Summer Semester 2004
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

This course is divided into two modules: Populations (June 4th - July 2th) and Land-Use (July 9th - Aug 20th).

Objectives

The first section of this course ("Populations ") 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.

The specific objectives of the Populations module are:
• To define an interdisciplinary approach to address environmental problems and conservation issues.
• 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.
The second section of this course ("Land Use") focuses on land use, environmental conservation and environmental impact. The purpose of the class is to examine: 1) several types of land use and their impacts on the environment; and 2) several methods for analyzing environmental impacts stemming from the use of land resources. The end result is to better prepare students to think critically about land use and environmental problems and to make decisions about the use of environmental resources.

The approach taken in the Land Use section of the course will cover a number of subject areas in resource management and different analytic approaches. The purpose of this course is to provide diverse approaches to issues of land use planning and management and their impacts on the environment. It provides students with a scientific foundation to understand resource use and techniques for analyzing land use management. The one technique to which we will give particular attention is geographic information systems (GIS). Students will gain a basic, practical understanding of GIS applications using ArcView GIS 3.3.

The specific objectives of the Land-Use module are:
• Define an interdisciplinary approach to address land-based environmental problems;
• Develop appropriate skills related to GIS;
• Develop skills to analyze the relationships among scientific, technological, societal and economic issues that shape environmental research and decision-making; and
• Develop environmental decision-making skills that are grounded in current scientific knowledge and methodology.

Course Structure and Method of Instruction
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.

The Populations portion of this course will begin with lectures intended to present a broad overview of the issues in conservation biology. Subsequent classes will be a mixture of lecture and discussion. 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.

In the Land Use module, we first develop a conceptual framework for examining the human-environment interaction and a framework for using geographic information systems (GIS). Then we look at various resource issues (e.g. Smart Growth, Sensitive Lands, Watersheds, Stormwater Quantity and Quality, Groundwater Protection, Coastal Zone, Wetlands, Natural Hazards, Endangered Species), all of which have implications for land use decision-making. Finally, we address several approaches to land use analysis, including environmental impact analysis and carrying capacity studies. The morning seminars (9:30 AM – 12:00 PM, including a break) will consist of lectures and discussions based on the assigned reading material outlined on the schedule. The afternoon pre-lab (1-2 PM) will introduce the topic for the afternoon. The labs will be based on assigned sections and exercises in the Conservation GIS Starter Kit.
Readings and Text:
The required texts for the Populations and Land Use sections are:
- "Principles of Conservation Biology" (1997), by Meffe and Carroll, 2nd Ed.
- "Environmental Land Use Planning and Management" (2004), by John Randolph.

All required Textbooks are available at the Columbia Bookstore under the course title and number.

The "Conservation GIS Starter Kit", used in labs from both modules of the course will be provided to the students on a signed-off basis. Additionally, scientific articles will be provided either online (if they are not copyright protected) on the CourseWorks website, or the citation is listed and you may download them individually. For Land Use, selected research articles bibliography on Land Use and GIS applications is available on reserve electronically and/or in hard copy (all articles are accessible through the Reserve option on coursework). You and your team members will need to read several articles (4-5) as outlined below in group project.

Method of Evaluation:

Populations:
The course will consist of lectures and discussion once a week, with grading based on participation in the debates, papers, and on general classroom participation. Students will be expected to do a significant amount of reading for the course. They will also undertake exercises assigned during lab as homework during the week. Each lab homework or in-class assignment is worth 10% of your grade. The first two laboratories are GIS oriented (Chapters 1 and 2 in Conservation GIS Starter Kit). The second labs will be ecology group exercises. A short-answer final exam will be given at the end of summer semester in conjunction with the “Lands” module (35%). Participation in classroom discussions on assigned reading will be 25% of your grade.

Land Use:
GIS Labs: There are four sets of labs due over the six-week period. They can be found in The Conservation GIS Starter Kit. Students are responsible for completing the exercises as follows:

1) Land Use and Housing Density - 3 exercises -- Due: Friday, July 16.
2) Using Images – 2 exercises --Due: Friday, July 23.
3) Watershed Analysis - 7 exercises -- Due: Friday, August 6.
4) Timber Sale Analysis - 10 exercises -- Due: Friday, August 20

The first two sets of exercises consist of 3 exercises each and are due on the second and third weeks. The third and fourth set of exercises are due on the fifth and seventh weeks and consist of 7 and 10 exercises respectively. Students have more time to complete the third and fourth sets. However, students will also be working on group written projects – due 6th week – and the final exam – scheduled for 7th week. Therefore, it is imperative that you manage your time well.

Upon completion of each set of exercises, the final page or the pages identified in the handout should be captured through “Snagit” and saved in a JPEG file and emailed to the teaching assistant, Alex Witworth according to the instructions that I will provide.
**Land-Use Group Paper/Project:** The group projects will be based on the work of five individuals per group and will culminate in the group producing a 20-25 page paper. The groups will analyze at least five of the articles on reserve on the use of GIS in land use problem solving and decision-making, identify key subjects and applications of GIS as an analytic tool in land use decision-making.

The articles in the selected bibliography are available online at:
1) www.columbia.edu
2) Click on Libraries on the Left menu bar
3) From there select CLIO (Columbia Online Catalog)
4) Click on the 3rd tab - Course Reserves
5) From there, scroll down to Professors’ Names and find “Ringer”
6) When you select it, all the available titles on reserve will show up along with their locations.

