# Global Change Biology

In the year 2000, atmospheric chemist 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 broadly 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, and 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 literature rather than through a single text book. Many lectures will pair with suggested readings (italicized below) that will 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, *Newman Ch.2 (Canvas)* |
| 4] Feedbacks, sources and sinks | Cox 2000, *Kurz 2008* |
| 5] Localized impacts: disturbance | Westerling 2006, *Logan 2001* |
| 6] Land use change | Foley 2005, *Grimm 2008* |
| 7] Nutrient cycling | Vitousek 1997, *Diaz 2008* |
| 8] Marine effects | Kroeker 2013, *Cheung 2010* |
| 9] Interacting drivers | Hoff 2011, *Newman Ch. 13 (Canvas)* |
| 10] Plant physiology | Korner 2006 |
| 11] Terrestrial ecosystem productivity and sequestration | Norby 2011 |
| 12 ] Environmental tolerance | Kaliq 2014 |
| 13] Plasticity and phenological shifts | Cleland 2012, *Logan 2014* |
| 14] Global change and evolution | Reusch 2007, *Gorton 2018* |
| 15] Fragmentation and migration | Chen 2011, *Hamman 2012* |
| 16] Invasion | Liu 2017, *Milbau 2003* |
| 17] The 6th extinction | Plotnick 2016 *Pyron 2017* |
| 18] Novel ecosystem and communities | Hobbs 2009, *Clavel 2010* |
| 19] Conservation I: Who, what, where, why? | Chan 2006, *Duffy 2014* |
| 20] Conservation II: How? | McGwire 2016, *Willis 2009* |
| 21] Ecological restoration | Cannon 2018, *Harris 2006* |
| 22] Conservation policy | Diaz et al. 2015 |
| 23] Spotlight on REDD+ | Visseren-Hamakers 2012, *Lindenmayer 2012* |
| 24] Communicating science in an era of global change | Knowlton 2017, *Godet 2018* |

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