

BIO 321: Ecology Lab

Fall 2006

Instructor: John Sabo

TA: TBA

Lecture/Field Trips (Lab): F 1-5 pm

Synopsis

This course is designed to give you broad exposure to field methods and analysis techniques in ecology. We will cover at least one basic topic in behavioral, population, community and ecosystem ecology. Our focus will be mostly on animals for behavioral and population ecology and plants for community and ecosystem ecology. This division is simply made for convenience and time efficiency. I have also tried to design the field exercises to provide data that answer compelling questions by comparing measurements of the same variable (e.g., species diversity) among diverse taxa or by using more than one method to answer a more detailed question. The course grade is based heavily on a term project and paper in which I expect you to collaborate with peers (other students in the class) and delve more deeply into a specific set of methods to answer a compelling ecological question.

Assignments & Grading

The majority of your grade for this class will be determined by your performance in four categories: 1) team lab reports (20%), 2) team research summaries (10%), 3) a group term project & paper (30%), 4) group research talks about project results (10%). Thus we will *talk* about our results as much as write about them in this class. The remaining 30% of your grade will be determined by your participation in mandatory field trips. You will get full credit for each trip by simply attending the whole trip (7.5% for each of 4 trips).

Lab Teams—For weekly field activities and assignments you will collaborate with 2-3 other students in ‘**teams**’ (of 3-4 people). In the field, we may work to collect data as individuals, in teams or as an entire class depending on the tasks and workload. In the lab, each team will collaborate to analyze and summarize (i.e., make tables, plot figures) class data together. Each week one team will summarize class results at the end of the class session (**1 summary per team**). These summaries will provide the basis for class discussion of results from field activities. Each team will then collaborate on a lab report (outside of class time) due the following week. There will be a total of **five** team lab reports throughout the semester and your grade for this portion of the class based on the **best 4/5** team reports.

Project Groups—For your term project, paper and research talk you will form into ‘**groups**’ of again 3-4 students, but your project group will be different than your lab team. I have designed the class this way so that you don’t get sick of collaborating with the same students and so that you get a chance to experience 2 collaborations in one class. There are five possible project topics (listed below)

- Seasonal & diurnal variation in thermal microhabitat use by lizards

- Comparison of field methods for abundance estimation of lizards
- Variation in litter decomposition with litter C:N and temperature
- Historical trends in fish community composition in Aravaipa Creek
- Seasonal differences in whole stream metabolism at Aravaipa Creek

Group term papers are due on the day of your final exam (December). On that day your group will also present the results from your project as a team in a 30 minute research talk followed by Q&A from students and instructors.

Textbook & suggested field guides

Krebs, C.J. Ecological methodology, 2nd Edition. 1999. Addison Wesley Longman. Menlo Park, CA.

Richard E. White, Donald J. Borror, Roger Tory Peterson. 1998. A Field Guide to Insects (Paperback). Houghton Mifflin Company. Boston.

Stebbins, R.C. and R.T. Peterson. 2003. A Field Guide to Western Reptiles and Amphibians: Field Marks of All Species in Western North America, Including Baja California. Houghton Mifflin Company. Boston.

Required supplies

Rite in rain © field notebook.

- Many different types. Bookstore typically has soft bound notebooks in stock. I prefer the durable hardbound variety, but these are expensive. Spiral notebooks with plastic covers are nice (and cheaper). I also prefer books with either 'horizontal lines' or 'level format'. These have less lines and allow you to write and draw in the same notebook.
- **See:** <http://www.pollardwater.com/EMarket/Pages/RR353.asp>

Tent (borrow or share if you don't have one)

Sleeping bag & pad

Headlamp or flashlight

Raingear

Shoes you can get dirty & wet (hiking boots best)

Water bottle

Sunscreen

Recommended extras

Binoculars

Camelback or other hydration system

Schedule of lectures & field trips

Week 1—August 25, 2006

Intro:

- Class requirements
- Survival necessities for class
- Lecture 1: Natural History, Experiments and Theory

Readings

- MacArthur, R.H. 1958. Population ecology of some warblers of Northeastern coniferous forests. *Ecology* 39(4): 599-619.
- Connell, J. H. 1961. The influence of interspecific competition and other factors on the distribution of the barnacle *Chthamalus stellatus*. *Ecology* 42(4): 710-723.

