Arch 623
Ecosystem Design for Urban Landscapes

Winter 2012, 0.5 credits
Small group lecture and seminar sessions
Course Instructor: Val Rynnimeri

A fundamental difficulty in managing social-ecological systems for long-term, sustainable outcomes is that their great complexity makes it difficult to forecast the future in any meaningful way. Not only are forecasts uncertain, the usual statistical approaches will likely underestimate the uncertainties. That is, even the uncertainties are uncertain. There are several reasons why uncertainties are large and difficult to characterize:

- *Key drivers, such as (those of) climate and technological change, are unpredictable. Many change non-linearly.*
- *Human action in response to forecasts is reflexive. If important ecological or economic predictions are taken seriously, people will react in ways that will change the future, and perhaps cause the predictions to be incorrect.*
- *The system may change faster than the forecasting models can be recalibrated, particularly during turbulent periods of transition, so forecasts are most unreliable in precisely the situations where they are most wanted.*

These aspects of uncertainty limit the usefulness of forecasting methods for the scientific study and management of regions in transition. Given these limits to understanding, we must focus on learning to live within systems, rather than "control" them. One might argue that it is impossible to deal with such fundamental limits of understanding, and our only reasonable choice is to struggle blindly onward.

Walker, B., S. Carpenter, J. Anderies, N. Abel, G. Cumming, M. Janssen, L. Lebel, J. Norberg,G. D. Peterson, and R. Pritchard. 2002.
Resilience management in social-ecological systems: a working hypothesis for a participatory approach. from Conservation Ecology

You don't design ecosystems. You design your relationships to them.

James Kay

Landscape design today is in the middle of being re-shaped by ecosystem thinking. The contemporary versions of such approaches, like the "resilience management", are found in new scientific journals like "Conservation Ecology". In turn, the ecosystem approach itself is also being re-shaped by increasingly sophisticated theories of emergent complexity.

The Arch 623 course outlines the concepts of complex ecosystem design useful for design and project work in urban places. Course focus will be on expanding conventional urban design's theoretical and working methodologies to place the larger surrounding urban ecosystems themselves in a more central methodological position, and to re-frame urban analysis and design in the terms of complex systems thinking.

There will be a dual emphasis in the course on both introducing theory and methodologies through selected readings and seminar discussion, and also in project work based on the student's anticipated thesis work. The course goals for students will be on using the theory and analytical methodology of complex ecosystem design introduced in the course to prepare an analysis of their Masters Thesis site and/or design framework. Such an analysis will be completed in a report outlining the complex ecosystems, natural and cultural, of the landscape or cityscape of the students' individual thesis projects, and to suggest avenues of research and design for future development in the next stages of the thesis work.

Design and the Complex Ecosystem Approach

The course readings begin with an overview of design theory and ecosystem concepts with an outlook based in ideas of emergent complex systems. Concepts in design and complex systems examined at this stage will be:

- design problem types, “linear, iterative and wicked”
- design problem spaces and decision-making
- ABCE analysis,
- scale, hierarchy, and self organizing holarchies (SOHOs),
- system “flips”,
- system narratives, attractors, and self-organization, complex adaptivity
- system approach decision-making, actors and adaptive agents.

Two fundamental concepts underpinning any evaluation of the success of an ecosystem approach to design will be examined:

- ecosystem function and health,
- ecosystem ‘sustainability’.

Basic concepts of natural ecology will exemplify complex system organization at varying scales with a focus on the conventional hierarchic classifications of ecosystem structure such as individuals or organisms, species, populations, communities, landscapes, biomes and bio-regions. Additional ecosystem concepts introduced in the theoretical overview will be those of: bioregions, island biogeography and biodiversity, ecological succession, physical gradients and scale, feedback loops, edge effects, and predator-prey relationships, meta-population landscape dynamics.

Analysis and Design of Complex Urban Landscapes

Cultural dimensions of urban ecosystems will be examined at the landscape scale using the land mosaic concepts of urban and landscape classification of the types initially developed by researchers like Richard Forman of the Harvard GSD, and in the use of ecosystem holarchies and management unit concepts developed by Timothy Allen of the US Forestry Service. As well, the seminal ideas of “design with nature” of Ian McHarg, and their development into concepts of ‘green infrastructure’ by theorists and designers like Michael Hough will be introduced. Historical and contemporary frameworks of urbanization affecting and re-organizing natural urban ecosystems will also be studied. Probably one of the most important concepts to consider underpinning much of the above work is that of the “Commons” described by Garrett Handlin in his “Tragedy of the Commons”.

