BIOLOGY 506 and EVSS 506, Fall 2016
GRADUATE CONSERVATION BIOLOGY

College of Charleston, Department of Biology, Fall 2016

Lecture: 10:30-11:20 M,W, and F. HWWE 211

Final: Wed., December 7, 8:00-11:00 AM

Instructor: Dr. Arch McCallum
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Office hours: Mondays, 11:25-12:00; Mondays, 13:10-13:30; and by appointment,

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Course Description: Biologists study the natural world at many levels of a hierarchy. This course focuses on biology at the level of the whole organism and above, in the context of a planetary environment that is over-exploited by humans. What explains the abundance and distribution of different organisms? How does human activity influence their abundance and distribution? Are we in the midst of a mass extinction, and what should we do about it? How does science aid our ability to conserve biodiversity? This dual emphasis on action and understanding derives from conservation biology's unique role as a value-laden science. Whether the values of conservation biology should include intrinsic valuation of nature is now being discussed vigorously within the field. We will join that debate.

Our study of conservation biology will have three focal questions: (1) What has gone wrong? (2) What can we do to correct it? (3) Why should we correct it? Is it a simple matter of enlightened self-interest, or do we have a deeper obligation to nature that derives from outside humanity? To establish context, we will review the current and past glories of biodiversity. Our study of the decline of biodiversity will be informed by our foundation in ecology and genetics. The solutions, though, are political and cultural as well as scientific. We will explore all avenues to conserving and restoring biodiversity. Finally, we will search our own minds, hearts, and souls to understand the need, if any, for conservation biology.

This course is taught concurrently for undergraduate and graduate credit. Graduate students have a more advanced text, an additional assignment, and a different apportionment of grading credit from their classmates taking Biology 406. Because they are expected to know the basics well, graduate students should reach out to undergraduates who are challenged by the more advanced material and offer assistance. This will help you crystallize your understanding of material you may not have truly mastered as undergraduates. Many undergraduates in this course are considering careers

or vocations in conservation; offering these students the opportunity to assist with your research could be mutually beneficial.

Learning Objectives:

- understand and practice science as a way of knowing.
- understand how ecosystems function and sustain life on earth
- learn to apply ecological and evolutionary principles to the conservation of biodiversity
- be able to recognize and to classify signature species of local ecosystems and representative species from all branches of the tree of life
- know where to find major biomes and signature species locally and on planet earth
- acquire hands-on familiarity with the population genetics of small populations, population viability analysis (PVA), and the definition and recognition of evolutionarily significant units (ESUs)
- understand the pros and cons of contemporary species concepts, and how each affects the success of the U.S. Endangered Species Act (ESA).
- know what has caused extinction of biological lineages and depauperization of local ecosystems in the past and how this informs an action plan for the present
- consider the ethical dimensions of human-caused extinction of other species, and practice making ethical arguments against extinction and the depauperization of ecosystems
- understand the political dimensions of conservation and the inadequacy of purely technical solutions to conservation problems

Course Structure: Different people learn in different ways. This course features a variety of learning activities to achieve redundancy, and hence success, in transmitting the core values and information of Conservation Biology from the academic establishment to the students.

Lecture: Lecture periods are thrice a week for 50 minutes each. Lectures will cover the basics of macro-evolution, ecology, and population genetics, as well as the applications of these fields to understanding the problems of populations and ecosystems at risk. In addition, conservation ethics, economics, and policy will be summarized. Two high-weight exams (15% each) will encourage students to make the most of lecture. These exams will consist of multiple choice questions, short answers or worked problems, and essays.

Textbook: The textbook is a concise "introduction" to the field and contains information that all conservation biologists should master as a foundation for the more controversial, philosophical, technical, and exciting information we will cover in lecture. Each student is expected to read the textbook in its entirety. Mastery of the textbook will be assessed first with online quizzes offered by Sinauer Associates, the publisher of the text. The quizzes will be "open-book." Selected quiz questions will re-appear on the two exams. Lectures will not follow the order of the textbook, but online quizzes will close on

specified dates as an encouragement to maintain progress on this major component of the grade (25%).

