BIOL 4680 Ecology

I. General Information

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Semester: Spring 2012
Credits: Lec/Lab 4
Class: Lec MWF 9:00-9:50 (N210)
Lab Tu 2:00-4:50 (N210)

II. Course Description

(Catalog Description): Basic interrelationships of plants and animals within their physical environments. Satisfies the ecology elective for the major. Prerequisites: BIOL 1050, BIOL 1150; and MATH 1600, MATH 1410, MATH 1910, or equivalents. (Lecture, 3 hours; laboratory, 3 hours; field trips) (Fall, Spring)

Ecology is an experimental, observational, mathematical and correlative science. Interactions between organisms and their environment are crucial to understanding the evolution of life, and the study of these interactions are at the heart of ecology. Ecologists draw upon every field of biology to study organisms, including evolution, molecular biology, physiology, and genetics. One semester is not enough time to explore all aspects of ecology, so **we will explore major concepts, hypotheses, theories and case studies to understand and investigate nature's processes.** In order to understand current trends and future directions, we will also examine classic experiments and their lasting effect on ecology.

An integral goal of this course is your continued development of critical thinking, written and verbal communication, quantitative reasoning, and experimental design skills. Lectures, assignments, and laboratory exercises will guide you in the development of these skills. For lectures, the readings will be drawn from two sources, namely, the textbook (and its website resources) and the primary literature (journal papers). It is important that you understand the concepts and hypotheses, are able to apply them and design experiments to test them, and then assimilate the available background information to apply them in the real world. **I will assume you have read the associated material listed in the schedule prior to coming to class and I may call on you to answer questions and participate in discussions**. See separate laboratory syllabus for laboratory format.

III. Course Objectives

1. The student will become conversant in the terminology, concepts, methods, and major theories of ecology, integrated within the larger discipline of evolutionary biology, the unifying theme of biology.

2. The student will discriminate between patterns, processes & dynamics operating at the population, community & ecosystem levels in terrestrial, freshwater & marine habitats.

3. The student will become familiar with different sampling methods and experimental designs & understand their assumptions, strengths & limitations.

4. The student will gain knowledge of ecological experiments & the theories & models that unlock understanding & prediction of relationships & interactions between organisms & their environments.

5. The student will use peer-reviewed journal articles to critically evaluate current topics in ecology & refine their communication skills through oral presentation (PowerPoint);

6. The student will gain further appreciation of the necessity that natural history provides to scientific understanding of ecological relationships of living organisms.

IV. Course Requirements

The course grade for the 4-credit component of this course will be determined by the combined grades from laboratory and lecture work. The grade distribution will be 60% lecture and 40% laboratory. It is your responsibility to know where you stand in the class at any one time.

This is a senior-level class; as such you are expected to attend regularly and on time for a complete understanding of course materials and to receive updates on exams and assignments. As per university regulations, students with excessive absences or tardiness will be dropped from the class. **Graduate students who are enrolled in this class are expected to perform at a higher level than undergraduates (see handout); subsequently (and according to university policies), graduate students will receive additional assignments.** Allow at least 2 weeks for exams, lab exercises, and homework to be graded and returned. Missed exams must be made up within one week of the exam date and require prior approval from me. It is your responsibility to contact me in the event you miss an exam and to provide relevant documentation (e.g., letter from a physician) documenting your absence. The final decision to offer makeup exams rests with me. **Lab assignments will each have a due date and will lose 20% of their value for each day they are late.**

Executive Order 1037 (effective August 2009) allows students to only repeat a course twice and in which they have earned less than a C grade. Students are only allowed to replace the first 16 units they repeat; those reaching the 16 unit limit may repeat an additional 12 units, but the resulting grade is averaged with all other grades. **Students repeating this class will be asked to present different journal papers and lab reports than they submitted previously.**

V. Required Text/i>clicker

(1) ***Ecology: Concepts and Applications, 5th ed.*** by Molles (chapters shown in schedule).

(2) **i>*clicker*** (used ones also available). Numerous pedagogical studies have shown that i>clickers improve student retention and learning. You are required to purchase an i>clicker remote to receive in-class participation and performance points. In order to receive this credit, you must register your i>clicker remote online at http://iclicker.com/dnn/. Complete the fields: first name, last name, student ID, remote ID. Your i>clicker will be used every class day and you are responsible for bringing it. Your responses will contribute 5% of your total grade. The i>clicker may also be used for peer teaching, provoking discussions, and to gauge student comprehension of difficult topics. Using another student's i>clicker or using multiple i>clickers is considered cheating.

