

BIODIVERSITY SCIENCE I
RPTS 655/WFSC 655
SPRING 2015
MON & WED 1:15 TO 2:45, ROOM 102 VET MED SCIENCE

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“Conservation cannot be achieved without the soundest information from the natural and social sciences.” Jose Sarukhan, Institute of Ecology, National University of Mexico

OVERVIEW

Efforts to halt the loss of biodiversity must be based on integration between science and practice. Linking theory with conservation requires the engagement of many different actors, including biologists and social scientists, universities and museums, governments and nongovernmental organizations, industries, interest groups, and communities. Such collaboration is critical for establishing conservation priorities, developing ecologically and socially acceptable management plans, building local capacity for stewardship, and guiding effective policy. Currently, a great deal of conservation research is based in universities with few linkages between scientists and practitioners, or between theory and on-the-ground work. Moreover, research on patterns and processes that underlie the loss of biodiversity are often conceptual and discipline specific, with few lessons shared among researchers from diverse disciplines.

Our goal in this course is to build cross-disciplinary understanding of biodiversity science. We ask:

- 1) What is biodiversity? How is it perceived, valued, measured, monitored, and protected?
- 2) What are the main concerns surrounding biodiversity? Who voices these concerns and why?
- 3) What are current perspectives about biodiversity conservation from evolutionary and community ecology, conservation biology, environmental anthropology, and political ecology?
- 4) What can we learn from popular and academic case studies?

REQUIREMENTS

Participation (20 points): The class is a seminar, facilitated by an anthropologist and a biologist. We will draw on our disciplinary backgrounds as we discuss various conservation issues and paradigms. We are relative beginners in each other's field. Each of you too will be a novice in some things, an expert in others. This is the nature of multidisciplinary collaboration. We encourage you to speak up about what you know well and listen carefully to the things that

are new. Please prepare for each class by reading the assigned articles, taking notes, and bringing questions, analyses, and critiques.

Facilitation of discussion (30 points): Each of you will be responsible for facilitating one of the weekly topics. You will work in pairs. Preparation will include reading and synthesizing the main messages from that week's readings, building a discussion plan, and guiding our conversation.

Team Project (50 points): We will assemble groups of 3-4 people to carry out a team project. The aim is to provide an academic response to a recent popular media piece on conservation. The project has three parts: a) White Paper, b) Presentation, and c) Reading Selection.

a) White Paper

- Please address the following questions in relation to the popular media piece:
 - What is the conservation concern or challenge?
 - What are the proposed solutions?
 - What is your informed perspective? What theoretical frameworks, scientific research, empirical data, and/or case studies can you bring to bear on this topic? You may include a conceptual framework, a literature review, data tables, and so forth.
 - What are the implications of your perspective for policy?
- Limited to 10 pages, double-spaced, not including literature cited.
- The series of "Working Papers" produced by the Wildlife Conservation Society may serve as a model for what you will write (<http://archive.wcs.org/wcspubs/science.html>) The first half of the following example may be especially useful: *Casting for Conservation actors: people, partnerships and wildlife* (<http://archive.wcs.org/media/file/wcswp28.pdf>)

b) Presentation

Each team has two class periods to cover the topic. You may devote some of the time to teaching the class about your conservation issue or presenting the topic generally. Be sure to allow enough time for seminar discussion as well.

c) Reading Selection

Two weeks before your team's presentation, please provide the class with 2-3 articles we should read in preparation for the discussion.

Grading: A=90-100 points, B=80-89 points, C=70-79 points, D=60-69 points, F=below 60 points

REQUIRED TEXTS

- Quammen, D. 1997. The Song of the Dodo: Island Biogeography in an Age of Extinction. Scribner.
- Dowie, M. 2009. Conservation Refugees: The Hundred-Year Conflict between Global Conservation and Native Peoples. The MIT Press.
- Additional journal articles, chapters, web links, and reports will be posted to website.

SCHEDULE

Class #	Date	Day	Week	Content
1	21-Jan	W	0	Introduction and Applied Biodiversity Science
2	26-Jan	M	1	Applied Biodiversity Science
3	28-Jan	W		Defining and Measuring Biodiversity
4	2-Feb	M	2	Cultural Diversity
5	4-Feb	W		
6	9-Feb	M	3	From Genes to Landscapes Fitzgerald Confirmed
7	11-Feb	W		
8	16-Feb	M	4	Crisis of Loss Brightsmith
9	18-Feb	W		
10	23-Feb	M	5	Questioning the Commons Fleischman confirmed
11	25-Feb	W		
12	2-Mar	M	6	Political Ecology Brannstrom
13	4-Mar	W		
14	9-Mar	M	7	Setting Priorities Lacher confirmed
15	11-Mar	W		
16	23-Mar	M	8	Team Panels And Discussions Week 1
17	25-Mar	W		
18	30-Mar	M	9	Team Panels And Discussions Week 2
19	1-Apr	W		
20	6-Apr	M	10	Team Panels And Discussions Week 3
21	8-Apr	W		
22	13-Apr	M	11	Team Panels And Discussions Week 4
23	15-Apr	W		
24	20-Apr	M	12	Market-based Conservation Woodward
25	22-Apr	W		
26	27-Apr	M	13	Book Discussion
27	29-Apr	W		
28	4-May	M	14	Insights, lessons, new questions

