

Environmental Change Modeling (GIS5306)
(Fall 2012)

Class meets: Tuesdays 2:30 - 5 pm, Bellamy 035
Office hour: Tuesdays 1-2 pm or by appointment

Instructor

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Credit Hours: 3

Course Objectives

This course is designed to help students understand the contemporary environmental changes as well as modeling techniques used for evaluating, simulating and predicting these changes. Lectures focus on human dimensions of environment change, with emphasis on terrestrial ecosystems. Topics include population dynamics, land-cover/land-use change, ecosystem dynamics, human behavior and institution, and vulnerability and adaptation of human-natural systems. You will also explore data used for modeling environmental changes and errors associated with data manipulation. IDRISI and NetLogo are the main software packages for labs and assignments.

Electronic Materials

Class announcements, part of lecture materials, and readings will be posted on Blackboard course site ENV CHANGE MODELING.

Grading

You will be graded based on contribution to class discussion (10%), four assignments (60%), and a term project (30%).

Term Project

Your project needs to address an environmental change issue. Focus should be given to the scientific background of this issue and modeling techniques associated with this issue. Your project may be either literature review or data-driven research project. Check the project guide (under Bb "Term Project folder") for detailed requirements on oral and written reports.

Course Policies

Attendance is required throughout the semester. Persistent informal talking and any reading or studying of other materials will not be tolerated.

Delay of the submission of assignment decreases 20 of 100 points per day. **No delay will be accepted for the term project**, including both oral and written reports.

All changes to the course schedule made in class are the responsibility of the student. Students are responsible for all missed class materials. Office appointments will be made only when there is a clear conflict with the student's course schedule.

Academic Honer Policy

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://dof.fsu.edu/honorpolicy.htm>.)

Americans with Disabilities Act

Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact

Student Disability Resource Center
874 Traditions Way
108 Student Services Building
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
<http://www.disabilitycenter.fsu.edu/>

Syllabus Change Policy

This syllabus is subject to change with advance notice.

Schedule (subject to change)

Week	Date	Topic	Readings	Lab
1	8/28	Environmental change & models	n/a	Intro to IDRISI
2	9/4	Data models	(Peuquet, 2001, Miller and Wentz, 2003)	
3	9/11	Errors & uncertainties	(Burnicki et al., 2007, Pontius and Millones, 2011)	Assignment 1: Accuracy Assessment (due on Sept 25)
4	9/18	Population dynamics	(Wilson and Rees, 2005, Booth, 2006)	
5	9/25	Land-cover/-use change	(Wood et al., 1997, Turner et al., 2007)	Assignment 2: Markov Model (due on Oct 9)
6	10/2	Land-cover/-use change (cont.)	(Verburg and Overmars, 2009, Theobald, 2005)	
7	10/9	Land-cover/-use change (cont.)	(Batty, 1997, Stevens et al., 2007)	Assignment 3: Cellular Automata (due on Oct 23)
8	10/16	Ecosystem dynamics	(Waring and Running, 2007, Mladenoff, 2004)	
9	10/23	Changes in ecosystem function	(Chapin et al., 2006, Zhao et al., 2007)	Term project topic and readings due
10	10/30	Human behavior	(Brown et al., 2005, Parker et al., 2003)	Assignment 4: Agent-Based Model (due on Nov 13)
11	11/6	Institution	(Dietz et al., 2003, Hexmoor et al., 2006)	
12	11/13	Vulnerability & adaptation	(Eakin, 2008, Cutter et al., 2000)	Preparing term project
14	11/27	Project oral report	Student's choice	n/a
15	12/4	Course summary & evaluation	n/a	n/a
16	12/11	Term project written report due by 5 pm. No delay will be accepted.		

