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Fall 9-1-2000

GEOG 550.01: Seminar in Global Change

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Edlund, Eric and Halvorson, Sarah J., "GEOG 550.01: Seminar in Global Change" (2000). *Syllabi*. 5118.
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GEOGRAPHY 550: Seminar in GLOBAL CHANGE

Additional Online Resources**Instructors**

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Background and Requirements

This new seminar is open to graduate students and seniors interested in the relationships between global change and environmental systems, including natural ecosystems, socioeconomic structures, water resources, and agroecosystems.

The seminar begins with consideration of the mechanisms of global climate change and the natural range of environmental variability. We address historic and present-day human impacts on the atmosphere, including the production and cycling of greenhouse gasses. Computer models (GCMs) and records of late Quaternary environments (e.g. ice cores, lake levels, pollen analysis and dendrochronology) allow us to consider the responses of ecological systems to global changes of the past, and to assess the value of those records as analogs for present and future environmental shifts.

In the second part of the semester attention is directed to climate-society interactions, including issues of vulnerability, regional and local impacts on social and economic systems, national and international policy responses and proposed mitigation strategies. We evaluate the estimated “costs” and “benefits” of projected global warming, as well as the issues associated with political decision-making in the face of scientific uncertainty. Proposed case studies will include a review of forest and fire management strategies, and a discussion of the consequences of climate change for water resources.

Students will prepare and present a seminar paper on a topic of particular interest to them. In addition, grades will reflect student participation, including leading one or more discussion sessions.

Reading lists will be distributed at least one or two weeks before each session. Readings will be on reserve at the Mansfield Library and in the Geography Department. Recommended reading throughout the semester is J.Houghton, 1997, *Global Warming: The Complete Briefing* (2nd edition, Cambridge University Press).

Seminar Topics/Outline

The course is organized around the following substantive questions:

- I. How does the Earth’s climate work?
- II. How do we reconstruct global climate changes in the past?
- III. How have systems responded to global changes in the past?
- IV. What are the emerging discussions and debates regarding climate-society interactions?
- V. What are current responses and proposed mitigation strategies?
- VI. What should we do to avert or respond to global climate change?

Geography 550: Seminar in GLOBAL CHANGE

SCHEDULE OF MEETINGS

<u>Week</u>	<u>Date</u>	<u>Topic and Readings</u>
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I. How does the Earth’s

climate work?

1. **Sept 5 Orientation and aims of the seminar**
 Introductions, course overview, reading materials, thematic issues

Background Reading (as Needed):

Moran, J.M., and M.D.Morgan. 1997. *Meteorology: The Atmosphere and the Science of Weather*. Upper Saddle River, NJ: Prentice Hall, chapter 2, "Radiation," and chapter 10, "Planetary-scale circulation."

2. **Sept 12 The science of climate change**
 Principles, evidence, measurements, uncertainties, feedback mechanisms

Readings/Resources:

Intergovernmental Panel on Climate Change. 1996. "Summary for Policymakers." In J.T. Houghton, *et al.*, eds., *Climate Change 1995: The Science of Climate Change*. Cambridge University Press, published for the Intergovernmental Panel on Climate Change (IPCC), pp. 1-7. The detailed "Technical Summary" from this volume is also very useful.

Trenberth, K.E., J.T. Houghton, and L.G. Meira Filho. 1996. "The climate system: an overview." In *Climate Change 1995: The Science of Climate Change*, pp. 51-64.

Wuebbles, D.J., and N.J. Rosenberg. 1998. "The natural science of global climate change." Chapter 1 in S. Rayner and E.L. Malone, eds., *Human Choice and Climate Change, Volume Two: Resources and Technology*, pp. 1-78. Columbus, OH: Battelle Press.

Intergovernmental Panel on Climate Change (IPCC): <http://www.ipcc.ch/>

US Global Change Research Program: <http://www.usgcrp.gov>

II. How do we reconstruct global climate changes in the past?

3. **Sept 19 Climate change records and historic climatological data**

Readings/Resources:

Nicholls, N., et al 1996. "Observed climate variability and change." In J.T. Houghton, et al, eds., *Climate Change 1995: The Science of Climate Change*. Cambridge University Press, published for the Intergovernmental Panel on Climate Change (IPCC), pp. 133-192.

Peterson, T.C., et al. 1999. "Global rural temperature trends." *Geophysical Research Letters* 26: 329-332.

