

GEOGRAPHY 4810/7810 Landscape Ecology & GIS Analysis 1 Spring 2008

Monday, Wednesday and Fridays 1:00-1:50

Lecture & Discussion meets in Room 106 Stewart (Monday/Wednesday); Labs in 107 Stewart (Friday)

INSTRUCTOR: Dr. Mark Cowell

OFFICE: 18 Stewart Hall

EMAIL: MCowell@missouri.edu

OFFICE HOURS: M,W,F 11-12:00 or by appointment PHONE: 882-0045

TEXTBOOKS:

Landscape Ecology in Theory and Practice. 2001. M.G. Turner, R.H. Gardner, & R.V. O'Neill. Springer.

Correction Lines: Essays on Land, Leopold & Conservation. 2004. Curt Meine. Island Press.

All additional readings are available by electronic reserve: <http://eres.missouri.edu> [password: scale]

Landscape ecology is a field that has recently emerged as a major new perspective on environmental analysis, with particular focus on issues such as biodiversity conservation, ecosystem dynamics, habitat management and restoration, and land use planning. At its core is the relationship between nature and humans, which is envisioned by landscape ecologists as inherently and unavoidably linked. It focuses primarily on the spatial dimension of these issues, taking an integrative approach that combines technologies such as geographic information systems (GIS) and remote sensing with knowledge from fields as diverse as ecology, geography, landscape architecture, philosophy and environmental history.

This course will be similarly wide-ranging, exploring the rationale for the landscape ecology approach, the ecological concepts and importance of landscape patterns (e.g., patches, corridors, mosaics), landscape processes (e.g., fragmentation) and the computer-based techniques of analyzing these phenomena. A significant portion of the coursework will be practical GIS lab exercises that focus on the application of these concepts to Missouri data and landscapes. Prerequisite to the class is an introductory GIS course (such as Geog 4840) that provided familiarity with ArcGIS software.

FORMAT, GRADES AND EXPECTATIONS:

Course time will be spent on an even mix of lecture, seminar-style discussion, and GIS labwork. We will do a healthy amount of reading, and it is expected that you will have read the assigned chapters and papers prior to class meetings, so that you will be prepared to contribute to discussions. The GIS lab projects are designed to be practical applications of the concepts under examination. Some classtime will be spent in the GIS lab to learn the procedures involved, but a large portion of this work will need to be done outside of class. Summary reports will be written for each GIS project, and students will present results from their labwork at different times during the semester.

Course grades will be determined from the sum of points earned on projects, exams and participation, based on the following distribution:

GIS Projects (60%)

Four Projects: (12.5% each)

Project Presentation 1: (5%)

Project Presentation 2 (5%)

Exams (30%)

Midterm (15%)

Final (15%)

Discussion participation (10%)

COURSE OUTLINE

I. Premise and Context

A. The human role in ecosystems

Lecture: course introduction; development of landscape ecology Jan 23, 25

Discussion: Central Missouri's watershed landscapes Jan 28

Discussion: Landscape ecology – the application of the land ethic? Jan 30

GIS PROJECT 1: Describing physical landscapes LAB Feb 1, 8, 15

Discussion: The emergence of contemporary conservation Feb 4, 6

B. Basics of natural landscapes

Lecture: ecosystem scale and dynamics Feb 11, 13, 18

Discussion: Changing environments and natural landscapes Feb 20

C. Humanized landscapes

GIS PROJECT 2: Inherit the grid LAB Feb 22, 29, March 7

Discussion: Changing environments and human landscapes Feb 25

Discussion: Inherit the grid Feb 27, Mar 3

Exam 1

March 5

II. Landscape patterns and processes

A. Pattern & process

Lecture: Landscape pattern – heterogeneity, diversity, abiotic controls.... March 10

B. Metrics

Lecture: Describing and quantifying landscape pattern March 12, 17

GIS PROJECT 3: Watershed metrics LAB March 14, April 4,11

LAB PRESENTATIONS: Watershed characteristics and prospects

March 19, 21

C. Patches and mosaics

Lecture: island biogeography, metapopulations March 31, April 2

Discussion: Corridor and matrix effects April 7

III. Landscape dynamics

A. Disturbance Mosaics

Lecture: Landscape dynamics – disturbance April 9, 14

Discussion: Presettlement landscape dynamics April 16, 21

GIS PROJECT 4: Livable landscapes LAB April 18, 25, May 2

B. Implementing Landscape Ecology

Discussion: Landscape restoration April 23

Lecture: Nature reserve design April 28

Discussion: Conservation geography April 30

LAB PRESENTATIONS: Watershed landscape analyses

May 5,7

Exam 2

Friday, May 16 (10:30am)

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Course Readings

Spring 2008

Week 1

READ FOR JANUARY 25 LECTURE:

- “Introduction to Landscape Ecology” *Landscape Ecology in Theory and Practice*, ch. 1

