



Environmental Catastrophes, Tipping Points, and Challenges
GEO 4938/6938 & LAS 4935/6938
Tuesday Periods 3-5 (9:35 AM - 12:35 PM), Room 3012 Turlington
Professor Robert Walker

Global Warming, Extinction Crises, Ocean Acidification. The newspapers and magazines are full of environmental doomsday prophecies, and this course will help you make sense of what's happening to our planet. We start with an overview of recent academic articles that have identified critical components of the earth's climate system that are on the verge of rapid change, with implications for all of us. What will happen to South Florida if sea level rises 10 feet? What will happen to communities on the North Atlantic if the Greenland Ice Sheet slides into the ocean and drifts away? After a broad overview of the scientific issues, we will address both mitigation and adaptation, taking a social science perspective to understand current policies aimed at helping us survive the Anthropocene. As part of this, we will examine the IPCC reports and UN publications addressing new global initiatives, such as those aimed at reducing carbon emissions from deforestation and forest degradation (UN-REDD). How do we manage teleconnections? How do we transition to a low carbon footprint as a global society? What works best, carbon markets or government regulation? These are critical questions addressing the big challenges we all face in a globalized world where the actions we take often have unexpected consequences.

Books:

Kolbert, E. (2014). *The sixth extinction: an unnatural history*. A&C Black.

Childs, C. (2013). *Apocalyptic Planet: Field Guide to the Future of the Earth*. Vintage.

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Office Hours:

Tuesday & Wednesday 12:45PM-2:45 PM Grinter Hall Rm 313

Global Warming, Extinction Crises, Ocean Acidification. The newspapers and magazines are full of environmental doomsday prophecies, and this course will help you make sense of what's happening to our planet. We start with an overview of recent academic articles that have identified critical components of the earth's climate system that are on the verge of rapid change, with implications for all of us. What will happen to South Florida if sea level rises 10 feet? What will happen to communities on the North Atlantic if the Greenland Ice Sheet slides into the ocean and drifts away? After a broad overview of the scientific issues, we will address both mitigation and adaptation, taking a social science perspective to understand current policies aimed at helping us survive the Anthropocene. As part of this, we will examine the IPCC reports and UN publications addressing new global initiatives, such as those aimed at reducing carbon emissions from deforestation and forest degradation (UN-REDD). How do we manage teleconnections? How do we transition to a low carbon footprint as a global society? What works best, carbon markets or government regulation? These are critical questions addressing the big challenges we all face in a globalized world where the actions we take often have unexpected consequences.

Of necessity, the course takes a multi-dimensional, multi-disciplinary view of its subject, addressing the Anthropocene from a variety of angles, formulating our understandings and drawing our conclusions on the basis of an inter-disciplinary reckoning. We will be reading in both the social and biophysical sciences, as well as from the humanities, thereby exposing ourselves to a transdisciplinary mix of vocabularies and paradigms. A student should not be intimidated by this, but excited and challenged. As necessary, the instructor will use class time for brief technical accounts, so that the readings can be digested to maximum effect.

Course Materials: The course materials are mostly assigned readings, to be completed prior to each class. Two books are of special interest, one required, the other, recommended.

Required: Kolbert, E. (2014). *The sixth extinction: an unnatural history*. A&C Black.

Recommended: Childs, C. (2013). *Apocalyptic Planet: Field Guide to the Future of the Earth*. Vintage.

Class preparation: The class is to be conducted in a seminar format, which means you are expected to be prepared for each class session. Preparation includes not only reading the assigned materials, but also reflecting upon the readings and being able to discuss them intelligently. The instructor will solicit class participation both

Office hours: The instructor would like to get to know as many of you as possible, and encourages you to drop by during office hours (Tuesday & Wednesday 12:45PM-2:45 PM Grinter Hall Rm 313), or by appointment.

Email Policy: I do not use email to answer substantive questions. If you wish to discuss course materials, or assignments, please come by during office hours.

CANVAS Policy: I use CANVAS to distribute readings, not as a mechanism for informing students of their running grade totals.

