

Conservation and Restoration Ecology – Fall 2013

BISC 525 (3 credit hours)

Instructor: Stephen Brewer, Department of Biology

Time: 9:00 – 9:50 MWF, Room 114, Shoemaker

Texts (Required): *Ecological Restoration – Principles, Values, and Structure of an Emerging Profession* (Second Edition), Andre Clewell and James Aronson; (Recommended): *Essentials of Conservation Biology*, Richard Primack; (Recommended) *The Sunflower Forest – Ecological Restoration and the New Communion with Nature*, William R. Jordan.

Course Objectives and Expectations

The primary objective of this course is to examine the efficacy of applying principles of population, community, landscape, and ecosystem ecology to the protection, restoration, and management of biological diversity and ecosystem function.

Learning Outcome - All students will be introduced to the primary scientific literature in conservation and restoration ecology and will become familiar with current academic and policy debates in the field. Graduate students also will be required to participate in a group research project at Strawberry Plains Audubon Center, the site of an oak woodland restoration project. This will be worth 25% of the final grade. All students will be given a midterm take-home essay exam and a final take-home essay exam. In addition, each student will be required to present a paper from a list of primary articles in conservation biology. The presentation will count for 5% of the final grade. Attendance will be worth 5%.

For undergraduates, the midterm and final exams will each be worth 45% of the final grade.

For graduate students, the exams will be worth 32.5% each.

Grading is on a 10 point percentage scale; The +/- system will NOT be used.

Independent Learning - The group research project is designed to foster independent learning, hands-on field experience, and thoughtful discussion of topics in restoration ecology and biological conservation, which will be of significant value in an academic or other professional career. Undergraduates are encouraged to participate in the research project on a voluntary basis, but will not be graded on their participation.

Office Hours and Contact Information: By appointment or one before after class; Email is the best way to contact me (Jbrewer@olemiss.edu). My office is room 412 in Shoemaker.

Course Outline

I. Introductory Concepts

What is Conservation Biology?

What is Restoration Ecology?

U – Chapter 1 (Overview) in *Ecological Restoration: Principles, Values, and Structure of an Emerging Profession*; A.F. Clewell and J. Aronson. 2013. Required Text.

U - Ridder, B. 2007. The naturalness versus wildness debate: ambiguity, inconsistency, and unattainable objectivity. *Restoration Ecology* 15:8-12. Blackboard

What is Reconciliation Ecology?

U - Rosenzweig, M. L. 2003. Reconciliation Ecology, Chapter 1 (pp. 1- 10) in *Win-Win Ecology*, Oxford University Press. – Available from Brewer

U/G - Primack, R.B., A. J. Miller-Rushing, and K. Dharaneeswaran. 2009. Changes in the flora of Thoreau's Concord. *Biological Conservation* 142:500-508. Blackboard.

Preservation and Restoration in a Changing Climate

U/G – Willis, C.G., Ruhfela, B., Primack, R.B., Miller-Rushing, R.B., and C. C. Davis. 2008. Phylogenetic patterns of species loss in Thoreau's woods are driven by climate change. *Proceedings of the National Academy of Sciences* 105:17029-17033. Blackboard.

U – Fule, P.Z. 2008. Does it make sense to restore wildland fire in changing climate? *Restoration Ecology* 16:526-531. Blackboard.

What is Biodiversity and What Good is it?

U/G – Ostfeld, R.S. and F. Keesing. 2000. Biodiversity and disease risk: the case of Lyme Disease. *Conservation Biology* 14:722-728. Blackboard.

G - Schwartz, M.W., C.A. Brigham, J.D. Hoeksema, K.G. Lyons, M.H. Mills, and P.J. van Mantgem. 2000. Linking biodiversity to ecosystem function: implications for conservation ecology. *Oecologia* 122:297–305. Blackboard.

What Threatens Biological Diversity?

U – Disturbance and Impairment (Chapter 3) from the Clewell and Aronson text.

U - Wilcove, D.S. D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *Bioscience* 48:607-615. Blackboard.

II. Threats to Biological Diversity – A Closer Look

Population-Level Concerns; Identification of Critical Life-History Transitions

Modeling Population Growth of Threatened Species

G - Crouse, D.T., L.B. Crowder, and H. Caswell. 1987. A stage-based model for loggerhead sea turtles and implications for conservation. *Ecology* 68:1412-1423. Blackboard.

Metapopulation Viability in Fragmented and Altered Landscapes

U/G – Menges, E. 1990. Population viability analysis for an endangered plant. *Conservation Biology* 4:52-62. Blackboard.

Community, Ecosystem, and Biosphere-Level Concerns

The Relevance of Theory to Conservation and Restoration

U/G - Doak, D.F. and L. S. Mills. 1994. A useful role for theory in conservation. *Ecology* 75:615-626. Blackboard.

