

# Graduate Seminar in Landscape Dynamics

Winter 2012

Daniel Gavin

10 AM – 12:50 PM Fridays in Condon 207

Natural landscapes are mosaics of ecosystems that interact in complicated ways. We see “landscapes” from mountain tops, across a meadow, down a stream, or along a coastline. Characterizing the pattern in those landscapes and the processes that depend on and/or create those patterns are the core of landscape ecology. Landscapes contain emergent properties, such as habitat, and landscapes change constantly at all scales of space and time. Three main approaches in the study of landscapes are 1) how best to characterize, quantitatively, the spatial patterns on landscapes and how they change over time, and 2) why those patterns matter to ecosystems and specific species, and 3) developing theories of how landscapes are organized and the processes responsible for transitions in landscape structure. An example of an early application of landscape-dynamic theories, including island biogeography, is the design of nature reserve networks.

The study of landscapes are central topics of biogeography, ecology, and physical geography in general. We will explore data and theory related to the dynamics of landscapes, beginning with classic works, followed by the rapid growth of theory in the late 20th century, and current areas of research.

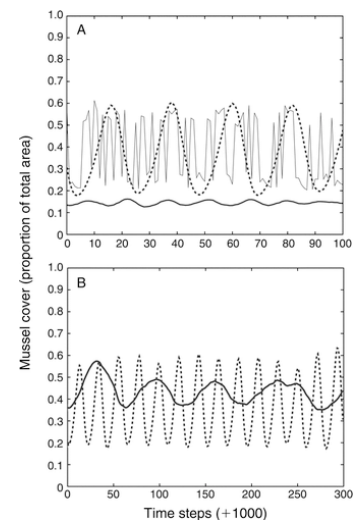
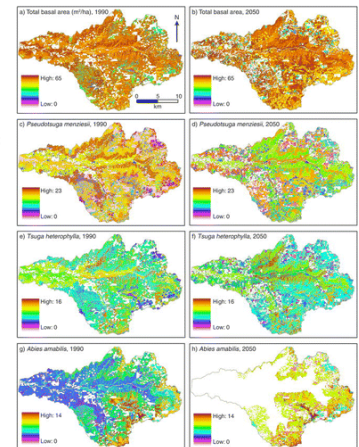
Examples will be biased to forest landscapes but *concepts and themes are very generalized*.

- Scaling of landscapes.
- Equilibrial, dynamic equilibrium, and non-equilibrium landscapes.
- Stability, catastrophes, and resilience of landscapes.
- Disturbance regimes, synchrony and synergisms.
- Patch dynamics, chorology, succession, species diversity and island biogeography.
- Vegetation simulation models and dispersal.
- Quaternary landscapes.

There will be three main class activities:

1. Class times will consist of short lectures interspersed with discussions of three major papers led by individual students, with the aim that each student leads the discussion of two papers during the term.
2. The major assignment will be a research paper that may take one of two forms: 1) a literature review of a particular line of theory in landscape ecology (see below) or 2) a data analysis of existing data or a novel simulation exercise, addressing specific theory of landscape dynamics. In the second option, you will need to draft a report in the scientific paper format (Intro, methods, results, discussion) with an emphasis on the discussion that ties your analysis to the existing literature.
3. As a group project, the class will also analyze data on forest fires (or other types of events) from a spatial network of sites. The class will break into teams to develop a means of characterizing the space-time pattern of fire on particular data sets. This will result in a manuscript for a peer-reviewed journal (with the entire class as co-authors).

*Representative readings or on the next page; the list will be more fleshed out by the start of the class.*



- Sauer, C. O. 1925. "The Morphology of Landscape". University of California Publications in Geography 2 (2):19-53.
- Busing, R.T., Solomon, A.M., McKane, R.B., Burdick, C.A., 2007. Forest dynamics in Oregon landscapes: evaluation and application of an individual-based model. *Ecological Applications* 17, 1967-1981.
- Gardner, R.H., Milne, B.T., Turner, M.G., O'Neill, R.V., 1987. Neutral models for the analysis of broad-scale landscape pattern. *Landscape Ecology* 1, 19-28.
- Malamud, B., Millington, J., Perry, G., 2005. Characterizing wildfire regimes in the United States. *Proceedings of the National Academy of Sciences of the United States of America* 102, 4694-4699.
- Meentemeyer, V., 1989. Geographical perspectives of space, time, and scale. *Landscape Ecology* 3, 163-173.
- Perry, G., 2002. Landscapes, space and equilibrium: shifting viewpoints. *Progress in Physical Geography* 26, 339-359.
- Sousa, W.P., 1984. The role of disturbance in natural communities. *Annual Review of Ecology and Systematics* 15, 353-391.
- