Biology 4327: Biological impacts of global climate change  
Fall 2018, Monday 5:30-8:00 PM  
408 Wachman

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Office Hours: M: 2:00-3:00  
Or by appointment

Goals: This course will introduce you to a totally new science—sustainability science (SS) defined as “meeting fundamental human needs while preserving the life-support systems of the planet” (http://www.sciencemag.org/cgi/content/full/292/5517/641). Sustainability science “seeks to understand the fundamental character of interactions between nature and society.”

This course builds on your understanding of basic biology and examines on-going and anticipated changes in the biology of our planet as the impacts and consequences of global climate change accelerate. Most of the background for the course is embedded in Biology 1111. There is no required textbook: readings will be selected from journals or published reports from governmental agencies and we will use active learning strategies including literature analysis, case studies, stakeholder identification and conflicting interests. Our focus will center on ecosystem services and the effects of climate change, we will consider the intersecting social, economic, human health and ethical concerns related to anthropogenic and natural impacts of climate change.

Upon successful completion of this course, students (you) will:

- have examined the complexity of climate change on living systems and the driving forces for the impacts on major ecosystems
- have gained presentation skills useful in all future academic and work endeavors
- have considered impacts from varied stakeholder perspectives and viewed examples of negotiating solutions among competing stakeholders
- have worked as a team to have gained proficiency in writing scientific papers.
- have gained proficiency in self-directed learning.

Required Readings: There are no textbooks for the course but you might find your Introductory Biology textbooks useful for background information and vocabulary especially related to the ecology-focused articles. The journal articles are available on-line using the doi listed in the syllabus or through the Temple library. I will review this in the initial class meeting.

Canvas: All course announcements and changes in reading assignments will be posted on Canvas. Please use your Temple email account for course communication. Once you select which articles you want to present, I will post the schedule on Canvas.

Scheduled topics and assigned articles. Articles presented by students are indicated in blue.
Introduction to the climate crisis and global biology
Introduction to CC. Vocabulary: drivers, greenhouse gases, anthropogenic and natural forcing, global and local concerns. Complexity of ecological, social, governmental and economic factors impacted and driving CC. Role of UN in sustainable development.

- Introduce the idea of sustainable development and consider the current state of the planet with respect to CC.
- Achim Steiner speech with comparison of changes since the speech to UN.
  https://www.youtube.com/watch?v=qeQOWhk-0c4
- Use this article to show biological responses to CC and correlation with biophysical data.


9/3/18 No class Labor day

9/10/18 Week 2: Introduction to terminology, interactions and intersections of biology and ecology with economics, culture and global implications.

  http://www.oceanfutures.org/news/blog/requiem-for-the-vaquita-marina

9/17/18 Marine ecosystem.


9/24/18 Coastal habitats


10/1/18 Freshwater ecosystems

- Modeling intrinsic potential for beaver (Castor canadensis) habitat to inform restoration and climate change adaptation Dittbrenner et al. 2018 PLOS One doi: 10.1371/journal.pone.0192538

• Not required but offered to those with an interest in monitoring fresh water contaminants. The research describes using a transgenic zebrafish with a fluorescent signaling in the presence of environmental endocrine disrupting chemicals in fresh water. They tested water samples in the Chesapeake water shed and demonstrated the impacts of the chemicals on zebrafish development. 

  Transgenic Zebrafish Reveal Tissue-Specific Differences in Estrogen Signaling in Response to Environmental Water Samples 
  Gorelick, DA et al., 2014 Environ Health Persp 356-362
  http://dx.doi.org/10.1289/ehp.1307329

10/8/18 6 Food and agriculture


10/15/18 7 Exam and Coltan case study

10/22/18 8 Forests, grasslands and fires Tanzania article

• Human-started wildfires expand the fire niche across the United States Balch et al., 2017 Proc Natl Acad Sci U S A. 2017 Mar 14; 114(11): 2946–2951. doi: 10.1073/pnas.1617394114

• Land use strategies to mitigate climate change in carbon dense temperate forests. Law, BE, et al.. Proc Natl Acad Sci U S A. 2018 Apr 3;115(14):3663-3668. doi: 10.1073/pnas.1720064115

10/29/18 9 Biodiversity and communication with the public


• Economic, Socio-Political and Environmental Risks of Road Development in the Tropics Alamgir et al. 2017 Current Biol 27: R1130-1140.
  DOI: https://doi.org/10.1016/j.cub.2017.08.067

Week on Biodiversity. Previous week introduce Novacek’s list of engaging with the public on biodiversity to have students evaluate the case study in the Peatland restoration project article. Show David Suzuki’s video on stakeholder engagement.
11/5/18 10 Population and disease

- Case study: Introduction of genetically modified mosquitoes to reduce malaria burden in Mali.