Announcements: Class announcements (if any) will be made in class and distributed electronically. You are responsible for remaining informed.

Incompletes and Deferrals: Final grades will be submitted for all students during finals week. No grades of incomplete or deferral will be submitted for students without a medical excuse or family emergency.

The grading scale is:

| | Graduate | Undergraduate |
|----------------|----------|---------------|
| A ⁺ | 94-100 | 84-100 |
| A ⁻ | 90-93.9 | 80-83.9 |
| B ⁺ | 84-89.9 | 74-74.9 |
| B ⁻ | 80-83.9 | 70-73.9 |
| C ⁺ | 74-79.9 | 64-69.9 |
| C ⁻ | 70-73.9 | 60-63.9 |
| D ⁺ | 64-64.9 | 54-59.9 |
| D ⁻ | 60-63.9 | 50-53.9 |
| E | Below 60 | Below 50 |

The grades are given on the basis of three components

A. Attendance and Participation (40 points)

Attendance and participation are mandatory. There is an expectation that each student will be prepared and will participate in class. You should not miss more than one class for any reason. Since this class meets once a week, missing a class is equivalent to three lecture periods. Excessive absences and poor participation will result in final grades being lowered. Points in class will be assigned primarily on the basis of discussions of the readings. Each week, several students will be selected to lead these discussions. This will involve a set of typed notes, prepared by the students, to be distributed in class, with at least five discussion points. The expectation is that the student team will prepare about two pages of notes touching on and highlighting the five discussion points; they, in turn, will lead the class discussion. I want a joint, collaborative product, i.e., one set of notes, and will pay attention to the extent to which students spark exchange and comprehension. The notes with discussion points are to be distributed at the beginning of class.

If you choose to present in power point, it is your responsibility to be sure to have the computer up and running, and your data ready to go. The instructor is not an audio-visual technician.

B. *Reflection* (20 points)

I ask you to keep a journal, which I will have you hand in to me 4 times during the semester. In this journal, you will reflect on the state of the world, and in particular on your impressions of environmental changes you are personally aware of in your daily life. This could range from comments on the weather to complaints about the polluted nature of a body of water. It could also involve discussions about things you read in magazines or newspapers, see on the web, view on television, or talk about with your friends. I expect 2 pages of journal entry each time I take a look, which means you will be writing 8 or more pages through the course of the semester to document your reflections. I will not be spell-checking your journal entries, and do not have the same expectations as I do for the class paper. This is more or less an exercise, a type of homework meant to help you become more aware of the world you live in. Thus, my grading here will be rather loose, which is to you can lose points only by failing to update your journal each time you turn it in. Each journal entry is worth 5 points.

C. *Class Paper* (40 points)

There will be one (1) class paper required for the course. The elements of this paper include an outline (10 points), presentation of outline (10 points), final paper (10 points), and presentation of final paper (10 points). These elements are due at specified dates throughout the semester.

The class paper should be based on a topic of interest to you, and relevant to class materials.

Outline. Paper outlines, both graduate and undergraduate, must show that students have selected an appropriate topic, and have begun to organize their thoughts and to write logically. They must be at least 2-pages in length and **should not** be restricted to simple outline format; rather, phrases, complete sentences, paragraphs, etc. are required. I also want to see several references (at least 3). These must be references to actual published materials, not simply webpages.

Presentation of Draft.

This should be about five minutes long, using powerpoint and handouts as necessary.

Presentation of Final Paper.

This should be a more formal presentation, about 10 minutes long, allowing 5 minutes for questions and answers. The class this day will be conducted like a mini-conference, and other students may attend.

Final Paper.

Note to all, especially non-native English speakers: your final paper will be graded on content AND form. You are strongly encouraged to make use of peer review, university resources, and other resources, to ensure your paper reads well and is free of grammatical errors. If an excessive number of grammatical errors are found, you will lose points.

Plagiarism: Plagiarism is the appropriation of the words, ideas, or thoughts of another and representation of them as one's own original work. Notice the breadth of that definition. You must cite another author not only for direct quotations, but also for the use of *ideas* and for the *paraphrasing* of another's work. To do a proper job of crediting you sources, it is not uncommon to have one citation for every two or three sentences of your paper.

