

# 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 sentiment of the statement has given rise to a whole new scientific sub-discipline seeking to understand the impacts of these massive planetary alterations on living organisms: Global Change Biology. This course is roughly divided into three parts. In part one, we will discuss the drivers and physical effects of global change. In **part two**, we will focus on how these changes impact organisms and ecosystems. In **part three**, we will explore some of the anthropogenic responses aimed to mitigate the effects of global change on organisms.

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

- Obtain a broad foundation for the study of Earth Systems and drivers of global change, with an emphasis on terrestrial systems.
- Gain an understanding of the range of possible effects of global change on organisms the complexity of interacting drivers.
- Increase in comfort and competence reading primary literature, and learn to 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. Many lectures will pair with suggested readings (italacized below) that will either provide additional background to the lecture topic or other examples of the concepts being discussed.

**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 facilitated discussions on relevant papers.

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

Topic	Reading(s)
1] Introduction to our changing climate system	IPCC 2014
2] Paleoclimate: the effects of rapid climate change in deep time	Knoll 2007
3] Predicting Future Climates	Bonan 2018, <i>Newman Ch.2 (Canvas)</i>
4] Feedbacks, sources and sinks	Cox 2000, <i>Kurz 2008</i>
5] Localized impacts: Disturbance	Westerling 2006, <i>Logan 2001</i>
6] Land Use Change	Foley 2005, <i>Grimm 2008</i>
7] Nutrient cycling	Vitousek 1997, <i>Diaz 2008</i>
8] Marine effects	Kroecker 2013, <i>Cheung 2010</i>
9] Interacting drivers	Hoff 2011, <i>Newman Ch. 13 (Canvas)</i>
10] Plant physiology	Korner 2006
11] Terrestrial ecosystem productivity and sequestration	Norby 2011
12] Thermal tolerance and Hutchinsonian Niche	Kaliq 2014
13] Plasticity and phenological shifts	Cleland 2012, <i>Logan 2014</i>
14] Global change and Evolution	Reusch 2007, <i>Gorton 2018</i>
15] Fragmentation and Migration	Chen 2011, Hamman 2012
16] Invasion	Liu 2017, <i>Milbau 2003</i>
17] The 6th extinction	Plotnick 2016 <i>Pyron 2017</i>
18] Novel ecosystem and communities	Hobbs 2009, <i>Clavel 2010</i>
19] Conservation I: Who, what, where, why?	Chan 2006, <i>Duffy 2014</i>
20] Conservation II: How?	McGwire 2016, <i>Willis 2009</i>
21] Ecological Restoration	Cannon 2018, <i>Harris 2006</i>
22] Conservation Policy	Diaz et al. 2015
23] Spotlight on REDD+	Visseren-Hamakers 2012, <i>Lindenmayer 2012</i>
24] Communicating science in an era of global change	Knowlton 2017, <i>Godet 2018</i>

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