Biology 565 (including 565H)--Conservation Biology--Spring 2019

Tuesdays & Thursdays
12:30-1:45 pm
107 Wilson Hall
See also the class website on SAKAI

The Honors Section (565H) meets
Tuesdays, 2-2:50 pm
1377 Genomic Sciences Building

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Who Should Take This Class:

This class draws from all aspects of biology for those at the upper undergraduate or beginning graduate student level who are interested in conservation, whether from a biodiversity or ecosystem perspective. Often students are majors in Environmental Sciences or Biology, but they have come from diverse backgrounds, including biology, ecology, environmental science, law, government, city and regional planning, geography, and anthropology.

Prerequisites:

A basic course in ecology and population biology is required (Biology 201) but seek permission of the instructor if you have special interest in conservation biology, are taking that course simultaneously with this course, or have other reasons to want to be in the class now.

Course Goals and Learning Objectives:

The goal of this class is to review all the biological knowledge that is essential to conservation, ranging from genetics to ecosystems and from small scales to broad ones. Some of the material is review, though with new conservation-themed examples, and some of the material will be new to you because the work in question is only carried out in a conservation context. Students learn from the discoveries of past science, but must also think creatively about new questions and to design projects that try answer those questions.

Learning objectives will be posted for each lecture. Examples of competencies gained are the following: ability to evaluate the relative contributions of niche-environment relations and spatial-temporal constraints to biodiversity patterns; the consequences of these patterns for conservation design; understanding how genetic diversity is affected by effective population size; understanding how extinction risk is affected by the size, number, and distribution of populations; understanding of extinction debt; understanding of the conceptual basis of population and metapopulation models; understanding concepts of ecosystem dynamics, resistance, resilience, and adaptability; ability to critically analyze modern conservation issues like invasive species, climate change and change in other ecological processes, habitat loss and fragmentation, trophic cascades, ecological restoration, and ex situ conservation. The key competency to gain is to think critically about scientific findings, to see where uncertainties and opportunities for new research lie, and to use the findings of biological science as a conservation tool box.

Course Requirements:

Read the assigned chapters before the class in question, as we will devote some of the class time to questions and discussions. The lectures will illustrate, clarify, and extended the readings, and the discussion will give you a chance to check your understanding and ask questions. We will also use Poll Everywhere to register your participation in classes, to assess your understanding, and to see where the areas of greatest confusion are (as a way to guide class discussion).

Other Class Policies:

Take the no-multitasking-pledge: come to class prepared to engage in the discussion and focus on the material.

If you must miss an exam, please contact the instructor in advance—arrangements will include taking an alternative version of the exam. The final exam will be given in compliance with UNC final exam regulations and according to the UNC Final Exam Calendar. Late work may be accepted with permission of the instructor, so please contact the instructor if you have any questions. All work submitted must be your own (you will be asked to acknowledge this), with sources credited and cited—the UNC Honor Code is linked on the SAKAI web site.

Course Philosophy:

We have four ambitions: (1) to discuss the biological principles and findings that all conservation biologists should know; (2) to integrate the latest research and information from the web and key journals with class discussion; (3) to connect the concepts and research findings to real world conservation problems; and (4) to go beyond the material we discuss by defining and proposing to answer original questions.

Conservation Biology is an applied field that opens up basic questions about how nature works. Though a considerable amount of knowledge has accumulated, this course also seeks to push towards the unanswered questions and to test the assumptions and the empirical basis of principles that have been presented.

The current state of and threats to the natural world are discussed, but this course does not focus on this year's headlines. Rather, we attempt to define the principles and findings that constitute conservation's tool box—a tool box that is universal rather than focused on particular places or times.

