Global Change and the Biodiversity Crisis

*Biology 4983.003*

MICHAEL A. PATTEN, Oklahoma Biological Survey and Department of Biology

**Semester:** autumn 2014  
**Class time:** Monday, 1:30–4:20 p.m. (Sutton 111)  
**Contact information:** mpatten@ou.edu or (405) 325-5061 or my office (room 236) at the Biological Survey (111 E. Chesapeake; south campus, northeast of LNC)

**Required text:**

none (!) — just think of the money you save  

★★★ all required readings (see syllabus, below) will be available at Desire2Learn ★★★

**COURSE DESCRIPTION**

The senior capstone is a forum for learning about and discussing key social, ethical, and economic issues raised by advances in biology and technology. An understanding of current topics is an important component to an undergraduate education, can provide a solid foundation either for employment in the field or for graduate school, and is essential to honing critical thinking. In this seminar students will use basic knowledge of ecology to grapple with how ecological processes are being altered by global change, including climate change, habitat loss, and invasive species. Topics for discussion include evolutionary responses of terrestrial and aquatic ecosystems and organisms, changing climate systems, biogeographic shifts, forecasting, and conservation and planning. Topics covered in the course will provide not only a deeper understanding of ecology but also, I hope, clearer insight into the challenges facing efforts to conserve the Earth’s biodiversity.

**COURSE COMPOSITION**

**In-Class Format**

This course centers around classroom interaction. It consists of assigned reading, introductory lectures, discussions of readings and interactive debates, and student presentations. Students will get good practice in accessing original literature, thinking critically about scientific evidence supporting various points of view, and organizing concise written and oral arguments about specific issues. To an extent, then, the students are responsible for the content and direction of this course. My role will include leading and evaluating classroom discussions and providing guidance during selection of, research for, and creation of an individual project.

Given the format of the class, participation in discussion and debates is essential. In this way you can learn how to take part in a meaningful, collegial exchange of ideas and thus be prepared to offer an informed opinion about topics covered in the course.
Individual Projects

A key aspect of the course will be an individual research topic. I will not allow students to work on the same topic or project. The individual project will require each student to research a particular topic—within the course’s theme, naturally—and to explore ecological (chiefly) and social issues related to this topic. The student will share his or her findings with the class during a 20-minute in-class presentation (using PowerPoint or a similar program) and will produce a review paper on the topic.

I will consider any topic broadly related to the course’s theme, and I encourage each student to choose a research topic that matches his or her background, interests, and future goals. The student will benefit from reading widely and selecting a topic that will not only provide a new perspective to other students but also an enjoyable learning experience. To that end, unless you are sure of what you want to study, spend some time in the library perusing a variety of topical books and journals to get a sense of the breadth of the field. You must select a topic of which I approve no later than the fourth week of class (preferably sooner). Once you have an approved topic you will need to provide me with a typed, one-page outline of it.

A goal of this class is training you to find and make sense of primary literature. Thus, when selecting and researching a topic, make use of the numerous books and journal papers that have been published about the ecology of global change. Also make judicious use of the internet, but please do not rely on it too much. The internet is an easily accessible repository of information, but bear in mind that anyone can post to it, meaning that there will be as many (and probably more) useless sites as useful ones. You probably do not need to be as leery of sites maintained by universities (.edu) or professional organizations, societies, or institutes (.org), but beware of personal blogs and dot-coms. You are responsible for verifying all information that is included in your presentation and review paper. You therefore may not cite any website in your work; only a clear reference to peer-reviewed literature will suffice. If you locate citations that you cannot find in the library, please come see me or ask a science librarian for help. Similarly, if you find apparently useful information on a website, trace that information to its source.

Much of your work for this course will be completed outside the classroom. As soon as you have an approved project spend time in the library or online searching for and reading appropriate journal articles and book chapters. Be assured that the amount of time you spend researching your paper will be directly correlated with the quality of your paper and presentation. In addition to the required textbook, various books that may be of useful to selecting and researching your topic include (but are not limited to):

Likewise, numerous journals routinely publish papers that are germane to the theme of this course. A by no means comprehensive list includes the following journals:

- American Naturalist
- Biodiversity & Conservation
- Biological Conservation
- Biological Invasions
- BioScience
- Canadian Journal of Zoology
- Climate Dynamics
- Climatic Change
- Conservation Biology
- Diversity & Distributions
- Ecological Applications
- Ecology
- Ecology Letters
- Evolutionary Ecology Research
- Global Change Biology
- Global Ecology & Biogeography
- Global Environmental Change
- Journal of Biogeography
- Nature
- Oecologia
- Oikos
- Proceedings of the Nat’l Academy of Science
- Proceedings of the Royal Society B
- Science
- Trends in Ecology and Evolution
- Urban Ecosystems

As with the books, do not feel restricted to the titles provided—they are only meant as a helpful guide to get the ball rolling. If you find a reference to a paper in a journal that OU’s library does not carry, you likely can get a copy of it (in about a week) through the interlibrary loan program. Ask a science librarian for help.