Please note that all copies of articles on E-reserve are also available in the folder reserve in the library. According to the Library, certain items are held only in reserve in the library and not on the internet e-reserves for copyright reasons: 1) the library cannot put on e-reserve any item that is over 20 per cent of a book; and 2) certain publishers do not allow electronic copies to be posted. The library maintains the copies of those articles on hand for students to copy themselves.

Each group will select at least as many articles as there are people in the working group. Each article must be in a different resource area (e.g. do not pick two articles on wetlands). Some questions or issues for group discussion and analysis include:

1) Identify the land use problems presented.
2) Critically analyze how GIS is used to solve real world land use problems.
3) What data layers are collected? How are the data used? Are there limitations or opportunities because of the data collected?
4) Discuss the implications of the results for environmental policy.
5) Discuss how the information in the articles can be used by non-scientists and environmental decision-makers.
6) What sorts of environmental decision-making is enhanced by the application of GIS in each case study?
7) Discuss the environmental values and perceptions that are reflected in the approaches taken.

**Final Exam:** The combined final exam is based on assigned readings and class discussions.

**Policy on Late Submissions of Labs and Papers:**
Ten percent (10%) of the grade will be deducted per day if the lab reports and group papers are submitted past the due date. Materials that are submitted more than one week late will not be accepted.

**Grades for the course will be based on the following:** 50% for Populations - 50% for Land Use

**Populations:**
- Classroom participation: 25%
- Lab reports: 40%
- Final Exam 35%

**Land Use:**
- GIS Labs: 40% (10% for each lab)
- Final Exam: 25%
- Group Paper/Project 35%
Course Schedule

Populations Section

1) Populations 1: June 4 - Introduction – What is Biodiversity?

Read:
1) Synthesis notes (available after lecture online at CourseWorks).
3) Fjeldsa, J. and J.C. Lovett 1997. Biodiversity and environmental stability. Biodiversity and

Pre-lab: Select groups for group projects. You will remain in these 5 person groups for group
   exercises in lab 4 &5. Each group MUST have at least one person with a scientific background
   and one person with a policy background (in other words, I don’t want all the policy people
   working together etc.)

Lab: Math Review

2) Populations 2: June 11 – Threats to Biodiversity

Read:
1) Synthesis notes (available after lecture online at CourseWorks).

Pre-Lab: 1-2pm in 407 IAB

Lab: ArcView Basics—Learn how to display geographic data, identify features in a view and
   produce a simple map layout. Complete exercises 1-3 in Chapter 1 of the Conservation GIS
   Starter Kit. Hand in either electronic copy of printed copy of your map to TA by end of lab.

3) Populations 3: June 18 - Ecosystem Loss and Fragmentation

Read:
1) Synthesis notes (available after lecture online at CourseWorks).
2) Read Chapter 9-10 in Principles of Conservation Biology

Pre-lab: 1-2pm in 407 IAB

Lab: Habitat Loss and Endangered Species GIS computer exercise. Save project and email to TA by
   the following lab meeting.

4) Populations 4: June 18 – Applied Demography

Read:
1) Synthesis notes (available online after lecture)
2) Ch 7 in Principles of Conservation Biology.

Pre-lab: 1-2pm in 407 IAB

Lab: 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.
5) Populations 5: June 25th - Threat Assessment in Conservation Planning

*Read:*

1) Synthesis notes (available online after lecture).


*Pre-Lab: 1-2pm in 407 IAB
Lab: Conservation Planning and Management Exercise for Kabini Biosphere Reserve. Work in groups and hand in exercise following week in lab.

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**Land Use Section**

6) **Land Use 1:** Friday, July 9
Topics: Introduction to Land Use Module, Land Conservation, Geospatial Data and Geographic Information Systems

*Read: Chapters 1, 2 (pp. 20-28, 32-34), 3 and 11(pp. 275-280, 299-315)

7) **Land Use 2:** Friday, July 16
Topic: Public Participation, Smart Growth Management, Government Management of Sensitive Lands

*Assignment Due:* GIS Lab on Land Use and Population Density

*Read: Chapters 4, 7, 8

8) **Land Use 3:** Friday, July 23
Topics: Land Use and Natural Hazards, Remote Sensing Applications (guest lecture)

*Assignment Due:* GIS Lab on Using Images/Land Cover

*Reading Assignment:* Chapter 9 (pp. 200-219), 11 (pp. 285-295)

9) **Land Use 4:** Friday, July 30
Topics: Ecosystem and Watershed Management, Runoff Pollution, Assessment of Stormwater Quantity and Quality

*Assignment Due:* Working outline for group project.

*Read: Chapters 10, 13 (pp. 392-412), 14 (pp. 442-446, 469-472)

10) **Land Use 5:** Friday, August 6
Topics: Wetlands and Habitats, Coastal Zone Management, Endangered Species

*Assignment Due:* GIS Lab on Watershed Analysis

*Read: Chapter 16 (pp. 538-554), Chapter 17 (pp. 575-589)

11) **Land Use 6:** Friday, August 13
Topics: Environmental Impact Assessment, Carrying Capacity

*Assignment Due:* Group Paper/Project

*Read: Chapters 18 (pp. 604-616)
12) Land Use and Population: Friday, August 20
Assignment Due: Final Exam, GIS Lab on Timber Analysis
Read: Review all assigned chapters in Randolph for exam. Be prepared to answer 6 of 10 questions in a written format.

Final Examination: Tuesday, August 20th.

READINGS

Required:
2) "Environmental Land Use Planning and Management" (2004), by John Randolph.
3) Conservation GIS Starter Kit.

Supplementary Articles for Populations Module (PDF found on Courseworks):