques of the papers we read 50 pts  
Written critiques of student presentations 50 pts  
Class participation 50 pts  
Oral Presentation 100 pts  
Mid-term Exam 100 pts  
Final Exam 100 pts  
Total Points Possible = 450 pts

Grading Scale:

A = 90-100%  B = 80-89%  C = 70-79%  D = 60-69%  F = < 60%

Course Description: This graduate-level course is intended to give students the tools needed to develop and test original research hypotheses. Students will be trained to think critically and to understand the ecological processes underlying commonly-observed patterns in the natural environment. The first third of the course is lecture and class discussion. We will begin with a review of the scientific method and discuss how past and current research in ecology has used (and mis-used) the scientific method. We will review induction, retroduction, and deduction and discuss why studies in ecology have been criticized for failure to follow this recipe for gaining reliable knowledge. We then review and contrast common but often mis-used and misunderstood terms and concepts in ecology: proximate causation, ultimate causation, pattern,
process, mechanism, research vs statistical hypotheses, theory, strong vs weak predictions, multiple working hypotheses, and strong inference. As a class, we will work through a series of case studies to provide examples of the issues and concepts listed above. In each case, we will design a conceptual approach that will allow us to address the question of interest by employing the hypothetico-deductive method. We will discuss the advantages and disadvantages associated with the three most common approaches to gaining knowledge in ecology: correlational analyses, experimental manipulations, and comparative analyses.

The second part of the course involves reading papers from the primary ecological literature than help illustrate proper use (and mis-use) of the terms and approaches discussed in the course. Examples may include:


The goal in this portion of the class is to help students to critically evaluate published papers in the primary literature. We read 2-4 papers per week and a student will be called on to lead the discussion and critique of each paper. Our discussion will focus on identifying the explicit and implicit questions addressed by the paper, how well each paper used the scientific method, and how the questions proposed could have been answered more rigorously. Each student is required to hand in a one-page critique of each paper discussed.

The third part of the course involves a presentation by each student in the class. The presenter is expected to introduce a conceptual research question, justify why the question is of interest from both an applied and basic science perspective, present the suite of alternative hypotheses, explain the processes/mechanisms underlying each hypothesis, and provide a series of predictions that would allow one to prove/disprove each hypothesis. The students are expected to critically challenge the presenter throughout the presentation and to submit a one-page critique of each presentation.
WFSC525 - Topic Outline and Schedule - Fall 2005

30 Aug  The Scientific Method
1 Sep  Pattern vs Process, Proximate vs. Ultimate Causation
6 Sep  Case Study #1
8 Sep  Induction, Retroduction, and Deduction
13 Sep  Research Hypothesis vs. Statistical Hypothesis
15 Sep  Case Study #2
20 Sep  Mechanisms, Predictions, and Strong Inference
22 Sep  Case Study #3
27 Sep  Exam
29 Sep  Correlational Analyses, Experimental Manipulations, and Comparative Analyses
4 Oct  Class Discussion of Gould and Lewontin 1979 and Mayr 1983
6 Oct  Class Discussion of MacArthur 1958
11 Oct  Class Discussion of Connell 1967
13 Oct  Class Discussion of Caro 1986
18 Oct  Class Discussion of Dobson 1979
20 Oct  Class Discussion of Dobson and Jones 1985
25 Oct  Class Discussion of Waser 1985
27 Oct  Class Discussion of Holekamp 1986
1 Nov  Class Discussion of Sinclair 1985
3 Nov  Class Discussion of Janzen 1967
8 Nov  Class Discussion of Stevens 1989 and Lewin 1989
10 Nov  Class Discussion of some other paper
15 Nov  Student Presentations - 2 @ 30min each
17 Nov  Student Presentations - 2 @ 30min each
22 Nov  Student Presentations - 2 @ 30min each
24 Nov  Thanksgiving – no classes
29 Nov  Student Presentations - 2 @ 30min each
1 Dec  Student Presentations - 2 @ 30min each
6 Dec  Student Presentations (1) and Teaching Evaluations
13 Dec  Final Exam; 2-5 pm