Week 2—September 1, 2006

Special Field Trip: San Pedro River Sept. 1-3

Lecture 2: San Pedro River Natural History

Lecture 3: Riparian Diversity Gradients

Activities/Data Collection Priorities

- 1) Terrestrial invertebrate sampling methods: pitfall, sticky, malaise and light traps. Goal: Compare assemblages trapped by each method (data for Lab 1)
- 2) Herbaceous plant cover and diversity gradients: comparison of cottonwood gallery and far scrub using Whitaker plots. Goal to test a theory about community structure (data for Lab 2)
- 3) Litter Collection & Litter Bag Construction (data for Lab 7)

Readings

- Sabo, J.L., †R. Sponseller, M. Dixon, †K. Gade, †T. Harms, †J. Hefernan, †A. Jani, G. Katz, †C. Soykan, †J. Watts, †J. Welter. 2005. Riparian zones increase regional richness by harboring different, not more species. *Ecology* 86(1): 56-62.
- Lite, SJ, KJ Bagstad and JC Stromberg. 2005. Riparian plant species richness along lateral and longitudinal gradients of water stress and flood disturbance, San Pedro River, Arizona, USA. *Journal of Arid Environments* 63(4): 785-813.

Week 3—September 8, 2006

Lecture 4a: Diversity theory 101

Lecture 4b: Basics of insect taxonomy

Lab 1 data analysis—Riparian insect diversity gradients

Readings

- Sousa, W.P. 1979. Disturbance in marine intertidal boulder fields: the nonequilibrium maintenance of species diversity. *Ecology* 60:1225-1239.
- Paine, R.T. 1966. Food web complexity and species diversity. *American Naturalist* 100: 65-75.
- Simberloff, D.S. and E.O. Wilson. 1969. Experimental zoogeography of islands: The colonization of empty islands. *Ecology* 50(2): 278-296.

Week 4—September 15, 2006

In depth description of group term projects

Lab 1 data analysis (continued)—Riparian plant diversity gradients

Lab team data summary: Instructor and TA give example

Readings

- **TEXTBOOK Chapters 11 & 12**

Week 5—September 22, 2006

In class meetings to discuss group term projects

LAB 1 DUE in class

Week 6—September 29, 2006

Lecture 5: Population biology 101

Readings

- **Morris, W.F. and D.F. Doak. 2002. Quantitative conservation biology. Sinauer Associates. CHAPTER 6.**
- **J. Davidson and H.G. Anderwartha. 1948. The influence of rainfall, evaporation and atmospheric temperature on fluctuations and the size of natural populations of Thrips imiginis. The Journal of Animal Ecology 17: 200-222.**
- **Sibly RM, Barker D, Denham MC, Hone J, Pagel M. 2005. On the regulation of populations of mammals, birds, fish, and insects. SCIENCE 309 (5734): 607-610.**

Week 7—October 6, 2006

Home range and population abundance estimation

Day trip—North Mountain Park

Activities/Data Collection Priorities

- 1) **Lizard abundance estimation: mark recapture and distance methods**
- 2) **Home range location flagging**

Week 8—October 13, 2006

Home range and population abundance estimation

Day trip— North Mountain Park

Activities/Data Collection Priorities

- 1) **Lizard abundance estimation: mark recapture and distance methods**
- 2) **Home range location flagging**

Week 9—October 20, 2006

Lecture 6: Behavioral ecology 101

Lab 2 data analysis— Home Range Estimation

Lab Team 1 data summary

Readings

- Burt, W.H. 1943. Territoriality and home range concepts as applied to mammals. *Journal of Mammalogy*, 24:346-352.
- Marzluff, J.M., Millspaugh, J. 2001. Radio tracking animal populations. Academic Press, San Diego, California. CHAPTER 1

Week 10—October 27, 2006

Milling & drying leaf samples for CHN analysis on EA
Tour of Goldwater Environmental Laboratory (see EA and Lachat)

LAB 2 DUE in class

Readings

- Eby LA, Fagan WF, Minckley WL. 2003. Variability and dynamics of a desert stream community. *ECOLOGICAL APPLICATIONS* 13 (6): 1566-1579.

Week 11—November 3, 2006

Special Field Trip: Aravaipa Creek Friday, Nov 3-5

Activities/Data Collection Priorities

- 1) Aquatic insect collection & identification
- 2) Fish collection & identification: Peter Reinthal
- 3) Ecosystem metabolism

Week 12—November 10, 2006

Lab 3 data analysis—Lizard abundance estimation

Lab Team 2 data summary

Readings

- TEXTBOOK Chapters 2 & 5

Week 13—November 17, 2006

Lab 4 data analysis—Ecosystem Metabolism {TKH}

LAB 3 DUE in class

Lab Team 3 data summary

Readings

- Bott, T. L. 1996. Primary productivity and community respiration. Pages 533-556 in F. R. Hauer and G. A. Lamberti, editors. *Methods in Stream Ecology*. Academic Press, San Diego, CA.

Week 14—November 24, 2006

NO CLASS-Thanksgiving Holiday

Week 15—December 1, 2006

Lab 5 data analysis—Litter C:N, First 2 months of decomposition

LAB 4 DUE in class

Lab Team 4 data summary

Readings

- Hobbie, S.E. 1992. Effects of plant-species on nutrient cycling. Trends in Ecology & Evolution 7 (10): 336-339.

Final Presentations December 8 1-5 pm.

LAB 5 DUE Friday December 8 5pm to TA