COURSE OUTLINE – EEOB 370 (EXTINCTION), Spring 2004

Instructors:

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Course requirements –

Required CD: Wilson, E. O. and D. L. Perlman. 2000. *Conserving Earth's Biodiversity. Island Press.* (Other required readings will be assigned throughout the course.)

Additional required reading (available on course web page):

1) synopses
2) pdf files

> Who can explain why one species ranges widely and is very numerous, and why another allied species has a narrow range and is rare?
> — C. Darwin (1859)
>
> Suddenly, as rare things will, [the species] vanished.
> — R. Browning (1855)
>
> "The balance of nature" does not exist and perhaps never has existed.
> — C. Elton (1930)
>
> . . . there is unfortunately no precedent for [6] billion human beings suddenly sharing an enlightened vision of the future.
> — N. R. Flesness (1992)
>
> There are no hopeless cases, only people without hope and expensive cases.
> — M. E. Soulé (1987)

Course goals –

Tropical deforestation is thought to be causing species extinctions at a record-setting pace. Familiar estimates are on the order of several extinctions per hour — in tropical forest ecosystems alone! These "guesstimates" are based on species-area relationships, combined with estimates of current rates of deforestation and the total number of species on Earth. These gloomy predictions serve the purpose of catching the public's attention. But do they make us skeptical and jaded or do they galvanize our joint interest in retarding the rate of global extinction.

We will explore some of the causes of, and potential remedies to, the loss of biodiversity on Earth today. We will also explore ways of improving estimates of current (and future) extinction rates. Throughout the course, we will discuss the underlying ecological and evolutionary basis of extinction, the role of humans as causal agents, and the prospects for conserving biodiversity in the face of a burgeoning human population.

We will address the following questions. If almost all species that have ever existed are now extinct, do we really need to worry about extinction? If human activity is causing, say, 30,000 global species extinctions per year, why is it that we can account for only a few of these species by name? Why are so many current extinctions cryptic? Are they really occurring? How does today's global extinction event compare with historical extinction events? Should we console ourselves with the extinction-is-inevitable argument? Will the global biota rebound? Will we humans still be here if and when it does? What are the ethics of extinction? What makes some species so rare in the first place? Are some species and ecosystems especially vulnerable to extinction? Are some taxa especially vulnerable? Do local extinctions really lead to ecosystem decay? Is biodiversity conservation really "all about real estate"? What are the problems facing small populations? Which kind of random element — demographic, environmental, or genetic — pushes dwindling populations into the extinction vortex? Do "bad genes" cause extinction? How are extinction rates assessed? To what degree can we improve these assessments? What is the role of extinction in the evolutionary process? What do population dynamic principles tell us about extinction risk? How should endangerment be assessed and how should such assessments be translated into conservation plans? Can we really bring species back from the brink? Which species should we save? Why do assessments of species endangerment ignore >99% of all

species? What is the role of the human "population bomb" in the endangerment of species? How large is our ecological footprint and how can we tread lightly? Why do attempts to exploit populations sustainably routinely fail? Why is the overexploitation of communal resources so pervasive? Is there an evolutionary basis for the failure of so many conservation efforts? If so, how can we exploit this insight? Why save biodiversity? How can you contribute toward solving the global extinction crisis?

Organizational details –

Class will be held biweekly, 3:30-4:48 PM. During these sessions, we will participate in:

- Quasi-lectures
- Seminar-style discussions, debates, town hall meetings, stakeholders meetings, etc.

During the early portion of the course, we will rely primarily on the quasi-lecture mode. However, as the class gains a general level of proficiency, we will explore recent advances in the biology of extinction through alternative approaches (listed above). We will discuss primary literature, which will require careful preparation by each of us. Readings and assignments will be posted on the course webpage.

Statement on diversity –

We the instructors embrace the university's mission regarding diversity. We are committed to the goal of creating a welcoming climate for all students and we will attempt to accommodate any student who may have special needs.

Grading Procedures –

Grades will be based on the following scheme. Final grades may be adjusted based on relative performance, but students with a composite score equaling or exceeding 90, 80, or 70% can expect to receive a grade no lower than A-, B-, or C-, respectively.

Required components –

100 points:	Midterm Exam
100 points:	Final Exam
50 points:	Class participation (includes attendance, formal preparation, and verbal contribution)

Notes on these components:

Exams will be given in class and may cover material from lectures/quasi-lectures, reading assignments, and in-class discussions. Exams may include a take-home component, which may include any or all of the following: assessment of extinction rates, written critique of primary literature, or analysis and interpretation of extinction risk.

Class participation refers to *meaningful* participation in all in-class activities and includes *written preparation* for in-class discussions. (Detailed explanation to be given in class.) Perfect attendance as well as consistent preparation and active participation are expected.

Course schedule

Week	Date	Topic	Readings
1	T (3/30)	The biodiversity crisis: fact or fiction?	Synopsis 1; Introduction (CD*)
	R (4/1)	Estimating the extinction event	Synopsis 1; Diversity of Life (CD), Biodiversity over Time (CD)
2	T (4/6)	Estimating the extinction event	Synopsis 1, Threats to Biodiversity (CD)
	R (4/8)	Extending the species-area approach	Synopsis 1; Brooks et al. 1999
3	T (4/13)	How much green stuff do we use?	Synopsis 1
	R (4/15)	Our ecological footprint and biodiversity conservation	Synopsis 1; Social Issues (CD)
4	T (4/20)	Biotic holocaust and eternal optimist	Synopsis 3
	R (4/22)	Can we defy Nature's end?	N/A
5	T (4/27)	New methods for estimating extinction; Review for Midterm	
	R (4/29)	**MIDTERM EXAM** (in-class portion); **Take-home assigned**	N/A
6	T (5/4)	Population dynamics and extinction risk	Synopsis 4
	R (5/6)	Population viability analysis **Take-home portion of MIDTERM EXAM due** (in class)	Conservation Practice (CD)
7	T (5/11)	Guest lecturer: Troy Wilson (cancelled) A geographic approach to biodiversity planning	Midgley et al. 2002; Global Biodiversity (CD)
	R (5/13)	Population loss and the extinction crisis	Ceballos and Erhlich 2002
8	T (5/18)	Biodiversity and ecosystem function	Naeem et al. 1999; Wardle et al. 1999; Naeem 2000
	R (5/20)	Biodiversity and ecosystems: revisited	Loreau et al. 2002; Pfisterer and Schmid 2002; Naeem 2002
9	T (5/25)	Global hotspots and evolutionary history	Sechrest et al. 2002
	R (5/27)	Inbreeding and extinction	Saccheri et al. 1998
10	T (6/1)	Sustainable consumption and biodiversity conservation *Take-home portion of Final Exam assigned*	Myers 2000
	R (6/3)	Economic reasons for saving wild nature The conservationist's cause for optimism Biodiversity conservation: getting involved	Balmford et al. 2002 [Recommended: Learning More (CD)]
Finals week	T (6/8)	**FINAL EXAM** (in-class portion, 3:30 PM, 103 Parks; take-home due)	N/A

*E. O. Wilson and D. L. Perlman's CD, *Conserving Earth's Biodiversity*.