Required Readings

- BATTY, M. 1997. Cellular automata and urban form: A primer. *Journal of the American Planning Association*, 63, 266-274.
- BOOTH, H. 2006. Demographic forecasting: 1980 to 2005 in review. *International Journal of Forecasting*, 22, 547-581.
- BROWN, D. G., RIOLO, R., ROBINSON, D. T., NORTH, M. & RAND, W. 2005. Spatial process and data models: Toward integration of agent-based models and GIS. *Journal of Geographic systems*, 7, 25-47.
- BURNICKI, A. C., BROWN, D. G. & GOOVAERTS, P. 2007. Simulating error propagation in land-cover change analysis: The implications of temporal dependence. *Computers Environment and Urban Systems*, 31, 282-302.
- CHAPIN, F. S., MATSON, P. A. & MOONEY, H. A. 2006. *Principles of Terrestrial Ecosystem Ecology*.
- CUTTER, S. L., MITCHELL, J. T. & SCOTT, M. S. 2000. Revealing the vulnerability of people and places: A case study of Georgetown County, South Carolina. *Annals of the Association of American Geographers*, 90, 713-737.
- DIETZ, T., OSTROM, E. & STERN, P. C. 2003. The struggle to govern the commons. *Science*, 302, 1907-1912.
- EAKIN, H. 2008. Human vulnerability to global environmental change. In: CLEVELAND, C. J. (ed.) *Encyclopedia of Earth*. Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment.
- HEXMOOR, H., VENKATA, S. G. & HAYES, D. 2006. Modelling social norms in multiagent systems. *Journal of Experimental & Theoretical Artificial Intelligence*, 18, 49-71.
- MILLER, H. J. & WENTZ, E. A. 2003. Representation and spatial analysis in geographic information systems. *Annals of the Association of American Geographers*, 93, 574-594.
- MLADENOFF, D. J. 2004. LANDIS and forest landscape models. *Ecological Modelling*, 180, 7-19.
- PARKER, D. C., MANSON, S. M., JANSSEN, M. A., HOFFMANN, M. J. & DEADMAN, P. 2003. Multi-agent systems for the simulation of land-use and land-cover change: A review. *Annals of the Association of American Geographers*, 93, 314-337.
- PEUQUET, D. J. 2001. Making space for time: Issues in space-time data representation. *Geoinformatica*, 5, 11-32.
- PONTIUS, R. G. & MILLONES, M. 2011. Death to Kappa: birth of quantity disagreement and allocation disagreement for accuracy assessment. *International Journal of Remote Sensing*, 32, 4407-4429.
- STEVENS, D., DRAGICEVIC, S. & ROTHLEY, K. 2007. iCity: A GIS-CA modelling tool for urban planning and decision making. *Environmental Modelling & Software*, 22, 761-773.
- THEOBALD, D. M. 2005. Landscape patterns of exurban growth in the USA from 1980 to 2020. *Ecology and Society*, 10.

- TURNER, B. L., LAMBIN, E. F. & REENBERG, A. 2007. The emergence of land change science for global environmental change and sustainability. *Proceedings of the National Academy of Sciences of the United States of America*, 104, 20666-20671.
- VERBURG, P. H. & OVERMARS, K. P. 2009. Combining top-down and bottom-up dynamics in land use modeling: exploring the future of abandoned farmlands in Europe with the Dyna-CLUE model. *Landscape Ecology*, 24, 1167-1181.
- WARING, R. H. & RUNNING, S. W. 2007. *Forest Ecosystems: Analysis at Multiple Scales*, Elsevier Academic Press.
- WILSON, T. & REES, P. 2005. Recent developments in population projection methodology: A review. *Population Space and Place*, 11, 337-360.
- WOOD, E. C., LEWIS, J. E., TAPPAN, G. G. & LIETZOW, R. W. 1997. The development of a land cover change model for southern Senegal. *Land use modeling workshop*. Sioux Falls, SD: National Center for Geographic Information and Analysis.
- ZHAO, T. T., BROWN, D. G. & BERGEN, K. M. 2007. Increasing gross primary production (GPP) in the urbanizing landscapes of southeastern Michigan. *Photogrammetric Engineering and Remote Sensing*, 73, 1159-1167.