TOPICS and READINGS

APPLIED BIODIVERSITY SCIENCE In the first week, we set the stage for our discussions about biodiversity, culture, ecology, governance, and conservation. We will discuss the

intersections between ecosystems and social systems, and we will define as a group what we mean by Applied Biodiversity Science.

Readings:

- Friedman, T. 2009 Connecting Nature's Dots. The New York Times, August 23, 2009. <http://www.nytimes.com/2009/08/23/opinion/23friedman.html>
- Schwartz, M. 2008. The importance of stupidity in scientific research
- Sutherland, W.J., et al. One Hundred Questions of Importance to the Conservation of Global Biological Diversity.
- Fitzgerald, L. and Stronza, A. 2009. Applied Biodiversity Science: Integrating Ecology, Culture, and Governance for Effective Conservation, *Interciencia* 34(8):563-570.

DEFINING AND MEASURING BIODIVERSITY Here we learn and discuss definitions of biodiversity, species diversity, and patterns of biological diversity (including species-area relationship, island biogeography, latitudinal gradient in species richness, local and regional richness, species-elevation relationship, and macroecological rules).

Readings:

- Hunter Jr., M. L. (1996) What is Biodiversity? pp. 19-31 *In Fundamentals of Conservation Biology*. Blackwell.
- Purvis and Hector (2000) Getting the measure of biodiversity. *Nature* 405:212-219.
- Gaston KJ (2000) Global patterns in biodiversity. *Nature* 405:220-227.
- Rodda, G (1993) How to lie with Biodiversity. *Conservation Biology* 7 (4):959-960
- Escobar, Arturo (1998) Whose Knowledge, Whose nature? Biodiversity, Conservation, and the Political Ecology of Social Movements *Journal of Political Ecology* Vol.5: 53-82.

CULTURAL DIVERSITY Relationships between humans and nature vary cross-culturally, over time, in different social and economic settings, and by ecosystem. This week, we explore the interface between human populations and ecosystems, viewing culture as something that influences the natural environment and is, in turn, shaped by it.

Readings:

- Cronon, William (1995) The Trouble with Wilderness; or, Getting Back to the Wrong Nature *In Uncommon Ground: Rethinking the Human Place in Nature*. New York: W.W. Norton & Co., William Cronon, Ed., pp 69-90.
- Holling CS. (2001) Understanding the Complexity of Economic, Ecological and Social Systems. *Ecosystems* 4: 390-405.
- Jelinski, Douglas (2005). There is No Mother Nature—There is No Balance of Nature: Culture, Ecology and Conservation. *Human Ecology*, Vol. 33 (2), pp. 271-288.

FROM GENES TO LANDSCAPES: This week, we examine why genetic diversity became part of the foundation of conservation biology, how conservation genetics has changed, how genetic information has been useful (and useless) to on-the-ground conservation, and how genetic and phylogenetic approaches are being applied to integrative conservation issues today. We will focus on case studies of sea turtles, sand dune lizards, cheetahs, and others.

Readings:

- Spielman et al. (2004) Most species are not driven to extinction before genetic factors impact them. *PNAS* 101(42):15261-15264.

- Amos and Balmford (2001) When does conservation genetics matter? *Heredity*:257-265.
- Bowen and Karl (2007) Population genetics and Phylogeography of sea turtles. *Molecular Ecology* 16:4886-4907.
- Campbell, LM. (2007) Local conservation practice and global discourse: a political ecology of sea turtle conservation. *Annals of the American Association of Geographers* 97(2):313-334.
- Storfer et al. (2007) Putting the 'landscape' in landscape genetics. *Heredity* 98:128-142.

POLITICAL ECOLOGY People make decisions about their environment in the context of many factors. These include policies and institutions, economic incentives, and social relations of power at different scales, from the local to the regional and the global. This week, we examine these dimensions of biodiversity loss and conservation with the help of an analytical framework known as political ecology.

Readings:

- Sherbinin, A. de, Carr, D., Cassels, S., Jiang, L. 2007. Population and Environment *Annual Review of Environment and Resources*, Vol. 32: 345-373.
- The Bigger Picture pp. 156-180 *In* Borgerhoff Mulder, M. and Coppolillo, P. 2005. Conservation: Linking Ecology, Economics, and Culture. Princeton, NJ: Princeton University Press.
- Stonich, S., and DeWalt, B. 2006. The Political Ecology of Deforestation in Honduras. pp. 284-301. *In* Haenn, N. and Wilk, R. The Environment in Anthropology. New York, NY: New York University Press.