Kutzbach, J.E., and T. Webb III (1993). "Conceptual basis for understanding Late-Quaternary climates." In H.E. Wright, Jr., et al, eds., *Global Climates since the Last Glacial Maximum*. Minneapolis: University of Minnesota Press, pp. 5-11.

EPA Global Warming Homepage: <http://www.epa.gov/globalwarming/index.html>

4. **Sept 26 Modeling climate change, recognizing "natural" vs. "anthropogenic" climate change**
 Student-led discussions begin

Readings/Resources:

Houghton, J. 1997. *Global Warming: The Complete Briefing* (2nd edition). Cambridge: Cambridge University Press (251 pp). See especially chapters 4-6 for this week.

Hulme, M., et al. 1999. "Relative impacts of human-induced climate change and natural climate variability." *Nature* 397: 688-691.

Reid, G.C. 1997. "Solar forcing of global climate change since the mid-17th century." *Climatic Change* 37: 391-405.

Trenberth, K. 1997. "The use and abuse of climate models." *Nature* 386: 131-133.

National Climatic Data Center: <http://www.ncdc.noaa.gov/>

The Hadley Centre for Climate Prediction and Research:

<http://www.metu.gov.uk/sec5/sec5pg1.html>

III. How have systems responded to global changes in the past?

5. **Oct 3** **Paleoecological evidence: ecosystem and human responses to prehistoric climatic changes**
Includes presentation on late Quaternary paleoecology in Sierra Nevada & northern Rockies by Professor Edlund

Readings/Resources:

- Huntley, B., and T. Webb III. 1989. "Migration: species' response to climatic variations caused by changes in the earth's orbit." *Journal of Biogeography* 16: 5-9.
Overpeck, J.T., et al. 1990. "Climate-induced changes in forest disturbance and vegetation." *Nature* 343: 51-53.
Roberts, N. 1998. "Early Holocene adaptations (11,500–5,000 Cal. yr BP)" In N. Roberts, *The Holocene: An Environmental History* (2nd edition), chapter 4, pp. 87-126. Oxford: Blackwell Publishers.

Illinois State Museum of Natural History: http://www.museum.state.il.us/exhibits/ice_ages/
International Geosphere-Biosphere Programme PAGES Newsletter: <http://www.pages.unibe.ch>

6. **Oct 10** **Documentary evidence: ecosystem responses**
Focus on changes in fire regimes over time and space

Readings/Resources:

- Bartlein, P.J., C. Whitlock and S.L. Shafer. 1997. "Future climate in the Yellowstone national Park region and its potential impact on vegetation." *Conservation Biology* 11: 782-792.
Clark, J.S. 1988. "Effect of climate change on fire regimes in northwestern Minnesota." *Nature* 334: 233-235.
Millsbaugh, S.H., C. Whitlock, and P.J. Bartlein. 2000. "Variations in fire frequency and climate over the past 17 000 yr in central Yellowstone National Park." *Geology* 28: 211-214.

U.S. Forest Service: <http://www.fs.fed.us/>

U.S.G.S. Geospatial Multi-Agency Coordination Group: <http://wildfire.usgs.gov/>

IV. What are the emerging discussions and debates regarding climate-society interactions??

7. **Oct 17** **Vulnerability and Impacts I:**
Global and regional impacts, issues surrounding risk and vulnerability, adaptive responses, impact assessments

Readings/Resources:

- Burton, I. 1997. "Vulnerability and the adaptive response in the context of climate and climate change." *Climate Change*, 36: 185-196.
Glantz, M.H. 1995. "Assessing the impacts of climate: the issue of winners and losers in a global climate change context." In *Climate Change Research: Evaluation and Policy Implications*, S. Zwerver, R.S.A.R. van Rompaey, M.T.J. Kok, and M.M. Berk (eds.), New York, Elsevier, pp. 41-54.
IPCC. 1997. *The Regional Impacts of Climate Change: Assessment of Vulnerability*. Also available online at <http://www.ipdd.ch/pub/sr97.htm>.
Mendelson, R. and N.J. Rosenberg. 1994. "Framework for integrated assessments of global warming impacts." *Climate Change*, 28: 15-44.

National Center for Atmospheric Research (NCAR): <http://www.ncar.ucar.edu/>

NCAR's Environmental and Societal Impacts Group: <http://www.esig.ucar.edu/>

8. **Oct 24** **Vulnerability and Impacts II:**
Regional and local impacts on social and economic systems, agriculture, island nations, ecosystems

Readings/Resources:

- Easterling, W.E. 1996. "Adapting North American agriculture to climate change in review." *Agriculture and Forest Meteorology*, 80: 1-53.