11/12/18 11 Sustainable development

Crafting usable knowledge for sustainable development. Clark, W.C. et al., 2016 Proc Natl Acad Sci USA 113:4570-78. doi/10.1073

Discuss major ideas in Clark et al. Crafting usable knowledge for sustainable development. Prepare ppt with background, definitions, and material from Clark et al. 4 things we need to know and 4 things we need to do.

11/19/18 No class: Fall break
11/26/18 12 Tragedy of the Commons (Hardin, 1968)
12/3/18 13 Struggle to govern the commons (Dietz et al., 2003)

12/10/18 14 Final project reviews. Final project topics and formats will be selected after the midterm. Group projects are encouraged. Creativity in the material and the presentation will count for a majority of the final grade. The other emphasis will be communication with the public an aspect of climate change related to our class discussions.

12/17/18 Final project due

Grading:

35% Presentation and class discussion*
30% Midterm
35% Final project

*Class discussion grades.

https://www.chronicle.com/blogs/profhacker/how-to-grade-students-class-participation/23726

To participate in the class, Ask questions. Be curious. You are welcome to have a different perspective on an issue. We ask you to share your perspective in a productive and supportive manner sharing your reasoning along with your comment. Since the course will be conducted as a seminar-and not a series of lectures-the substance of our class will primarily consist of your responses to the challenges presented by the articles and suggestions for the future. Your
active participation will be consequently factored into your final grade for the course. If you are reluctant to speak up, please talk to me and we’ll figure out a way for you to participate.

At the midterm, I will give you a preliminary participation grade based on your contributions to class discussion. However, this grade is only an indication that you can use to increase the frequency or the quality of your contributions. Monitor yourself: if you are talking too much, listen more. If you are not talking, speak up.

My goal is to find a good balance of participation in the class allowing for all inputs. Having a mid-term grade is intended to reduce grade anxiety with a chance to improve the grade.

**Attending class and presenting your article (described below) are necessary but not sufficient conditions for getting an A.**

Questions are very important and welcome; however, they are not considered participation. There is a clear difference between a student raising/waiving his/her hand in order to be noticed and a student actively participating/contributing in a discussion that ask questions for getting more information.

A biology colleague defines “participation” as: a) comments showing that you have read the assigned article, b) a reasonable attempt to understand or highlight a problem, c) provide an alternative perspective about an issue, d) recommend, introduce or discuss a research article to the class related to the topic at hand, e) participation in your group discussions led by the students presenting that week. I reserve the right to give unannounced short writing exercises related to the assigned article and the discussion of the issues.

**Class format:**

I will introduce each topic giving a brief background and a rationale for selecting the topic. I will prepare a learning activity that might include a TED talk, a video or a case study related to the problem. Then the groups presenting that week will organize the following material.

Groups of 2 students will sign up for each assigned article. Usually, there may be 2 articles but depending on the topic, there may be a single article. Each group will prepare a brief presentation that conveys a summary the major ideas. The presentations **will be posted after class so serve as a study tool.** Each group with formulate 4-5 questions directly from the article and we will break into groups to discuss the questions with each group focusing on only one question.

**Attendance:** This class is interactive; each person will make contributions and the quality of our discussions will depend on having input from everyone. You have one **unexcused class absence.** After that, you will be **docked 50 points** for an unexcused absence and you cannot get credit for the weekly assignment. (Excused means with a Drs. note for an illness or validation for another situation related to your academic work with permission in advance).

**There are NO MAKEUP EXAMS** In the case of illness, sports competitions or other excused absences, you will be excused **IF** you inform me in advance. You must have a note from your physician, a coach or whoever is appropriate for explaining a legitimate absence. If you are not excused, you will receive a zero for the midterm.
Honesty and Civility: You must abide by Temple’s Code of Conduct (see http://www.temple.edu/assistance/udc/coc.htm), which prohibits:

1. Academic dishonesty and impropriety, including plagiarism and academic cheating. We will discuss collaboration on the assignments in terms of what is acceptable and what is not.

2. Interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University.

3. Do not try to cheat; avoid all appearance of cheating. We have a “zero tolerance” policy. The Temple Honor code, which you will sign before you take all of the exams in the course, provides disciplinary action for cheating which may include expulsion from the University.

Disabilities: Any student who has a need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional materials required for the course, should contact me privately to discuss the specific situation by the end of the second week of classes or as soon as practical. If you have not done so already, please contact Disability Resources and Services (DRS) at 215-204-1280 in 100 Ritter Annex to learn more about the resources available to you. We will work with DRS to coordinate reasonable accommodations for all students with documented disabilities.

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty and Academic Rights and Responsibilities (Policy #03.70.02) which can be accessed through the following link: http://policies.temple.edu/getdoc.asp?policyno=03.70.02.