Earle, Kolbert, and Marris: As you will learn, textbooks present the positions of old guards just before paradigms shift. Primack and Sher confirm the stereotype with a lavishly illustrated, fact-filled volume that presents some of the pressing issues of conservation biology but robs them of urgency with dry objectivity. To get to the heart of the matter, we will imbibe deeply from three highly readable "popular" treatments of key aspects of conservation biology. Earle describes the loss of cetaceans and major marine fish stocks and additional threats to marine biodiversity. Kolbert vividly traces the history of scientific recognition of extinction, the mass extinctions of the geological record, and the current anthropogenic extinction-spasm. She won a Pulitizer Prize for this book. Marris challenges the reigning elitist, wilderness-oriented paradigm of conservation and argues for new ways of valuing nature. Lectures will overlap with Earle and Kolbert in the first half of the semester and with Marris in the second half. A set of questions will be answered while reading each book, with the grade for the book (10% for each book) depending on the thoroughness and accuracy of the answers you submit.

Lowcountry Natural History: There is no substitute for knowing and being able to name the species we are trying to save. We are blessed to have a wide variety of biomes, both terrestrial and aquatic, within a short distance of Charleston. They include currently endangered species, and they recently included others that are now extinct. Others flourish, so the whole spectrum is here. All students at the 400 or higher level in the CofC Biology department should already be well acquainted with these species and ecosystems; for those who are not, it is now time to catch up. Accordingly, a list of approximately 200 species and ecosytems that every local Conservation Biologist should know will be provided to all students in this course, along with access to slide shows that introduce them and provide recognition cues. Because graduate students are expected to already be accomplished naturalists, the credit value of this item will be less than for the undergraduates.

World Geography: The central problem of Conservation Biology is extinction. Extinction is not just a temporal phenomenon, the end for all time of a phylogenetic lineage. It is also a spatial phenomenon: the local extinction of a species changes ecosystem structure and thereby ecosystem function. Should Conservation Biology be more concerned with the functioning of local ecosystems and their utility to people, or with the pruning and wholesale destruction of branches of the phylogenetic tree, as has occurred five times previously in the history of life. To fully comprehend the natural and unnatural phenomena that Conservation Biology covers, we must know the geography of planet earth, both present and past, as reflected in maps. Accordingly, a list of approximately 100 physical features of Charleston County, South Carolina, the United States, and the world that every local Conservation Biologist should know will be provided to all students in this course, along with access to materials that introduce them and provide recognition cues. Because graduate students are presumably committed to a career in conservation or ecology, they are expected to have learned world geography

during their undergraduate careers. Accordingly, the credit value of this item will be less than for the undergraduates.

Term Paper: A 10 to 20-page (double-spaced) term paper on a subject of interest to the student will be due at the end of the semester. Each student must submit to the instructor a 1-page (more or less) proposal for the term paper subject by the end of September. The quality of this proposal will be incorporated in the midterm grade for the course. Every student should strive to make this paper publishable in the peer-reviewed scientific literature. Check the Commentaries in *Conservation Biology* for examples of how an idea and a literature review can advance the field. A couple of examples of topics: "Signature sounds in animals and their uses for monitoring." "Do 'culturally significant units' exist, and do they deserve conservation attention?" While these sound like opinion pieces, they could not succeed without thorough literature review. Students are encouraged to select topics that advance their research programs.

Required Reading: *The World is Blue: How Our Fate and the Ocean's Are One*, by Sylvia Earle, National Geographic Books. *The Sixth Extinction*, by Elizabeth Kolbert, MacMillan; *The Rambunctious Garden*, by Emma Marris, Bloomsbury USA.

Required Text: *Introduction to Conservation Biology, 1st edition*. 2016. Richard Primack and Anna Sher. Sinauer Associates. This is a handsomely-illustrated, undergraduate-style text.

