

GEOG 8: Life in the Anthropocene

Instructor: Prof. Jaclyn Hatala Matthes
Course time & location: MWF 1:45-2:50, Fairchild 101
Office location: Fairchild 015
Office Hours: Thursdays 1-1:50, or by appointment
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X-Hours: Will be used for exam review and office hours
Web: Canvas course website

Course Description: Most scientists believe we now live in The Anthropocene, a period defined by the unprecedented influence of human activity on the Earth and its ecosystems. This course will investigate the physical and ecological consequences of the Anthropocene. We will examine the global impacts of climate change and land-use change to better understand future feedbacks between climate, ecosystems, and human societies.

Prerequisites: This is designed as an introductory undergraduate course. Although previous work in environmental science, biology, earth science, or social sciences at the college level may be helpful, the requisite background material will be covered in class.

LEARNING OBJECTIVES

1. Understand the basic physical and ecological anthropogenic mechanisms and feedbacks driving global change.
2. Be able to describe how human activities are central to studying and interpreting current processes within the Earth system.
3. Develop interdisciplinary skills to assess the physical, ecological, and social aspects of global change impacts and potential solutions.

Assignments: 3 Problem Sets (10% each), Exam 1 (20%), Exam 2 (20%), Term paper (20%), Course participation (10%)

Problem sets will contain a mix of concept mapping, short answer questions, and basic quantitative analysis. Problem sets and the term paper must be uploaded in docx or pdf format via Canvas on the date due before the start of class. Assignments received after that are considered late. Late assignments will be penalized 10% per 24-hour period. Each student will be expected to prepare for discussions by bringing two reactions to the reading (questions, key insights, or critiques) into class. Reactions will be collected

and factored into class participation. Exams will be similar in structure to the problem sets. No makeup exams will be given without prior consent or documented emergency.

Student Needs: Students with disabilities enrolled in this course and who may need disability-related academic adjustments and services are encouraged to see me privately as early as possible in the term. Students requiring disability-related academic adjustments and services must consult the Student Accessibility Services (SAS) office. Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to their professor. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, they should contact the SAS office. All inquiries and discussions will remain confidential.

Academic Honesty: All students must comply with Dartmouth's Academic Honor Principle, detailed here: <http://www.dartmouth.edu/~uja/honor/students.html>. If you have questions or concerns, please contact me or the Undergraduate Deans Office.

COURSE READINGS

All course readings are available as PDFs on the course Canvas website.

Barnosky, A. D., 2008. Megafauna biomass tradeoff as a driver of Quaternary and future extinctions, *Proceedings of the National Academy of Sciences*, vol. 105.

Bierman, F. and I. Boas. 2010. Preparing for a Warmer World: Towards a Global Governance System to Protect Climate Refugees, *Global Environmental Politics* 10(1): 60-88.

Brand, S. and P. S. Ehrich, The Case For/Against De-extinction, Yale 360 Point/Counterpoint, 13 Jan 2014.

Caldeira, K., G. Bala, and L. Cao. 2013. The Science of Geoengineering, *Annual Reviews of Earth and Planetary Sciences* 41: 231-256.

Cronon, W. 2001. *Changes in the Land: Indians, Colonists, and the Ecology of New England*. Chapters 1-4, pp. 3-82.

Crutzen, P. J. 2002. Geology of mankind. *Nature* 415: 23.

DeFries, R. S., T. Rudel, M. Uriarte, M. Hansen. 2010. Deforestation driven by urban population growth and agricultural trade in the twenty-first century. *Nature Geoscience* 3:178–181.

Donlan, C. J., J. Berger, *et al.*, 2006. Pleistocene Rewilding: An Optimistic Agenda for Twenty-First Century Conservation, *The American Naturalist* 168(5): 660-681.

