MPA in Environmental Science and Policy

ENV U6110: Population and Land Use

Summer Semester 2005
Lectures: Fri 9:30am-12pm; Room 407 IAB
Pre-Labs: Fri. 1-2 PM; Room 407 IAB
Labs: Session A: 2-4 PM and Session B: 4-6 PM; SIPA computer room 510A IAB

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Course Outline

Objective

This course will serve as an introduction to the applied science of maintaining the earth's biological diversity, its landscapes, and wilderness. It is targeted at entry-level Master's students. The course will focus on the biological principles relevant to the conservation of biodiversity at the genetic, population, and community and landscape levels. Due to the cross-disciplinary nature of ecology and biological conservation, some of the social, philosophical, and economic dimensions of biological conservation will also be addressed. Our focus will be on applications and problem-solving in conservation biology. Basic and advanced ecology and evolutionary processes will also be discussed. Students will gain a basic, practical understanding of GIS.

The specific objectives of the course are:

- To define an interdisciplinary approach to address environmental problems and conservation issues.
- An understanding of the ways in which biology can contribute to the solution of the kinds of conservation problems now (or soon to be) facing human society.
- To develop skills needed to recognize and analyze the relationships among the scientific, technological, societal and economic issues that shape environmental research and decision-making.
- To prepare environmental management and policy professionals to use research in a data based decision-making process that is firmly grounded in current scientific knowledge and methodology.

Course Structure
Each section of the course includes the examination of key questions and concepts that will be illustrated by lectures, class discussion, required and supplemental readings, and associated websites.

Course lectures intend to present a broad overview of the issues in conservation biology affecting populations and the landscape. I encourage individuals in class to contribute to discussions in the lecture period. Students will be expected to do the assigned reading before class (excluding the synthesis notes which will be available online at Courseworks after each lecture) and be prepared to discuss the articles in class. The class will meet for one lecture period (2.5 hrs) and one lab (2 hrs) per week. The group will be divided into two sections for the afternoon labs (2-4 PM and 4-6 PM) to make the learning environment more accessible to all.

Readings and Text:
The principal text for this course is "Principles of Conservation Biology" by Meffe and Carroll, 2nd edition (Sinauer, 1997). You can purchase textbooks online or in Columbia bookstore. Scientific articles are available either online (if they are not copyright protected) or on the CourseWorks website (under Class Files/Shared Files), or the citation is listed and you may download them individually. Synthesis notes which summarize all lecture material, and often contain supplemental material, are available after most (but not all) lectures online at Courseworks: (https://courseworks.columbia.edu/), also found in the shared files folder.

Grades will be based on the following:

The course will consist of lectures and discussion/labs once a week, with grading based on participation in the debates, papers, and general classroom participation, including attendance.

Article Review (15%): (no more than 2 pages). Students will be expected to do a significant amount of reading for the course and to contribute to discussions on readings. Most weeks, a number of required readings will be assigned. Every few weeks, I will select two readings from these and ask you to write a two-page review of one of these papers. The purpose of these exercises is to hone your close reading of the scientific literature and develop your critical thinking skills. Peer review is a core part of the structure of scientific community, and a two-page review (while longer than most peer reviews) is a good length to master. In these reviews, please provide: a) one paragraph summary; b) discussion of critical strengths; c) discussion of critical weaknesses. I anticipate the format to be that of a scientific narrative with transitions between sections, NOT bullets or disconnected sections under headings.

Group Project (20%): Groups of up to five students will explore a geographic area of the world, working throughout the semester to summarize the status and importance of that region: what is the biodiversity of that region; why is the biodiversity important (from different stakeholder perspectives); and what threatens the biodiversity of that region. Use relevant lecture material &/or supplement your knowledge using scientific literature or web searches (web searches alone are not sufficient). Your group paper will include three sections: a biodiversity summary, stakeholder summary, and threats summary. Specific details on this project are available under the 'Assignments' section of Courseworks.

Your portfolio of summaries will be collected in class on **August 5th**, late papers will be penalized. Group members will prepare a 10-minute presentation to the class summarizing the main findings of the semester – what is the biodiversity of the region, why is it important, and what threatens it.