Supplementary Text: *Principles of Conservation Biology, 3rd edition*. Croom, Meffe, and Carroll. Sinauer Associates. This text is unfortunately a little out of date, but it is comprehensive and a must for advanced study. Its many essays introduce the beginning professional to many of the major contributors to the field, and chapters drill deeply into the major themes of conservation biology.

Prerequisites: Biology 111, 112, 211, 305, 341

COURSE POLICIES

Communication – Students are responsible for knowing and complying with all announcements made by the instructor during the regularly scheduled hours of Lecture. Additionally, documents needed for completing required (and optional) work will be available on OAKS. Check OAKS frequently for newly uploaded or recently revised documents. Finally, the instructor will send emails to the entire class as needed to inform students of changes of schedule, interesting seminars, materials needed for class, etc. It's a good idea to check your cofc email shortly before each class.

Lecture – You are expected to attend every lecture. If you must be absent, please inform the instructor in advance and visit him during office hours if you have any questions about the lecture you missed.

Exams – If you know in advance of an unavoidable conflict with a scheduled exam, talk to the instructor about it during the first two weeks of the semester. Scheduled exams that are missed without prior permission cannot be made up except in the case of a true medical emergency *suffered on the day of the exam*. SNAP students are requested to make arrangements with the instructor well in advance of exams.

ACADEMIC INTEGRITY

Academic integrity is important to the College of Charleston community. In addition, this course asks you to perform tasks like a professional biologist, and you will be required to uphold the standards of integrity expected in the profession. Plagiarism, lying, cheating or attempted cheating are violations of the College's honor code and will be dealt with accordingly. Please be absolutely sure that you understand what the honor code requires of you (refer to pages 10-12 of the student handbook, http://cofc.edu/generaldocuments/handbook.pdf). If you have any questions or concerns about honor code expectations or about how to avoid violations, please consult with the instructor.

Any honor code violations that occur will be handled as outlined in the student handbook.

(a) For lesser or unintentional offenses, the student will be asked to sign a form acknowledging an understanding of the mistake. This form will be kept on file by the Dean of Students, and a second such violation will automatically result in an honor court hearing.

(b) More serious cases of suspected academic dishonesty will be reported to the Dean of Students and forwarded to the honor board. Severe punishments are mandatory if found in violation of the honor code, including an XF for the course, a mark that indicates failure due to academic dishonesty.

Plagiarism: Plagiarism is any use of words or ideas produced by another person without proper attribution, and includes failing to paraphrase adequately or to cite sources properly. Whether intentional or unintentional, plagiarism is forbidden by the honor code. Please consult the instructor if you have any questions or concerns about how to use and cite sources.

Re-using work: Please be aware that re-submitting work that you or anyone else has done for this or any other class or project is a violation of the honor code, even if the work is revised. On the other hand, graduate students are urged to use the term paper and grant proposal required for this course to further their research programs, and this will undoubtedly lead to some redundancy. Consult the instructor for guidance.

ASSESSMENT

Your grade in this course will be based on the components shown below. These components will be worth the following percentages of your final grade:

Biology 506 and Environmental Studies 506 (graduate students)

Course component	***% of grade***
Exams (2)	31.8%
Textbook Quizzes	22.7%
Earle, Kolbert, Marris Questions	27.3%
Lowcountry Natural History	4.5%
Map Sense(Geography)	4.5%
Term Paper (Publishable)	9.1%
Total	**100%**

Grading policy –

A:	93.0-100.0%
A-:	90.0 - 92.9%
B+:	87.0 - 89.9%
B:	83.0 - 86.9%
B-:	80.0 - 82.9%
C+:	77.0 - 79.9%
C:	73.0 - 76.9%
C-:	70.0 - 72.9%
D+:	67.0 - 69.9%
D:	63.0 - 66.9%
D-:	60.0 - 62.9%
F:	0.0 - 59.9%