U- Rosenzweig, M. L. 2003. The tyranny of space, Chapter 8 (pp. 102-126) in *Win-Win Ecology*. Available from Brewer

U- Rosenzweig, M. L. 2003. Falling down the time shaft: The case of the incredible shrinking planet, Chapter 9 (pp. 127-141) in *Win-Win Ecology*. Available from Brewer

U/G - Nowacki, J. N. and M. D. Abrams. 2008. The demise of fire and “mesophication” of forests in the Eastern United States. *BioScience* 58:123-138. Blackboard.

Species Interactions, Disturbance Regimes, and Habitat Fragmentation

- U/G – Berger, J., P. B. Stacey, L. Bellis, and M. P. Johnson. 2001. A mammalian predator-prey imbalance: grizzly bear and wolf extinction affect avian neotropical migrants. *Ecological Applications* 11:947-960. Blackboard.
- G – Donovan, T. M. and C. H. Flather. 2002. Relationships among North American songbird trends, habitat fragmentation, and landscape occupancy. *Ecological Applications* 12:364-374. Blackboard.
- G – Brewer JS, Bertz, CA, Cannon JB, Chesser JD, Maynard EE (2012) Do natural disturbances or the forestry practices that follow them convert forests to early-successional communities? *Ecological Applications* 22:442–458. Blackboard.

Exotic Species Introductions and Impacts of Invasive Species

- G - Brewer, J.S. 2011. Per capita community-level effects of an invasive grass, *Microstegium vimineum*, on vegetation in mesic forests in northern Mississippi (USA). *Biological Invasions* 13:701-715. (Blackboard)
- G - Porter, S.D. and D.A. Savignano. 1990. Invasion of polygyne fire ants decimates native ants and disrupts arthropod community. *Ecology* 71:2095-2106. Blackboard
- U/G – King, J.R. and W.A. Tschinkel. 2006. Experimental evidence that the introduced fire ant, *Solenopsis invicta*, does not competitively suppress co-occurring ants in a disturbed habitat. *Journal of Animal Ecology* 75:1370-1378. Blackboard.

Global Environmental Change and Ecosystem Function

- U/G – Beedlow, P.A., D.T. Tingey, D.L. Phillips, W.E. Hogsett, and D.M. Olszyk. 2004. Rising atmospheric CO₂ and carbon sequestration in forests. *Frontiers in Ecology and the Environment* 2:315-322. Blackboard
- U/G – Hurteau, M.D., B.A. Hungate, and G.W. Koch. 2009. Accounting for risk in valuing forest carbon offsets. *Carbon Balance and Management* 4:1. Blackboard
- U/G – Dull, R.A., Nevle, R.J, Woods, W.I., Bird, D.K., Avnery, S. and William M. Denevan, W.M. 2010. The Columbian Encounter and the Little Ice Age: Abrupt Land Use Change, Fire, and Greenhouse Forcing, *Annals of the Association of American Geographers*, 100:755-771.

III. Practical Applications

Identification of Conservation Priorities and Restoration Potential

- U – Ecological References (Chapter 7) in the Clewell and Aronson text.
- U – Scott, J. M. et al. 2001. Nature preserves: do they capture the full range of America's diversity? *Ecological Applications* 11:999-1007. Blackboard
- G – Brewer, J.S. and T. Menzel. 2009. A method for evaluating outcomes of restoration when no reference sites exist. *Restoration Ecology* 17:4-11. Blackboard

Successes, Failures, and Challenges

- G - Laughlin, D.C., J.D. Bakker, M. L. Daniels, M. M. Moore, C. A. Casey, and Judith D. Springer. 2008. Restoring plant species diversity and community composition in a ponderosa pine-bunchgrass ecosystem *Plant Ecology* 197:139–151. Blackboard.
- G – Brawn, J. D. 2006. Effects of restoring oak savannas on bird communities and populations. *Conservation Biology* 20:460-469. Blackboard.
- G – Brewer, J. S. 2005. The lack of favorable responses of an endangered pitcher plant to habitat restoration. *Restoration Ecology* 13:710-717. Blackboard
- U – Keeley, J. E. 2006. Fire management impacts on invasive plants in the Western United States. *Conservation Biology* 20:375-384. Blackboard.
- U - Snyder, N.F. et al. 1996. Limitations of captive breeding in endangered species recovery. *Conservation Biology* 10:338-349. Blackboard

IV. Conservation and Human Societies

Balancing Exploitation with Protection of Biodiversity – Ecological Economics

U - Brown, L.R. 2001. Tools for restructuring the economy, pp. 233-251, in *Eco-Economy: Building an Economy for the Earth*. W.W. Norton & Company, New York.

U – Czech, B. 2003. Technological progress and biodiversity conservation: a dollar spent, a dollar burned. *Conservation Biology* 17:1455-1457. Blackboard

Protecting Biodiversity - Perspectives and Public Policy

U/G – Scott, J.M., D.D. Goble, J.A. Wiens, D.S. Wilcove, M. Bean, and T. Male. 2005. Recovery of imperiled species under the Endangered Species Act: the need for a new approach. *Frontiers in Ecology and the Environment* 3:383-389. Blackboard.