- Intergovernmental Panel on Climate Change (IPCC), 2013. *Climate Change 2013: The Physical Science Basis, Summary for Policymakers*.
- Kolbert, E. 2013. *The Sixth Extinction: An Unnatural History*. Chapters 1 & 10, pp. 1-22, 193-217.
- Krieger, M. H., 1973. What's wrong with plastic trees? *Science* 179(4072): 446-455.
- Lugo, A. E. 2014. Evolving conservation paradigms for the Anthropocene, In: *Forest Conservation and Management in the Anthropocene*, Eds. V. A. Sample and R. P. Bixler, Washington, DC: Pinchot Institute for Conservation, pp. 47-61.
- McPhee, J. 1990. *The Control of Nature*. Chapter 1: Atchafalaya, pp. 3-94.
- Meyerson, L. A. and H. A. Mooney. 2007. Invasive alien species in an era of globalization, *Frontiers in Ecology & the Environment* 5: 199-208.
- Obbard, R. W., S. Sadri, *et al.* 2014. Global warming releases microplastic legacy frozen in Arctic Sea ice. *Earth's Future* 2(6): 315-320.
- Oki, T. and S. Kanae, 2006. Global hydrological cycles and world water resources. *Science* 313: 1068-1072.
- Polsky, C., J. M. Grove, *et al.* 2014. Assessing the homogenization of urban land management with an application to US residential lawn care. *Proceedings of the National Academy of Sciences* 111(12): 4432-4437.
- Pongrasi, M. J., J. Roman, V. O. Ezenwa, T. L. Goldberg, H. S. Koren, S. C. Newbold, R. S. Ostfeld, K. Pattanayak, D. J. Salkeld. 2009. Biodiversity Loss Affects Global Disease Ecology. *BioScience* 59(11): 945-954.
- Price, S. J., J. R. Ford, A. H. Cooper, and C. Neal. 2011. Humans and major geological and geomorphological agents in the Anthropocene: the significance of artificial ground in Great Britain. *Philosophical Transactions of the Royal Society A* 369: 1056-1084.
- Rockström, J., *et al.*, 2009. A safe operating space for humanity. *Nature* 461: 472-475.
- Ruddiman, W. F. 2005. How did humans first alter global climate? *Scientific American* March 2005: 46-53.
- Skinner, B. J. and B. W. Murck. 2011. *The Blue Planet: An Introduction to Earth System Science, 3rd Edition*. Chapters 1, 15, 17, & 19, pp. 5-30, 449-487, 519-541, 573-605.
- Seto, K. C., B. Güneralp, L. R. Hutyrá. 2012. Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences* 109 (40): 16083-16088.

Course material, assignments, and schedule are subject to change.

This American Life, Episode 440: Game Changer. 2011.

<http://www.thisamericanlife.org/radio-archives/episode/440/game-changer>

Velasquez-Manoff, M. Should you fear the Pizzly Bear? *New York Times Magazine*, 14 Aug 2014.

Weisman, A. 2005. The Earth Without People. *Discover*.

COURSE SCHEDULE

DATE	TOPIC	READING/MATERIALS
<i>Introduction</i>		
5 Jan	Introduction to the Anthropocene	Crutzen (2002); Kolbert Ch. 5
7 Jan	The Earth System in the Anthropocene I	Skinner & Murck Ch. 1
9 Jan	The Earth System in the Anthropocene II	Skinner & Murck Ch. 17, TAL Episode #440
<i>Part I: The Anthropocene & the Physical Environment</i>		
12 Jan	The Atmosphere I	De Blij et al (2013) Ch. 6
14 Jan	The Atmosphere II	Ruddiman (2005)
16 Jan	Guest Lecture: Kerri-Ann Jones, former Asst. Secretary of State – PSET #1 assigned	IPCC, WG2: Climate Vulnerability (2014)
21 Jan	Controlling Water I	Oki (2006)
22 Jan	Controlling Water II	McPhee (1990)
23 Jan	Geomorphology I – PSET #1 DUE	
26 Jan	Geomorphology II	Price (2011)
28 Jan	Synthetics and Waste Management	Obbard (2014)
29 Jan	X-period: Student-led review for Exam 1	
30 Jan	Exam 1	
<i>Part II: Ecosystems in the Anthropocene</i>		
2 Feb	Ecology in the Anthropocene	Kolbert Ch. 1; Chapin <i>et al.</i> Ch. 1
4 Feb	Agriculture	Chapin <i>et al.</i> , Ch. 13; Cronon (2001)
5 Feb	Natural Resource Extraction, Part I – PSET #2 assigned	DeFries (2010)
9 Feb	Natural Resource Extraction, Part II	Lugo (2014)
11 Feb	Extinction & Forced Adaptation	Barnosky (2008); Velasquez-Manoff (2014)

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13 Feb	Global movement of organisms, Part I – PSET #2 DUE	Kolbert Ch. 10
16 Feb	Global movement of organisms, Part II	Meyerson (2007)
18 Feb	Global disease	Kolbert Ch. 1; Pongrasi <i>et al.</i> (2009)
19 Feb	X-period: Student-led review for Exam 2	
20 Feb	Exam 2	
<i>Part III: Novel environments in the Anthropocene</i>		
23 Feb	Urbanization – Term Paper topics distributed	Seto (2012)
25 Feb	Suburbanization	Polsky (2014); Marzluff (2014)
27 Feb	Re-wilding & De-extinction – PSET #3 assigned	Donlan (2006); Brand & Ehrlich (2014)
2 Mar	Geoengineering I	Caldeira (2013)
4 Mar	Geoengineering II	Krieger (1973)
6 Mar	Anthropocene refugees – PSET #3 DUE	Bierman (2010)
9 Mar	Planetary stewardship – TERM PAPERS DUE	Rockström (2009); Weisman (2005)