Paper Expectations: Graduate Students

Your paper should be at least 15 pages in length (double spaced, 1” margins, Times New Roman with 12 point font) **excluding endnotes, references, figures, tables, etc.**, which should follow the 15 (or more) pages of text. I expect your paper to be written and organized at a level sufficient for submission to a peer-reviewed journal. The class paper should be comparable to the first part of a full manuscript excluding data collection, analysis, and discussion. Failure to meet the page limit will result in point loss.

Paper Expectations: Undergraduate Students

Your paper should be at least 10 pages in length (double spaced, 1” margins, Times New Roman with 12 point font) **excluding endnotes, references, figures, tables, etc.**, which should follow the 15 (or more) pages of text. I do not expect you to write something that could be submitted to a journal, but I do expect a grammatically clean, and well-structured exposition. Failure to meet the page limit will result in point loss.

Submission of work: Due dates for all assignments are in the syllabus. Papers are to be submitted electronically. Late papers will not be accepted without medical excuse or family emergency.

SCHEDULE OF TOPICS AND READINGS

Week 1 Our own very special catastrophic time on Earth

Introduction to Course

Two Critical Issues: Global Warming, Loss of Biodiversity
The Two Gigantic Drivers: Greenhouse Gas Emissions, Habitat Loss
More Localized Problems

A Language for Catastrophe
An eye for dynamic change in our own lives

Week 2 Climate change we just don't want yet

Childs, C. Chapter 1 "Deserts Consume"

Chapter 1: National Research Council. 2002. *Abrupt Climate Change: Inevitable Surprises*. (National Academy Press, Washington DC). Eds. Solomon S., Qin D., Manning M., Chen Z., Marquis M. Averyt K.B., Tignor M., Miller H.L. (Cambridge University Press, Cambridge, UK).

Goodbye, Miami *Rolling Stone*

Jeff Goodell June 20, 2013

<http://www.rollingstone.com/politics/news/why-the-city-of-miami-is-doomed-to-drown-20130620?page=5>

Week 3 Extinction, it's getting real First Journal Entry

Kolbert, E. Chapter 1 "The Sixth Extinction"
Kolbert, E. Chapter 2 "The Mastodon's Molars"
Kolbert, E. Chapter 3 "The Original Penguin"
Kolbert, E. Chapter 4 "The Luck of the Ammonites"
Kolbert, E. Chapter 5 "Welcome to the Anthropocene"

Week 4 What does a catastrophe feel Like? First Journal Entry Due Jan 29

Lenton TM, Held H, Kriegler E, Hall JW, Lucht W, Rahmstorf S, Schellnhuber HJ. 2008. Tipping elements in the Earth's climate system. *Proceedings of the National Academy of Sciences* 105:1786-1793 doi_10.1073_pnas.0705414105.

Chapter 2: National Research Council. 2002. *Abrupt Climate Change: Inevitable Surprises*. (National Academy Press, Washington DC). Eds. Solomon S., Qin D., Manning M., Chen Z., Marquis M. Averyt K.B., Tignor M., Miller H.L. (Cambridge University Press, Cambridge, UK).

IPCC. 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment of the Intergovernmental Panel on Climate Change.*

Additional Resources:

Lenton et al. 2008. Supplemental Online Materials.

Week 5 Tipping Points, teleconnections, and bistability

Nobre, Carlos Afonso, and Laura De Simone Borma. "'Tipping points' for the Amazon forest." *Current Opinion in Environmental Sustainability* 1, no. 1 (2009): 28-36.

Oyama, Marcos Daisuke, and Carlos Afonso Nobre. "A new climate-vegetation equilibrium state for tropical South America." *Geophysical research letters* 30, no. 23 (2003).