Class Participation and Questions on Readings (5%): Attendance is not mandatory, but to do well in this course you should expect to attend class and read the background material in the text. Since part of this course will consist of class discussion, and since some of the labs will depend upon everyone's participation, my subjective evaluation of your participation (including attendance, obviously) will account for 5% of your grade. You should come to class every day having read the material to be discussed or having done the assignment for lab and be prepared to contribute to the discussion of it. Each week students will prepare two questions for discussion based on the readings and post those questions on the discussion section of CourseWorks by the evening prior to the class. If there is a problem posting questions online, they should be submitted via email to the TA's. Questions submitted on Monday AM will not be accepted. Questions should be designed to elicit discussion, comparing and contrasting or synthesizing results from different readings. Students will be asked to share either their own question posted on Courseworks, or their favorite question (which can be posted by others) during class discussions on readings.

Debates (25%): The last class meeting will be devoted to formal debates on topics that are selected at the beginning of the semester. You will have almost the whole semester to prepare for your debate, and my intention is that you delve deeply into the literature on your topic as part of that preparation. Since many debate topics will have economic, sociological, political ramifications in addition to biological ones, I'll expect you to delve into those as well. A total of 4-6 students will be assigned to each debate**, but you won't know which side you'll be arguing for until the actual day of the debate. Thus, you will have to prepare adequately to argue either side!** To help prepare in a timely manner, you'll be required to write a 10 pages (or so, double spaced) essay presenting both sides of the resolution. This essay will be due for everyone on the last day of class. Here again, you'll need to prepare not just your written essay, but also to be prepared to make a brief oral statement of your side's position during the debate. The structure of the debate and potential debate topics can be found under "Assignments" in Courseworks.

Labs (35%): Approximately half the labs require some computer simulations and GIS related exercises, while the other half are ecological calculative exercises based on data sets collected elsewhere, etc. You should also be aware that some lab activities might require out-of-class time. Please bring a calculator to all labs.

Course Outline

Class 1: June 3 - Introduction – What is Biodiversity?
Read:

1) Chapter 2 & 4 in Conservation Biology (Meffe and Carroll, Sinauer 1997).
2) Fjeldsa, J. and J.C. Lovett 1997. Biodiversity and environmental stability. Biodiversity and Conservation 6: 315-323.
3) Naeem, S. 2002. Biodiversity equals instability? Nature 416 :23-24

Lab 1: **Math Review**

Class 2: June 10– Threats to Biodiversity

Read:

1) Tilman, D. 2000. Causes, consequences, and ethics of biodiversity. Nature 405:208-211.
2) Sodhi, N.S. et al. 2004. Southeast Asian biodiversity: an impending disaster. Trends in Ecology and Evolution 19: 664-660
3) Chapter 5 in Principles of Conservation Biology text (Meffe and Carroll, Sinauer 1997)

Lab 2: **Trip to American Museum of Natural History- Hall of Biodiversity.**

Group 1 will meet at the Rose Center Entrance promptly at 1:40 pm
Group 2 will meet at 3:40 pm (Rose Center Planetarium entrance is located on W. 79th b/t Central Park West and Columbus Ave.- Take either the 1/9 subway line to W. 79th St. and walk ~4 blocks east towards Central Park, or take the C/E to 79th St. and exit onto the street to get to the Rose Center Planetarium Entrance. This entrance is the one with the large cobblestone driveway and leads toward the glass enclosure of the planetarium. **If you're late, we will not be waiting for you!**

Class 3: June 17- Conservation Genetics

Review Material: This website is a great place to review the basics of genetics and conservation genetics:
http://gslc.genetics.utah.edu/units/basics/tour/
http://www.ncbi.nlm.nih.gov/About/primer/genetics.html
http://www.science.org.au/nova/044/044print.htm

Read:

1) Hedrick, P. and Miller, P. 1992. Conservation Genetics: Techniques and Fundamentals 2:30-46
2) O'Brien, S.J. 1994. The cheetah's conservation controversy. Conservation Biology 8:1153-1155
3) O'Brien, S.J. et al. 1985. Genetic basis for species vulnerability in the cheetah. Science 227:1428-1434.
4) Chapter 6 in Principles of Conservation Biology text

Lab 3: **Genetics Exercises**

Class 4: June 24 – Guest Lecturers: The Role of NGO's and Independent Gov't Agencies in Conservation