An explanation of generality and the qualifier "it depends" in conservation biology. Often conservationists have limited time and money and must choose between alternatives. For example, does genetic diversity matter more than current population size? Are corridors the answer or does isolation provide benefit? Is it better to conserve a single large area or several small areas of the same total area (the so-called SLOSS debate, see also below)? The obvious answer to these questions is "sometimes" or "it depends"—an answer which feels unsatisfying when presented in those terms. Rather, we should learn to examine these questions more deeply. For example, the question isn't "does genetic diversity matter?", but, "When does genetic diversity matter?" If the answer is "it depends", what does it depend on? Use of corridors is one tool in the conservation tool box—the question isn't *if* we should use it, but *when* we should use it. So, do not expect universal and simple answers (though we will be excited to find some of these!) in the face of nature's complexity.

We cover all levels of biological organization: genetics, species, ecosystems, and landscapes. Some of the material reviews information from other courses, but hopefully with a new slant and examples drawn from a new literature. We hope that this material, whether old or new, is drawn together in a new way and focused on a common set of questions.

Doing Well in this Class

Do the Readings BEFORE the class on which they are assigned…Come to ASK AND ANSWER QUESTIONS (including those posed in class with Poll Everywhere), and PARTICIPATE IN DISCUSSION…Get intellectually engaged in the material…meet with the professor or the grad student TA to discuss course material as necessary.

Grading

Grading is based on (1) a take-home mid-term (25 pts), (2) a part take-home, part in-class final exam (30 pts), (3) a class project (30 pts), (4) participation and understanding as demonstrated in class (10 pts), and (5) a service project (5 pts) (for a total of 100 pts). These components of grading are described below.

Service Project

At some point during the semester, participate in a service project. This can consist of such activities as attending a conservation-related campus lecture and summarizing the lecture (using a template that will be available on the Sakai site) or volunteering (for example, during student volunteer mornings at Battle Park). The Service Project is documented by a half-to-full-page summary of the activity and what you learned from it. See Announcements section of the SAKAI site for periodic announcements of service opportunities and email me if you have a problem with scheduling.

The 2 Exams

The exams are *open notes, open book, open google,* and *open mind.* As a result I will ask questions that depend on understanding and using the material, rather than just looking it up or repeating it. You should keep up with the material and email me if you feel that something is not clicking in order to get help or set up a meeting. Coming to class and engaging in the lectures is important to doing well in this class.

I want you to engage in the material and, as long as you know how to get the facts you use, it doesn't matter where you get the facts—but you MUST, of course, cite your sources (you do NOT have to cite our lectures, readings, or powerpoint slides, however, in your exam answers). I should point out this is how your professors work—open library, book, open notes, open google, and hopefully open mind. But the thinking and work, your exam answers and research project that are based on your notes, google searches, and class materials must, of course, be yours and yours alone—see Honor Code.

Biology 565 Class Project: A PhD Proposal

This project is a major part of your grade and you should start working on it early in the class. A rough draft of the first section of the project—that is, a Problem Statement—is **due the Friday before Spring Break and the finished project is due at the end of the last week of classes. See separate document "Biology 565 Class Project—A Phd Proposal".**

Class Schedule: Topics and Readings

Do the readings before class—some portion of the class time will be devoted to questions and discussion based on these readings!

NOTE: powerpoint slides will be posted on the class Sakai site. There may be changes to the syllabus as we move along, including project due dates and test dates (excluding the final examination). These changes will be announced as early as possible so that you can adjust your schedules. The material in square brackets below "[xyz]" refers to the powerpoints.

Text Book (available at Student Stores):

Peter White 2019. Conservation Biology (Ver.9): Understanding how nature works as a guide to conservation. Published by the author, University of North Carolina, Chapel Hill, NC.
https://tinyurl.com/biol-565-001-unc-w19

Please note this is a DRAFT based on the lectures for this class—and that the tables and figures are not inserted but are in a slim volume that accompanies the text (some figures are hard to read in the print version, but they will all appear in class powerpoints—these are listed below with the readings and will be on the SAKAI site). Note also that not all references are inserted or cited! It is a work in progress. Please provide feedback!