I will go over in class how to conduct a literature review and how to read a scientific paper, and some of your assignments will be writing short reviews of such papers. As always, if you have questions or need guidance, do not hesitate to see me at my office, to give me a call, or to drop me an email. Reading and understanding the scientific literature is an acquired skill.

**Grading**

The nature of this course makes a student’s participation in discussion a critical part of his or her grade. Oral presentations will be assessed by other students, with written critiques turned in to
me. I will assign occasional quizzes and short exams. Obviously, the individual assignments—both the in-class presentation and the resultant research paper—will form a considerable part of a student’s final grade. To facilitate classroom discussion, students will be assigned the task of leading the debate. But just because you are not leading the discussion that week is not an excuse to avoid participation.

I will use the following point system as a guide for grading:

**assignment points**
- review paper 150
  - substance = 75
  - organization and clarity = 50
  - tables and figures = 25
- oral presentation 100
  - substance = 40
  - organization and clarity = 30
  - graphics = 30
- classroom participation 75
- short writing assignments (3) 75
- exercises and quizzes (3–4) 100

**total points:** 500

The nature of this course makes absences costly. Be warned that missed assignments cannot be completed later. It should go without saying, but a student’s grade will suffer drastically if he or she misses multiple classes.

★★★ **IMPORTANT NOTICES ★★★**

I will tolerate neither plagiarism nor academic misconduct. Please consult OU’s website (http://www.ou.edu/provost/integrity/) to learn the university’s stance on these policies. Any student guilty of plagiarism—including self-plagiarism (turning in your own work for more than one course) and copying information directly from a web site—will receive no credit for that assignment.

Please notify me if for any reason you require special accommodations to ensure that you participate fully in this course: this course will be made accessible to any student with a disability.
## Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>18 August</td>
<td>Orientation</td>
<td>none</td>
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<tr>
<td>25 August</td>
<td>Biodiversity and biogeography</td>
<td>Barnosky et al. (2011); Laurance (2007); Mooney (2010)</td>
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<tr>
<td>01 September</td>
<td>★★★ Labor Day ★★★</td>
<td></td>
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<tr>
<td>08 September</td>
<td>Aspects of global change</td>
<td>Rockström et al. (2009); Chapin et al. (2000); Vilà et al. (2011)</td>
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<tr>
<td>15 September</td>
<td>Climate change</td>
<td>Karl &amp; Trenberth (2003); Burrows et al. (2011); Parmesan (2006)</td>
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<tr>
<td>22 September</td>
<td>Oceanic systems</td>
<td>Harley et al. (2006); Diaz &amp; Rosenberg (2008); Hollebone &amp; Hay (2008)</td>
</tr>
<tr>
<td>29 September</td>
<td>Habitat loss and fragmentation</td>
<td>Fahrig (2003); Watling &amp; Donnelly (2006); Ewers &amp; Didham (2006)</td>
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<tr>
<td>06 October</td>
<td>Evolutionary and ecological responses</td>
<td>Bell &amp; Collins (2008); Davis et al. (2005); Pruet et al. (2009)</td>
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<tr>
<td>13 October</td>
<td>Synergistic responses</td>
<td>Brook et al. (2008); Opdam &amp; Wascher (2004); Pounds et al. (2004)</td>
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<td>20 October</td>
<td>Looking forward</td>
<td>Bellard et al. (2012); Dawson et al. (2011); Van der Putten et al. (2010)</td>
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<tr>
<td>27 October</td>
<td>Conservation and restoration</td>
<td>Hannah et al. (2007); Araújo et al. (2011); Schwartz et al. (2012)</td>
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<tr>
<td>03 November</td>
<td>Humans and policy</td>
<td>Mace et al. (2012); Cook et al. (2013); Selin &amp; VanDeveer (2007)</td>
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<tr>
<td>10 November</td>
<td>Public understanding</td>
<td>Reynolds et al. (2010); Li et al. (2011); Markowitz &amp; Shariff (2012)</td>
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<tr>
<td>17 November</td>
<td>★★★ ACAT test ★★★</td>
<td></td>
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<tr>
<td>24 November</td>
<td>oral presentations</td>
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<tr>
<td>01 December</td>
<td>oral presentations</td>
<td></td>
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<tr>
<td>08 December</td>
<td>★★★ review paper due ★★★</td>
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Note: For each week the paper listed first is a general overview or, at least, the closest to an overview that I could find. Read it first. Feel free to read other papers for that week in whatever order you wish.
READINGS


★★★ ACCESS ★★★

All readings for this course have been posted online at OU’s Desire2Learn system (see https://learn.ou.edu/index.asp). You will need your OU 4×4 and password to download copies of the papers. If you wish to make hard copies, try to find a color printer: many of the research and review articles above include color photographs or graphics. The latter, especially, can be difficult to understand if color is omitted.

Note that I have placed four additional sources on the Desire2Learn site. We will not discuss these in class explicitly, but I encourage you to peruse them. The first is the official statement from the United Nations’ Intergovernmental Panel on Climate Change, the second is by the United States Climate Change Science Program, the third is a lengthy dissenting review, and the fourth is a comprehensive analysis of data from a former climate skeptic.