-*Dr. Tim Ragen,* Scientific Program Director of the Marine Mammal Commission

-*Dr. Tom Lacher,* Senior Vice President and Executive Director, Center for Applied Biodiversity Science at Conservation International

Read:

1) About the Marine Mammal Commission (pdf)
2) Conservation International Overview
3) Stem, C. et al. 2005. Monitoring and evaluation in conservation: A review of trends and applications. Conservation Biology 19:295-309

Lab 4: **TBA**

Class 5: July 1- Applied Demography

Read:

1) Ch 7 in Principles of Conservation Biology.
2) Bradbury, R. et al. 2001. Predicting population responses to resource management. Trends in Ecology and Evolution 16:440-445.
3) Lamont, B.B. and P.G. Klinkhamer. 1993. Population size and viability. Nature 362:211

***Lab 5*: Parrots and palms: Estimating the vital statistics of populations to determine best management strategies and sustainable harvest levels. Work in groups and turn in exercise at end of lab.**

Class 6: July 8- Population Dynamics and Small Populations

Read:

1) Burrows, R., H. Hofer, et al. 1994. Demography, extinction and intervention in a small population- the case of the Serengeti Wild Dogs. Proceedings of the Royal Society of London Series- B- Biological Sciences 256(1347): 281-292.
2) Berger, J. 1990. Persistence of different-sized populations: an empirical assessment of rapid extinction in bighorn sheep.
3) Chapter 8 in Principles of Conservation Biology

***Lab 6:* Population Viability Analysis (PVA): Management strategies for a small population of Bandicoots (NetLibrary)**

Class 7: July 15- Threat Assessment in Conservation Planning and GIS in Conservation Planning

Read:

1) Gardenfors, U. 2001. Classifying threatened species at a national versus global level. Trends in Ecology and Evolution 16: 511-516.
2) Gardenfors,U., C. Hilton-Taylor, G.M. Mace and J.P. Rodriguez. 2001. The application of IUCN Red List Criteria at regional levels. Conservation Biology 15 (5): 1206-1212

***Lab 7:* Conservation Planning and Management Exercise for Kabini Biosphere Reserve. Work in groups and hand in exercise following week in lab.**

Class 8: July 22- Ecosystem Loss and Fragmentation

Read:

1) Read Chapter 9-10 in Principles of Conservation Biology
2) Fahrig & Merriam. 1994. Conservation of Fragmented Populations. Conservation Biology 8:50-59.
3) Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. Annual Review of Ecology, evolution and systematics 34:487:515.
4) Sih, A., G. Jonsson, and G. Luikart. 2000. Habitat loss: ecological, evolutionary and genetic consequences. Trends in Ecology and Evolution (TREE) 18:94-101.

***Lab 8:* GIS exercise**

Class 9: July 29- Ecosystem Management

Read:

1) Scientific Consensus Statement on Marine Ecosystem-Based Management, March 2005
2) Grumbine, R. 1994. What is Ecosystem Management? Conservation Biology 8:27-38
3) Grumbine, R. 1997. Perspectives on Ecosystem Management. Conservation Biology 11:41-47.
4) Yaffee, S.L. 19999. Three Faces of Ecosystem Management. Conservation Biology 13:713-725.

Lab 9: **GIS exercise**

Class 10: Aug 5- Ecology, Politics, and Economics/ Biodiversity and Geographic Regions Presentations (10 min/group).

Read:

1) Chapter 15 in Conservation Biology Text
2) Soule et al. 2005. Strongly interacting species, conservation policy, management, and ethics. Bioscience 55: 168-176.
3) Vitousek, P., H.A. Mooney, J. Lubchenco, & J. Melillo. 1997. Human Domination of Earth's Ecosystems. Science 277:494-503.

Lab 10: **Work in groups to prepare for debate**

Class 11: Aug 12- Guest Lecturer and Group Debate

Guest: Dr. Sanjayan, Lead Scientist at The Nature Conservancy

Read:

1) The Nature Conservancy Overview (pgs 1-4).
2) Adams, W. et al. 2004. Biodiversity conservation and eradication of poverty. Science 306: 1146-1149.

Lab 11: **Debates Continued If Needed**