January

10 Logistics, Formats, Readings, Grading, Assignments; Introduction to Conservation Biology; The 18 Threads of Conservation Biology *[Chapter 1, 2] [Biology 565 Introduction, Conservation Biology introduction & the 18 Threads Slides]*

15 Ethics and philosophy 1: Grassy Balds…You decide! *[Grassy Bald Slides] [Class vote and research categories]*

17 Ethics and philosophy 2: Toward a Conservation Ethic *[Chapter 3, 4] [Conservation Ethics Slides]*

22 Ethics and philosophy 3: Timeline of conservation in the U.S. *[Timeline Slides];* History of change in Great Smoky Mts National Park *[Reading: Smokies Change] [Smokies Slides];* The two triangles and a taxonomy of conservation goals *[Chapter 5] [Triangles, Goals Slides].*

24 Biodiversity: A Shifted Focus and Biodiversity and Ecosystem Function *[Chapter 6, 7, 8, 9] [Biodiversity Slides 1] [Phylogeny in conservation: references]*

29 Biodiversity, continued. *[Biodiversity Slides 2];* Biodiversity in the Southeast *[Biodiversity example: Endemism in the Southeast]*

31 Biodiversity, concluded. *[Biodiversity and Ecosystem Function Slides]*

February

5 Foundation paradigms 1: Island Biogeography & related ideas *[Chapter 10, 11, 12] [IBT Slides]*

7 Foundation paradigms 2 *[Chapter 13, 14] [IBT Slides 2]*

12 Foundation paradigms 3: Island Biogeography concluded.

14 Genetics 1 *[Chapter 15, 16] [Conservation Genetics Slides 1]*

19 Genetics 2: Conservation genetics concluded *[Conservation Genetics Slides 2]*. Experiment with a simulation of population genetics by down loading the program AlleleA1.exe from this SITE.

21 Populations 1: *[Chapter 17, 18] [Population Slides 1]*

26 Populations 2: Populations concluded *[Population Slides 2]*

28 Metapopulations 1: *[Chapter 19, 20] [Metapopulation Slides]*

March

5 Metapopulations 2: Metapopulations concluded

7 Review

If you have questions as you study for the midterm, please email *peter.white@unc.edu*. I'll try to keep up with these and respond quickly.

Mid-term distributed after class on March 7th, due anytime on Friday, March 8th, the Friday before Spring Break. Plan ahead to have 2 hours available the 7th or 8th.

***A draft of the first section (problem statement) of your class project is also due anytime on Friday, March 8th.* `**

12 & 14 NO CLASS, *Spring Break!*

19 Invasive species *[Chapter 21, 22] [Invasive species slides] [Conservation Garden slides]*

21 Rarity, ex situ conservation, reintroduction *[Chapter 23, 24, 25] [Rarity and ex situ Slides]*

26 Rarity, ex situ conservation, reintroduction continued

28 Communities, ecosystems, landscapes 1: *[Chapter 27, 28] [Species Interactions Slides]*

April

2 Communities, ecosystems, landscapes 2: Species Interactions Concluded; Disturbance ecology *[Chapter 29, 30] [Disturbance 1 Slides] [Disturbance 2 Slides]*

4 Communities, ecosystems, landscapes 3: Disturbance ecology *[Fire and the Smokies Slides]*

9 Communities, ecosystems, landscapes 4: Disturbance ecology continued

11 Communities, ecosystems, landscapes 5: Disturbance ecology concluded *[Chapter 31] [Intermediate Disturbance Hypothesis Slides]*

16 Behavioral ecology *[Chapter 26] [Behavior Slides]*

18 Landscape ecology *[Chapter 32] [Landscape Ecology Slides]* Fragmentation and Edges *[Chapter 33] [Fragmentation Slides*], Ecosystems and Large Scale Conservation *[Chapter 34]*

23 Ecological Restoration *[Chapter 35] [Restoration Slides]*

25 The 18 Threads Revisited ***[Chapter 36] [12 Threads Slides]*****; REVIEW! And Conclusion** ***[Chapter 37] [What Makes a Good Question Handout]***

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Anytime on the last day of classes of the Spring Semester classes, all assignment documentations are due (submitted to the Sakai site).
The FINAL EXAM will consist of two parts, a take home part (open book, notes, web site, and google like the Mid-term) and an in-class part.

IN-CLASS FINAL: to be announced!