(3) Lab will rely mostly on **handouts**; these will be provided one week (or less) before the next lab meeting. Each student will present one *PowerPoint presentation* that will come from reading,

critiquing, and summarizing a *journal paper* (from *Ecology*, *Ecological Applications*), accessible by JSTOR (e-journal archive) – see last pages. **Bring your calculator and i>clicker to lab every week.**

VI. Grading Procedure

Two semester exams (**March 9 and April 27)** will be 100 point mixed format (short answer/essay, matching, graph interpretation, fill-in-the-blanks). Questions for the exams will come from the lecture notes, textbook, videos, assigned websites, lab handouts & reports, and student presentations. The final exam (**May 21: starting time 8:30 am**) will be comprehensive over the entire class (lecture and lab) material. If you arrive late after other students have turned in their exams, you will be turned away, so leave early on exam days to ensure you will be on time. Traffic and/or car problems are not acceptable excuses for being late. **No extra credit will be offered beyond the points earned on exams, lab exercises, and oral presentation.**

Your active participation in lectures and labs are expected, including field trips. I expect you to WORK COLLABORATIVELY on group lab and field exercises, but WORK INDEPENDENTLY on individual lab assignments, written exams and oral presentations. For group work, students will use a scoring rubric to evaluate each other's contribution to lab reports (= peer evaluation).

Cheating in any form is inappropriate conduct and will be dealt with swiftly and severely according to Sections 41301 through 41304 of Title 5 of the *California Code of Regulations*" which includes expulsion, suspension and probation.

Except for two lab reports which are mandatory (see lab schedule below), you have the choice of which and how many group lab reports to turn in to reach the 400-point total; however, you are responsible for knowing the procedures, computational steps, and outcomes of every lab. **Lab reports are due two weeks after they are assigned.**

Lecture Exams (2 @ 100 points each)	200
Comprehensive Final (1 @ 200 points)	200
PowerPoint Presentation	100
Lab Reports	400
i>clicker Questions	50
Participation, conduct, attendance	50
Total	1000 points

A = 900-1000, B = 800-899, C = 700-799, D = 600-699, F < 600 points. No +/- grading will be applied to your final grade.

VII. Presentations

The date of each student (PowerPoint) presentation is listed by number (see lab schedule below). Your presentation grade will be based on your verbal performance and the 1-page synthesis prepared for your classmates that summarizes the major questions/hypotheses, methodology, results, and conclusions of the paper. When I announce your name and paper, present your topic taking no more than 20 minutes (including 2-5 minutes for questions) of lab time. A standardized grading sheet will be used to grade the verbal and written parts of your presentation. **In the event you miss (or are unready to present) your scheduled talk, you will receive an automatic `0' for the 100-point assignment. E-MAIL ME YOUR .ppt FILE (NOT .pptx) AND/OR**

PROVIDE ME WITH A CD/MEMORY CARD OF YOUR TALK BEFORE LAB STARTS SO YOU ARE READY TO TEACH THE CLASS!!

Talking, whispering and giggling during lectures is rude and disruptive for your classmates and the instructor. It is expected that students will refrain from these activities while anyone is lecturing at any time during lecture or lab time. If this becomes a problem, I will ask you to leave class for the duration of these activities. **Turn off all cell phones before arriving to class**.

VIII. Recording Policy:

Audio or video recording of classes (tape and digital format) is not permitted under any circumstances. If you do not intend to comply with this policy, please discuss this with the instructor. An exception is made for students registered with Disability Resource Services, who are approved for this accommodation. In such exceptions, DRS students will be asked to sign a "Recording Agreement" which disallows them from sharing recordings with other individuals unless approved by the DRS program.

IX. Field Trips

Field trip regulations that do not specifically pertain to being in vehicles, pertain to all parts of class (lecture and lab) as well as field trips. These are not limited to, but especially include numbers 4, 7 and 8 of our department's "Field Trip Regulations and Verification Form".