- Rosenzweig, C. and D.Hillel. 1998. *Climate Change and the Global Harvest: Potential Impacts of the Greenhouse Effect on Agriculture*. New York: Oxford (324 pp).
- Tooley, M.J. 1994. "Sea-level response to climate." In N.Roberts, ed., *The Changing Global Environment*, pp. 173-189. Oxford: Blackwell Publishers.

Federal Emergency Management Agency: <http://www.fema.gov>

9. Oct 31 Vulnerability and Impacts III: Western Water Case Study

Readings/Resources:

- Miller, K.A. 1997. *Climate Variability, Climate Change, and Western Water*. Report to the Western Water Policy Review Advisory Commission, National Technical Information Service, Springfield, VA.
- Miller, K.A., Rhodes, S.L. and L.J. MacDonnell. 1997. "Water allocation in a changing climate: Institutions and adaptation." *Climate Change*, 35: 157-177.
- National Research Council. 1993. *Water Resources in the West under Conditions of Climate Uncertainty*. Washington, DC: NRC.
- Rogers, P. 1994. "Assessing the socioeconomic consequences of climate change on water resources." *Climate Change*, 28: 179-208.

The Pacific Institute for Studies in Development, Environment and Security:

<http://www.pacinst.org/overview.html>

National Research Council's Water Science and Technology Board Homepage:

<http://www4.nationalacademies.org/cger/wstb.nsf>

V. What are current responses and proposed mitigation strategies?

10. Nov 7* The Economics of Climate Change:
Addresses "benefits" and "costs," issues of finance
**Election Day-Meeting time to be rescheduled if necessary*

Readings/Resources:

- Moore, T.G. 1998. *Climate of Fear: Why We Shouldn't Worry about Global Warming*. Washington, D.C.: Cato Institute. See chapters 4-6.
- Nordhaus, W.D. 1993. "Reflections on the economics of climate change." *Journal of Economic Perspectives*, 7 (14): 11-25.
- Repetto, R. and D. Austin. 1997. *The Costs of Climate Protection: A Guide for the Perplexed*. New York: World Resources Institute.
- Weyant, J.P. 1993. "Costs of reducing global carbon emissions." *Journal of Economic Perspectives*, 7(4): 27-63.

World Resources Institute Climate Protection Initiative: <http://www.wri.org/wri/cpi/>

Western Fuels Association Global Warming: <http://www.westernfuels.org/>

11. Nov 14 International Cooperation and Conflict:
The history of negotiations, Post-Kyoto Treaty perspectives, international cooperation, policy challenges

Readings/Resources:

- Bodansky, D.M. 1995. "The emerging climate change regime." *Annual Reviews of Energy and Environment*, 20:425-461.
- Kauppi, P.E. 1995. "The United Nations climate convention: unattainable or irrelevant." *Science*, 270: 1454.
- White, R.M. 1996. "Climate science and national interests." *Issues in Science and Technology*, Fall:33-38.
- Houghton, J. 1997. *Global Warming: The Complete Briefing* (2nd edition). Cambridge: Cambridge University Press (251 pp). See chapter 9 for this week.

Framework Convention on Climate Change: <http://www.unfccc.de/index.html>

12 Nov 21 Thanksgiving Week—no class meeting (?)

VI. What should we do to avert or respond to global climate change?

13 Nov 28 Equity, Sustainability, and Environmental Justice Concerns

Readings/Resources:

Cohen, S., Demeritt, D., Robinson, J. and D. Rothmann. 1998. "Climate change and sustainable development: towards dialogue." *Global Environmental Change*, 8: 341-371.

Jamieson, D. 1992. "Ethics, public policy, and global warming." *Science, Technology, and Human Values*, 17: 139-153.

Rayner, S. and E.L. Malone. 1997. "Zen and the art of climate maintenance." *Nature*, 390:332-334.

Pielke, R.A.J. 1998. "Rethinking the role of adaptation in climate policy." *Global Environmental Change*, 8: 159-170.

Union for Concerned Scientists: <http://www.ucsusa.org>

Global Change: <http://www.globalchange.org>

Sarewitz, D. and R. Pielke, Jr. Atlantic Monthly article:

<http://www.theatlantic.com/cgi-bin/o/issues/2000/07/sarewitz.htm>

14 Dec 5 Student Presentations (topics and readings to be announced)

15 Dec 12 Presentations (topics and readings to be announced)

Final Dec19 Final Meeting and Course Wrap-up, 7:40-9:40 p.m.