Conservation Biology in the Southern Appalachians
Highlands Biological Station
Highlands, North Carolina
May 16-27, 2022

Instructor: Peter White
Campus Box 3280 Biology
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-3280
peter.white@unc.edu
919-414-2803 (cell)

Format: Readings, class lecture and discussion, field trips
Text Book: Conservation Biology by Peter White (draft to be available the first day of class)
Additional requirement: write-in-the-rain field notebook, to be used also for notes on readings and classes
Grading: Quizzes (equal weight), class participation
Field Trips **There will be field trips throughout, time and weather permitting!**

Note: As we get closer to class time, I will share additional information about the text, other materials, and supplies to bring along via email.

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 populations to ecosystems and from small scales to broad ones, while focusing on the diverse and complex landscape of the Southern Appalachians. Some of the material may be review from general biology or ecology classes, albeit with new conservation-themed examples, and some will be new to you because the work in question is only carried out in a conservation context. Examples of competencies gained are the following: ability to evaluate the relative contributions of niche-environment relations and spatial-temporal constraints to biodiversity patterns and the consequence 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; ability to construct, in a conceptual sense, 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 Philosophy:

Conservation biology seeks principles from all parts of biology (genetics, population biology, ecology, evolution) that contribute to conserving biological diversity. 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—and a particularly intriguing one because the information we need focuses on the basic understanding of 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. We will attempt to go beyond the simple to the deeper issues.

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.

We warn you that the literature often presents conflicts. Often this is because 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, heed our warning: Do not expect universal and simple answers (though we will be excited to find some of these!) in the face of nature's complexity. Learn to think critically about the questions posed.

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.

Schedule, Readings & Topics

Monday, May 16
Logistics, Formats, Readings, Assignments
Introduction to Conservation Biology; The 12 Threads of Conservation Biology *[Chapters 1, 2]*
Ethics and philosophy: Toward a Conservation Ethic *[Chapters 3, 4]*
The two triangles and a taxonomy of conservation goals *[Chapter 5]*

Tuesday, May 17
Biodiversity *[Chapters 6, 7, 8, 9]*
Foundation paradigms 2: Island Biogeography & related ideas *[Chapters 10, 11, 12, 13, 14]*

Wednesday, May 18
Genetics *[Chapters 15, 16]*
Populations: *[Chapter 17, 18]*

Thursday, May 19
Metapopulations: *[Chapters 19, 20]*

Friday, May 20
Invasive species *[Chapters 21, 22]*
Rarity, ex situ conservation, and reintroduction *[Chapters 23, 24, 25]*
Behavioral ecology in conservation biology *[Chapter 26]*

Saturday, May 21 Field trip, Catching Up, Review, Discussion!

Sunday, May 22 Flex day for more review, catching up, and quiz 1!

Monday, May 23
Communities, ecosystems, and landscapes 1: *[Chapters 27, 28];* Communities, ecosystems, and landscapes 2: *[Chapters 29, 30]*

Tuesday, May 24
Communities, ecosystems, landscapes 3: Intermediate Disturbance Hypothesis *[Chapter 31]*

Wednesday, May 25
Communities, ecosystems, and landscapes 4: Landscape Ecology *[Chapter 32]*
Fragmentation, Edges *[Chapter 33]*

Thursday, May 26
Ecological Restoration, Ecosystem Management *[Chapters 34, 35]*

Friday, May 27
Review, the 12 Threads Revisited *[Chapters 36, 37]*
Quiz 2

Saturday, May 28 Anything left? Travel day