Important Dates to Remember:

January 26	First Day of the Term
February 22	Census Date: Last Day to Add or Drop
March 9	Exam 1
March 30	Cesar Chavez Day (No Class)
April 9-13	Spring Break (No Classes)
April 22	Earth Day!
April 27	Exam 2
May 1	Field Trip to Turlock WWTP
May 11	Warrior Day (No Afternoon Classes)
May 15	Last Day of Classes
May 16	Reading Day (No Classes)
May 21 (Monday)	Comprehensive Final (starting time: 8:30)

LECTURE OUTLINE AND READING ASSIGNMENTS*

Week Beginning	Lecture Topic	Reading(s) or Exam
Friday, Jan 27	Syllabus Review, Introduction	Ch 1
Monday, Jan 30	Global Patterns of Biological Diversity, Geographical Ecology	Ch 16, 22
Monday, Feb 6	Some Population Genetics, Ecological Causes of Evolution	Ch 4
Monday, Feb 13	Life on Land	Ch 2
Monday, Feb 20	Life on Land (cont'd), Life in Water	Ch 2, 3
Monday, Feb 27	Life in Water	Ch 3
Monday, March 5	Population Ecology: Temperature & Water Relations, review of Exam 1	Ch 5, 6 **March 9**
Monday, March 12	Population Ecology: Energy and Nutrients	Ch 7
Monday, March 19	Populations: Distribution and Abundance	Ch 9
Monday, March 26	Population Dynamics, Competition	Ch 10, 13
Monday, April 2	Competition (cont'd)	Ch 13
Monday, April 9	Spring Break, No Classes	
Monday, April 16	Predation & Herbivory, Earth Day Video: "*Rachel Carson's Silent Spring*"	Ch 14
Monday, April 23	Parasitism & Mutualism, review for Exam 2	Ch 14, 15 **April 27**
Monday, April 30	Parasitism & Mutualism (cont'd)	Ch 14, 15
Monday, May 7	Species Interactions, Food Webs	Ch 17
Monday, May 14	Succession & Stability	Ch 20
Monday, May 21	**Comprehensive Final (starting time 8:30)**	

*Reading assignments listed on the course outline above are for *Ecology: Concepts and Applications, 5th edition.* Topic content and dates of coverage in the syllabus may be changed due to extenuating circumstances.

Useful & Informative Web Links:

Student Website for Textbook (strongly recommended): Molles, 5th edition:
http://highered.mcgraw-hill.com/sites/0073383228/student_view0/index.html

"Bill Moyer's Journal" segment (Video & Slide Show) of September 21, 2007 on Rachel Carson's life & legacy: http://www.pbs.org/moyers/journal/09212007/watch.html.

LAB SCHEDULE

Lab Meeting	Topic(s)	Points
January 31	Lab Safety, Field Trip Regulations, Group Assignments, Peer Review, Graph Interpretation Exercise, EXCEL Hints & Tips Bring soil sample to next lab, Read for next lab: S.H. Hurlbert. 1984. *Ecol. Monogr*. 54: 187-211	
February 7	Soil Lab (setup), Microclimate, Experimental Design Exercise	
February 14	Soil Analysis, Climate Diagram Exercise, Grading & Format for PowerPoint Presentations	
February 21	*Parametric Statistics, Confidence Intervals	50¶
February 28	Duckweed Population Growth (Day 0) Format for Lab Reports, Peer Grading Presentations #1, #2, #3, #4	150¶
March 6	*Duckweed Population Growth (Day 7), Exponential, Geometric, Logistic Growth (lab lecture) Presentations #5, #6, #7, #8	
March 13	Duckweed Population Growth (Day 14, clean up), *Mark-Release-Recapture (isopod set up) Presentations #9, #10	200
March 20	*Measuring H_2O Quality (3-4 day trial) Mark-Release-Recapture Methods (1^{st} of 3 estimates) Presentations #11, #12	100
March 27	Mark-Release-Recapture Methods (2^{nd} of 3 estimates) Presentations #13, #14, #15, #16	
April 3	Mark-Release-Recapture Methods (final estimate, cleanup) *Sampling Techniques for 2-D Habitats Presentations #17, #18	200
April 9-13	Spring Break, No Classes	
April 17	Life Tables, Survivorship Curves, *Cemetery Demography Presentations #19, #20, #21	100
April 24	*Foraging & Flocking Behavior (Outdoor Lab)	200
May 1	Applied Nutrient Cycling: Field Trip to Turlock Water Treatment Plant	
May 8	Submit Last Lab Reports, Review for Lecture Final Presentations #22, #23, #24	

*Lab report with accompanying points. The lab grade is based on 400 points; a combination of lab reports equal to 400 possible points must be completed (no exceptions).