In addition to the theoretical ecosystem concepts described earlier, an overview of the present regulatory framework for urban landscapes will be undertaken and places for innovation in such planning and design-based organizations will be discussed. In particular, the role of watershed and bioregional planning in establishing a strong footing for ecological design initiatives will be examined.

Concluding the course, approaches and partial models of ecosystem design will be discussed:

- defining indicator issues in a study area,
- actors, goals definition and roles in a public process,
- project-based initiatives and impact extrapolation,
- boundary definition and control,
- bio-regional initiatives outside a study area,
- incremental design interventions and their evolution over time,
- management units and managed succession of ecosystems
- situation monitoring, control structures, and decision making processes.

Readings

- Simon Levin, “Fragile Dominion”, 1999, Helix Books, Perseus Publishing. (A large part of the book will be read over the course of the term.)
- Timothy Allen and Thomas Hoekstra, Toward a Unified Ecology”, 1992, Columbia University Press: Introduction, Ch. 1, 2, 6, and 8.
- J. R. Minkel, “The Meaning of Life”, from “New Scientist”, p. 30, vol. 176, issue 2363, 5 Oct. 2002
- James Kay, “Some notes on the Ecosystem Approach”, UW pamphlet
- James Kay, Henry Regier, Michelle Boyle, George Francis, “An ecosystem approach for sustainability”, from “Futures”, no.31, 1999, pp 721-742, Pergamon
- Huron Natural Area Master Plan Committee, “The Huron Natural Area Master Plan, 2000, selections from an ongoing project.
- Bruce P. Winterhalder, “Concepts in Historical Ecology”, from “Historical Ecology”, 1994, ed. Carole Crumley, School of American Research Press, Santa Fe, New Mexico.
- “The Place, the Region, and the Commons”, from “The Practice of the Wild”, Gary Snyder, Northpoint Press.
- J. B. Jackson, “A Pair of Ideal Landscapes”, from “Discovering the Vernacular Landscape”, 1984, Yale University Press
- N. John Habraken, “The Control of Complexity”, from “Places”, Vol. 4, No.
- Richard Forman, “Land Mosaics”, 1995, Cambridge University Press.

Articles from various sources on ACE

The Pentagon Climate Change Report and related documents:

- Peter Schwartz and Doug Rand, “An Abrupt Climate Change Scenario and Its
- Implications for United States National Security”, US Dept. of Defense study, October 2003
- Fortune.com, by David Stipp, “Climate Collapse,The Pentagon's Weather Nightmare”, Jan. 26, 2004
- Aljazeera.net, “Report: Climate change may lead to war”, 22 February 2004
- Robert B. Gagosian, President and Director, Woods Hole Oceanographic Institution, “Abrupt Climate Change, Should We Be Worried?”, prepared for a panel on abrupt climate change at the World Economic Forum, Davos, Switzerland, January 27, 2003
- Summary for Policymakers, “A Report of Working Group I of the Intergovernmental Panel on Climate Change”, Eighth Session of Working Group I in Shanghai on 17 to 20 January 2001

Others (this may vary with new additions):

- Jean Giono, The Man Who Planted Trees
- Environment News Service, by Vinu Abraham, “In India, One Man Creates a Forest”, Feb. 10, 1998 Source Copyrighted, contact source to reprint
- The Sawyer Preservation Woodlot Association, “Trees A Forest Legacy Started by Otis Sawyer, Harold & Aileen Burgin, R.R. #1 St. Mary’s, ON N4X 1C4
- Garrett Hardin, "The Tragedy of the Commons," Science, 162(1968):1243-1248
- John Ralston Saul, “Leadership & the Environment”, Spruce Roots Magazine, Transcript No.1 from the Gowgaia Institute Speakers' Series, September 2, 2002

- Society for Ecological Restoration Science & Policy Working Group. 2002, “The SER Primer on Ecological Restoration1, A Publication of the Science & Policy Working Group2, April 2002 (First Edition)
- Nature.com, “Back in ten million years”, Feb. 6, 2004, (plus attached chart on GIF file)

Useful and Interesting Web Sites:

This section is under review and updating. To be added shortly.