U – Rohlf, D. J. 1991. Six reasons why the Endangered Species Act doesn't work and what to do about it. *Conservation Biology* 5:273-282.

U – Clewell and Aronson – Chapter 12 (Moving Forward – Together)

All papers are required reading for all students taking the course for credit.

Difficulty Codes

U - These readings may be presented by undergraduates only.

U/G - These readings may be presented by either undergraduates or graduate students. Undergraduates get dibs if there is a shortage of U papers.

G - These readings typically contain sophisticated statistical analyses and other methodological details and are intended to be presented by graduate students

Discussion Requirements

Undergraduate Students – Each undergraduate student must lead the discussion of TWO U-rated or ONE U/G-rated paper.

Graduate Students – Each graduate must lead the discussion of ONE G-rated paper or TWO U/G-rated papers.

Each discussion leader will provide the instructor and the entire class with a list of 5 questions pertaining to the assigned reading *at least one day in advance*. The discussion leader then calls upon a different student to answer each question. Disagreements and differences of opinion are intended to spur discussion within the class. The best questions will be judged as those that stimulate the most discussion. Hence, the amount and level of discussion, along with class participation, will be used in grading the performance of the discussion leader and the class.

Schedule of Lecture and Discussions

1. Week of Aug 26

Monday – Aug 26 - Introduction

Wednesday and Friday - Lecture: What is Conservation Biology? Restoration Ecology? Reconciliation Ecology? What is Biodiversity? What is Ecosystem Function?

Recommended reading – Chapter 1 in Primack; Chapters 1 and 2 in Clewell and Aronson

2. Week of Sep 2

Monday – No Class, Labor Day

Wed and Fri – Lecture: Why Protect Biodiversity? Productivity and Community

Invasibility, What are the Major Threats to Biodiversity? What are the Different Levels of Concern in Conservation Biology and Ecological Restoration?

3. Week of Sep 9

Monday - Discussion: Clewell and Aronson (Ch. 1) Ridder

Wednesday – Discussion: Rosenzweig, Primack et al.

Friday – Discussion: Willis et al., Fulé,

4. Week of Sep 16

Monday – Discussions: Ostfeld and Keesing, Schwartz et al.

Wednesday – Discussions: Clewell and Aronson (Ch. 3); Wilcove et al.

Friday – Lecture: Modeling Population Growth/Sensitivity Analyses

5. Week of Sep 23

Monday – Simulation exercises: Matrix models

Wednesday – Discussion: Crouse et al.

Friday - Lecture: Metapopulations and Landscape Ecology

6. Week of Sep 30

Monday - Discussion: Menges

Wednesday - Lecture: Island and Continental Biogeography Theory

Friday – Lecture: Island and Continental Biogeography Theory; **Handout Midterm – Sep 30**

7. Week of Oct 7

No Class; Brewer at Society for Ecological Restoration meetings

8. Week of Oct 14

Monday - Discussions: Doak and Mills, Rosenzweig (Chapter 8); **Midterm due – Oct 14**

Wednesday – Rosenzweig (Chapter 9) Nowacki and Abrams

Friday –Lecture: Species Interactions and Disturbance Regimes

9. Week of Oct 21

Monday – Lecture: Species Diversity; Discussion: Berger et al.,
Wednesday - Discussions: Donovan and Flather; Brewer et al. 2012
Friday: Effects of Invasive Species

10. Week of Oct 28

Monday – Lecture: Effects of Invasive Species (cont.) Discussion: Brewer (Per capita effects...)
Wednesday - Discussions: Porter and Savignano; King and Tschinkel
Friday - Lecture: Global Environmental Change

11. Week of Nov 4

Monday - Lecture: Global Environmental Change; Discussion – Beedlow et al.,
Wednesday - Discussions: Dull et al., Hurteau et al.
Friday - Lecture: Identification of Conservation Priorities and Restoration Potentials

12. Week of Nov 11

Monday – Lecture: Identification of Conservation Priorities and Restoration Potentials;
Discussion – Ecological References (Chapter 7) in Clewell and Aronson text
Wednesday – Discussions: Scott et al. 2001, Brewer and Menzel
Friday - Discussions: Successes, Failures, and Challenges; Laughlin et al., Brawn

13. Week of Nov 18

Monday – Discussions: Successes, Failures, and Challenges; two of three; Brewer,
Keeley, Snyder et al.
Wednesday – Lecture: Balancing Exploitation with Conservation
Friday - Discussions – Brown, Czech

14. Week of Nov 25 – No Class

15. Week of Dec 2

Monday - Lecture: Protecting Biodiversity: Perspectives and Public Policy **Handout
Final, December 2**
Wednesday - Discussions: Scott et al. 2005, Rohlf
Friday – Moving Forward – Together (Chapter 12) in Clewell and Aronson.

Final Exam is due Wednesday, December 11, no later than 11 a.m., the scheduled time of the end of the final exam period for this class.

The class project for the graduate students will be due December 11 no later than 11:00 am, December 11.