¶Required lab report (everyone is required to complete and turn in).

Primary Literature for BIOL 4680 (ECOLOGY)

THESE ARTICLES ARE AVAILABLE FOR DOWNLOAD FROM OUR LIBRARY'S ELECTRONIC JOURNAL LIST (JSTOR BIOLOGICAL SCIENCES COLLECTION); WEBLINK IS: http://library.csustan.edu/serialsolutions/onlineJournals/jnlsIndex.html.

1. Schiel, D.R. et al. 2004. Ten years of induced ocean warming causes comprehensive changes in marine benthic communities. *Ecology* 85: 1833-1839.

2. Kelly, D.J. et al. 2003. Effects of solar ultraviolet radiation on stream benthic communities: an intersite comparison. *Ecology* 84: 2724-2740.

3. Davidson, C. et al. 2001. Declines of the California red-legged frog: climate, UV-B, habitat, and pesticides hypotheses. *Ecological Applications* 11: 464-479.

4. Wimp, G.M. et al. 2010. Increased primary production shifts the structure and composition of a terrestrial arthropod community. *Ecology* 91: 3303-3311.

5. Lomolino, M. et al. 1989. Island biogeography of montane forest mammals in the American Southwest. *Ecology* 70: 180-194.

6. Angilletta, M.J., Jr. 2001. Thermal and physiological constraints on energy assimilation in a widespread lizard (*Sceloporus undulatus*). *Ecology* 82: 3044-3056.

7. Crozier, L. 2004. Warmer winters drive butterfly range expansion by increasing survivorship. *Ecology* 85: 231-241.

8. Plath, K. and M. Boersma. 2000. Mineral limitation of zooplankton: stoichiometric constraints and optimal foraging. *Ecology* 82: 1260-1269.

9. Bluthgen, N. and K. Fiedler. 2004. Competition for composition: lessons from nectar-feeding ant communities. *Ecology* 85: 1479-1485.

10. Day, R. et al. 1997. Effects of Exxon Valdez oil spill on habitat use by birds in Prince William Sound, Alaska. *Ecological. Applications* 7: 593-613.

11. Hellgren, E.C. et al. 2000. Variation in tortoise life history: demography of *Gopherus berlandieri*. *Ecology* 81: 1297-1310.

12. Weider, L.J. 1993. Niche breadth and life-history variation in a hybrid *Daphnia* complex. *Ecology* 74: 935-943.

13. Rode, K.D. et al. 2010. Reduced body size and cub recruitment in polar bears associated with sea ice decline. *Ecological Applications* 20: 768-782.

14. Burns, C.E. et al. 2005. A prescription for longer life? Bot fly parasitism of the white-footed mouse. *Ecology* 86: 753-761.

15. Wilson, S.D. and Tilman, D. 1993. Plant competition and resource availability in response to disturbance and fertilization. *Ecology* 75: 438-445.

16. Grosholz, E.D. 1992. Interactions of intraspecific, interspecific, and apparent competition with host-pathogen population dynamics. *Ecology* 73: 507-514.

17. Chalcraft, D.R. and W.J. Resetarits, Jr. 2003. Predator identity and ecological impacts: functional redundancy or functional diversity. *Ecology* 84: 2407-2418.

18. Carlsson, N.O.L. et al. 2004. Invading herbivory: the golden apple snail alters ecosystem functioning in Asian wetlands. *Ecology* 85: 1575-1580.

19. Goheen, J.R. et al. 2004. Net effects of large mammals on *Acacia* seedling survival in an African savanna. *Ecology* 85:1555-1561.

20. Lafferty, K.D. 2004. Fishing for lobsters indirectly increases epidemics in sea urchins. *Ecological Applications* 14: 1566-1573.

21. Huntzinger, M. et al. 2004. Relaxation of induced indirect defenses of acacias following exclusion of mammalian herbivores. *Ecology* 85: 609-614.

22. Howe, H.F. and D. Lane. 2004. Vole-driven succession in experimental wet-prairie restorations. *Ecological Applications* 14: 1295-1305.

23. Farina, J.M. et al. 2009. Can conservation biologists rely on established community structure rules to manage novel systems? … Not in salt marshes. *Ecological Applications* 19: 413-422.

24. Knapp, R.A. et al. 2005. Fauna of Yosemite National Park lakes has low resistance but high resilience to fish introductions. *Ecological Applications* 15: 835-847.