Arch 623 Course Work

Course evaluation will be based on student case study projects to be done individually. Students will have one seminar session of approximately one half hour during course time at the end of term to present and discuss their case study work in draft form. The final grade evaluation will be based on the completed case study report submitted at the end of the term.

Report Structure

- acknowledgements
- table of contents
- executive summary [1-2 pages]
  - what is the report and its conclusions
  - "walk through" / précis to go to the big document
  - "map" to the overall report
- **report (see below)**
- references and appendices

Report Content

Analytical Content:

20 pages plus or minus

- ABC analysis
- narrative (historical and alternatives)
- existing and possible new actors
- holarchy (how does this relate to other system scales)
- existing attractors
- goals + re-arranged actors
- designed attractors

Interventions and Anticipated Initiatives:

4 pages plus or minus

- strategic initiatives (comes out of goals)
- system of management units (give examples)
- any projects to undertake?
- monitoring + governance

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Course Schedule Week by Week

Week 1
Overall course introduction
Discussion of student case study projects for the term
Ecosystem theory and Design theory Introduction

- Levin's six questions
- Hardin and the Commons
- Design, problem types, and problem spaces
- Complex Systems Thinking

Week 2
The Urban Bioregion

- Bioregions, watersheds, and urban morphology

Week 3
Complex systems concepts for ecosystems analysis:

- Complexity, actors and decision-making
- Narratives (using the HNA narrative as an example)
- Scale, complexity, pattern generation and self-organization
- Definitions: holons, attractors, SOHO systems, AMESH systems
- Landscape scale and community scale, population meta-dynamics

Week 4
Brief discussion of student case study proposal outlines, 10 minutes each student
Landscape and conventional approaches to urban site analysis and design:

- Gardens and Public parks, Haussmann, Olmstead and Burnham
- Modernism, Le Corbusier, the Garden City, Broadacre City, the mid-century Suburbs
- Ian McHarg and "Design with Nature"
- Lawrence Halperin and RSVP Cycles
- New Urbanism and Neo-Traditionalism
- Toronto Donlands and its ecosystem crisis
- Michael Hough and "Cities and Natural Processes"

Week 5
Concepts in Urban Ecology and Green Infrastructure

- Land mosaics and land systems
- Urban governance and management
- Environmental planning and review processes
- Green infrastructure

The Seaton competition, a green infrastructure case study

Week 6
Environmental management and land development processes

- Ecosystem analysis
- Partnerships, and actors, virtual governance
- Project narratives, goal development and strategic initiatives
- Management Units (MUs) and open-ended design

Fresh Kills case study
Huron Natural Area case study

Week 7
Interim discussions of student case studies.
Format in brief presentations with general critical commentary and a loose informal discussion following the presentations.

Week 8

Ongoing Adaptive Management

- Definitions of sustainability for complex ecosystems

Ecosystem function and health

- Monitoring and system indicators
- Monitoring and system actors
- Monitoring and open-ended design

Week 9

Broad future issues affecting ecological and normative design of urban landscapes:

- global warming, species and biodiversity loss
- urban development, countering ecosystem degradation in urbanizing areas
- peak oil and alternate energy systems
- reworking what is already built

Week 10

Presentation of student case studies, complete working drafts, forty-five minutes each student plus ten minutes discussion*

Week 11

Presentation of student case studies, complete working drafts, forty-five minutes each student plus ten minutes discussion*

Week 12

Presentation of student case studies, complete working drafts, forty-five minutes each student plus ten minutes discussion*

Completion and submission of the final Case Study projects for Arch 623 is to be at the individual student's discretion over the Winter 2012 exam period and submissions will be made by the end of exams on April 21 in sufficient time to be graded for the Winter 2012 term.

University of Waterloo Policies on Academic Behavior

Academic Integrity:
In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.
[Check www.uwaterloo.ca/academicintegrity/ for more information.]

Grievance:
A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline:
A student is expected to know what constitutes academic integrity [check www.uwaterloo.ca/academicintegrity/] to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Appeals:
A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities:
The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.