Week 6 Sea level rise and global warming

Childs, C. Chapter 3 "Seas Rise"
IPCC Projections

Week 7 Habitat loss by land and by sea Second Journal Entry Due Feb 19

Kolbert, E. Chapter 8 "The Forest and the Trees"
Kolbert, E. Chapter 9 "Islands on Dry Land"
Kolbert, E. Chapter 6 "The Sea Around Us"
Kolbert, E. Chapter 7 "Dropping Acid"

Week 8 Outlines Due Feb 26

Outline Presentations, Discussion

Week 9 SPRING BREAK Feb 29-Mar 4

Week 10 Habitat transformations

Kolbert, E. Chapter 10 "The New Pangaea"
Kolbert, E. Chapter 11 "The Rhino Gets an Ultrasound"
Kolbert, E. Chapter 12 "The Madness Gene"
Childs, C. Chapter 6 "Species Vanish"

Applegate, John S. "The Prometheus principle: Using the precautionary principle to harmonize the regulation of genetically modified organisms." *Indiana Journal of Global Legal Studies* (2001): 207-263.

Ferreira, Carlos EL, Osmar J. Luiz, Sergio R. Floeter, Marcos B. Lucena, Moysés C. Barbosa, Claudia R. Rocha, and Luiz A. Rocha. "First record of invasive lionfish (*Pterois volitans*) for the Brazilian coast." (2015): e0123002.

Pimentel, David, Rodolfo Zuniga, and Doug Morrison. "Update on the environmental and economic costs associated with alien-invasive species in the United States." *Ecological economics* 52, no. 3 (2005): 273-288.

Week 11 What have we done to the Earth? The case of Amazonia

Salazar, Luis F., Carlos A. Nobre, and Marcos D. Oyama. "Climate change consequences on the biome distribution in tropical South America." *Geophysical Research Letters* 34, no. 9(2007).

Walker, R. "The Amazonian Water World"

The IIRSA Plan:

Killeen, Timothy J. "A perfect storm in the Amazon wilderness." *Adv. Appl. Biodivers. Sci* 7 (2007): 102.

PRODES Maps of Amazonia, Population Census Data, Road Network

Week 12 What have we done to the Earth? The case of Florida

Third Journal Entry Due March 25

Knight, Robert L. 2015. *Silenced Springs: Moving from Tragedy to Hope*.

Chapter 1 "History, Ecology, and Significance of Florida's Springs"

Chapter 2 "The First Signs of Trouble"

Chapter 3 "Dying of Thirst"

Chapter 4 "Nitrate Nitrogen – An Ecological High?"

Chapter 5 "The New Normal"

Bartram *Travels of William Bartram* Part II Chapter IV – Part II Chapter VII pp 100-211.

Week 13 Existential Challenges

Baumol, William J. "On the social rate of discount." *The American Economic Review* 58, no. 4 (1968): 788-802.

Coase, Ronald H. *The problem of social cost*. Palgrave Macmillan UK, 1960.

In: Wittman, Donald A., ed. *Economic Analysis of the Law: selected readings*. John Wiley & Sons, 2008.

Week 14 The Response to Date Fourth Journal Entry Due April 8

Loft, Lasse, Ashwin Ravikumar, Maria Fernanda Gebara, Thu Thuy Pham, Ida Aju Pradnja

Resosudarmo, Samuel Assembe, Jazmín Gonzales Tovar, Esther Mwangi, and Krister Andersson.

"Taking stock of carbon rights in REDD+ candidate countries: Concept meets reality." *Forests* 6, no. 4 (2015): 1031-1060.

(*Carbon Markets and UN-REDD*)

Yandle, B., M. Vijayaraghavan, and M. Bhattarai. "The Environmental Kuznets Curve: A Primer, PERC Research Study 02-1." *Center for Free Market Environmentalism, Bozeman, MT* (2002).
(*The Environmental Kuznets Curve*)

Mansfield, Becky, Darla K. Munroe, and Kendra McSweeney. "Does economic growth cause environmental recovery? Geographical explanations of forest regrowth." *Geography Compass* 4, no. 5 (2010): 416-427.
(*Forest Transition*)

Week 15 Final Paper Due April 15

Paper presentations, Discussion