CRISIS OF LOSS: Throughout your careers you have been led to believe that our planet is experiencing the 6th major extinction event, equal in magnitude to the mass extinctions in the geologic past. The 6th extinction is caused by human activities. To understand something so important at a scientific level, we will review the processes that result in the generation of biodiversity and some causes of extinction. We will take a scientific look at the logic and evidence for the extinction crisis.

Readings:

- Pimm et al. 1995. The Future of Biodiversity. *Science*. 269:347-350
- Jablonski et al. 2004. Extinction risk from climate change. *Nature* 427:145-148. Hooper et al. 2005. Effects of biodiversity on ecosystem functioning: A consensus of current knowledge. *Ecological Monographs* 75(1):3-35.
- Stuart et al. 2004. Status and trends of amphibian declines and extinctions worldwide. *Science* 306:1783-1786.
- Dunn et al. 2009. The sixth mass coextinction: are most endangered species parasites and mutualists? *Proceedings of the Royal Society B-Biological Sciences* 276:3037-3045.

QUESTIONING THE COMMONS: How should society manage resources like water, air, wildlife, and fish that belong to everyone? In 1968, Garrett Hardin addressed this question in an essay that became one of *Science*'s most popular articles. Hardin argued that humans seek to maximize their individual gains and thus deplete the common resources on which everyone depends. He called this the "tragedy of the commons." Hardin's article spawned a great deal of policy, controversy, new theory, and research on "common property resource management."

This week, we read the original essay and ideas that emerged in subsequent years about sustainable governance of common resources.

Readings:

- Hardin, G. (1968) The Tragedy of the Commons *Science* 162:1243-1248.
- Ostrom, E., Burger, J., Field, C.B., Norgaard, R.B., Policansky, D. (1999) Revisiting the commons: local lessons, global challenges. *Science* 284:278–82
- Agrawal, A. (2001) Common Property Institutions and Sustainable Governance of Resources. *World Development* 29(10):1649-1672.
- Berkes, F. (2003). “Rethinking Community-Based Conservation” *Conservation Biology*, 18(3): 621-630.

SETTING PRIORITIES Ideally, conservationists would have the wherewithal to protect all biodiversity everywhere effectively and with high levels of investment and effort. Of course, this is impossible as political, economic, and social capital for conservation is limited. Thus priorities must be established to determine where to focus first and most intensively. The identification of biodiversity “hotspots” has been one approach to prioritization. This week, we examine how “hotspots” have been defined and critiqued, and we discuss the implications for conservation.

Readings:

- Jepson and Canney 2001. Hot for what?
- Kareiva and Marvier. 2003. Conserving Biodiversity Coldspots. *Am. Sci.* (Includes letter to editor and replies.)
- Orme et al. 2005. ...hotspots not congruent with endemism or threat. *Nature*. (includes news and views feature by Possingham and Wilson)

MARKET-BASED CONSERVATION From the certified sustainable wood on the shelves at Home Depot, to the certified organic, shade grown coffee served at the local Starbucks, market-based conservation strategies have become the latest panacea for the globe’s environmental woes. Combining the trend in environmental management towards social sustainability and the trend in global economic management towards free-market liberalism, these programs attempt to address both conservation and development goals. This week, we discuss the basic principles behind market-based conservation, its environmental and social impacts and some critiques against it.

Readings:

- Economist (2005) Rescuing environmentalism. April 21, 2005
- Frost, P., and Bond, I. (2008) The CAMPFIRE programme in Zimbabwe: Payments for wildlife services. *Ecological Economics* 65:776-787.
- Phillpott, S., Bichier, P., Rice, R. and Greenberg, R. (2007) Field-testing ecological and economic benefits of coffee certification programs. *Conservation Biology* 21 (4):975-985.

CONSERVATION: POPULAR AND ACADEMIC

1	<p><i>New York Times</i> In Brazil, Paying Farmers to Let the Trees Stand by Elisabeth Rosenthal http://www.nytimes.com/2009/08/22/science/earth/22degrees.html</p>
2	<p><i>Time Magazine</i></p>

	Vanishing Act: How Climate Change is Causing a New Age of Extinction by Bryan Walsh http://www.time.com/time/covers/0,16641,20090413,00.html
3	<i>National Public Radio (NPR)</i> African Mammals May Migrate to North America, Interview with Josh Donlan by Robert Siegel http://www.npr.org/templates/story/story.php?storyId=4804383
4	<i>MediaStorm.com</i> Project: Black Market by Patrick Brown http://www.mediastorm.com/0015.htm