Week 2

READ FOR JANUARY 30 DISCUSSION:

- A Leopold, 1949. “The land ethic.” *A Sand County Almanac*. On *ERES: electronic reserves*
- C. Meine. *Correction Lines*, Introduction and ch. 1 “The oldest task in human history” (pp 1-41)

Week 3

READ FOR FEBRUARY 4 DISCUSSION:

- C. Meine. *Correction Lines*, ch. 2 & 3 “Conservation and the progressive movement” and “Conservation biology and sustainable societies (pp 42-85)

READ FOR FEBRUARY 6 DISCUSSION:

- C. Meine. *Correction Lines*, ch. 10 & 11 “The once & future land ethic,” “Home, land, security” (pp 210-246)

Week 4

READ FOR FEBRUARY 11 LECTURE:

- “The critical concept of scale” *Landscape Ecology in Theory and Practice*, ch. 2
- Bossebroek et al., 2004. “Taxon-dependent scaling: beetles, birds & vegetation” On *ERES*

Week 5

READ FOR FEBRUARY 20 DISCUSSION:

- Andersen & Baker, 2005. “Reconstructing landscape-scale tree invasion using survey notes in the Medicine Bow Mountains, Wyoming” *ERES*
- Hotchkiss et al., 2007. “Response of vegetation and fire to Little Ice age climate change: regional continuity and landscape heterogeneity” *ERES*
- Westerling et al., 2006. “Warming & earlier spring increase US forest wildfire activity” *ERES*

Week 6

READ FOR FEBRUARY 25 DISCUSSION:

- Foster, 2002. “Thoreau’s country: a historical-ecological perspective on conservation...” *ERES*
- Schulte et al., 2007. “Homogenization of northern US Great Lakes forests due to land use” *ERES*

READ FOR FEBRUARY 27 DISCUSSION:

- C. Meine. *Correction Lines*, ch. 9 “Inherit the grid” (pp 187-209)

Week 7

READ FOR MARCH 3 DISCUSSION:

- Rhemtulla et al., 2007. “Regional land-cover conversion in the US upper Midwest (1850-1993)” *ERES*

EXAM I

Week 8

READ FOR MARCH 10 LECTURE:

- “Causes of landscape pattern” *Landscape Ecology in Theory and Practice*, ch. 4

READ FOR MARCH 12 LECTURE:

- “Quantifying landscape pattern” *Landscape Ecology in Theory and Practice*, ch. 5

Spring Break

Week 10

READ FOR MARCH 31 LECTURE:

- “Organisms and landscape pattern” *Landscape Ecology in Theory and Practice*, ch. 8
- Howell et al., 2007. “Landscape context and selection for forest edge by brown-headed cowbirds” **ERES**

Week 11

READ FOR APRIL 7 DISCUSSION:

- Damschen et al. 2006, “Corridors increase plant species richness at large scales” **ERES**
- Öckinger & Smith, 2008. “Do corridors promote dispersal in grassland butterflies and insects?” **ERES**
- Dunford & Freemark, 2004. “Matrix matters: effects of surrounding land use on forest birds” **ERES**

READ FOR APRIL 9 LECTURE:

- “Landscape disturbance dynamics” *Landscape Ecology in Theory and Practice*, ch 7

Week 12

READ FOR APRIL 16 DISCUSSION:

- Tinker et al., 2003. “Historic range of variability in landscapes of Yellowstone...” **ERES**
- Foster et al., 2002. “Oak, chestnut and fire: climatic and cultural controls...” **ERES**
- Guyette et al., 2002. “Dynamics of an anthropogenic fire regime.” **ERES**

Week 12

READ FOR APRIL 21 DISCUSSION:

- Rentch & Hicks, 2005. “Changes in presettlement forest composition for five areas in the Central Hardwood forest, 1784-1990” **ERES**
- Davis et al., 2007. “Local and landscape effects on butterfly community in fragmented prairie” **ERES**
- Grossmann & Mladenoff, 2007. “Open woodland & savanna decline in a mixed-disturbance landscape” **ERES**

Week 13

READ FOR APRIL 23 DISCUSSION:

- Allen et al., 2002. “Ecological restoration of SW ponderosa pine ecosystems...” **ERES**
- Litvaitis, 2003. “Are pre-Columbian conditions relevant baselines for managed forests?” **ERES**

Week 14

READ FOR APRIL 28 LECTURE:

- “Applied Landscape Ecology” *Landscape Ecology in Theory and Practice*, ch 10

READ FOR APRIL 30 DISCUSSION:

- Gimona & van der Horst, 2007. “Mapping hotspots of multiple landscape functions: a case study on farmland afforestation in Scotland” **ERES**
- Milne & Bennett, 2007. “Biodiversity and ecological value of conservation lands in agricultural landscapes of southern Ontario” **ERES**

Week 15: lab presentations