Global Change Biology

In the year 2000, atmospheric chemest Paul Crutzen suggested that humans had fundamentally changed Earth systems so much that is was time to declare a new Geological epoch: the Anthropocene. While this proposal has yet to be formally accepted, the impact of the statement has given rise to a whole new scientific sub-discipline seeking to understand the impact of these massive Earth systems changes on living organisms: Global Change Biology. This course is roughly divided into two parts. In part one, we will discuss the elements of the Earth system and how they are changing. In part two, we will focus on how these changes impact organisms and how the effect might be mitigated.

Course Objective: The goals of this class are to broady expose students to the the drivers of effects global change on life. Specifically, students should expect to:

- Obtain a broad foundation for the study of Earth systems and drivers of global change.
- Gain an understanding of the range of possibile effects of global change on organisms the complexity of interacting drivers.
- Learn to identify and evaluate the current state of global change science with all of its limitations and promises.

Required Text: Because of the diversity of topics covered, we will approach our study of global change biology through the developing body of primary scientific liturature rather than through a single text book. Most lectures will include with suggested readings (italacized below) from the text:

Levin, Simon A., et al., editors. *The Princeton Guide to Ecology.* Princeton University Press, 2009.

These reading will serve to clarify the background information provided in lectures, and is highly reccomended.

Course structure: This course will meet twice per week for 75 minutes. This first half will consist of a lecture from the instructor, with the second half consisting of student faciliated discussions on relevant papers.

Prerequisites: A course in introductory biology or permission of instructor.

Topic	Reading(s)
1] Introduction Global Change and the Earth's Climate System	IPCC 2014
2] Tools for the study of climate change	Newman Ch.1(Canvas)
3] Paleoclimate: the effects of rapid climate change in deep time	Knoll 2007
4] Predicting Future Climates	Bonan 2018, *Newman Ch.2 (Canvas)*
5] Sources, sinks and feedbacks	Cox 2000, *Levin IV.7*
6] Localized impacts of climate change: disturbance	Kurz 2008, *Levin IV.1*
7] Intensification and land conversion	Foley 2005, *Levin VII.7*
8] Nutrient cycling	Vitousek 1997, Levin II.10
9] Eutrofication	Diaz 2008, *Levin VII.4*
10] Ocean acidification	Anthony2008, Kroeker 2013
11] Urbanization	Grimm 2008
10] Interacting drivers	Hoff 2011, *Newman Ch. 13 (Canvas)*
11] Plant physiology and biosphere productivity	Korner 2006, Levin III.9
12] "FACE" case study	Norby 2011
13]Thermal tolerance	Kaliq 2014, Levin I.2-3
14] Plasticity and phenological shifts	Cleland 2012, Levin I.9
15] Global change and evolution	Logan 2014, *Levin III.19*
16]Migration and dispersal	Chen 2011,*Levin I.6 and 12*
17] Habitat Fragmentation	Hamann 2012, Levin IV.3
18] Invasion	Liu 2017, Levin VII.8
19] The 6th extinction	Plotnick 2016 *Levin V.1*
20] Novel ecosystem and community change	Clavel 2010, Hobbs 2009
21] Conservation	McGwire 2016, *Levin V.6*
22] Ecological Restoration	Harris 2006, Levin V.7
23] Assisted Migration	Nunez 2013, Willis 2009
24]Communicating science in an era of global change	Knowlton 2017, Godet 2018

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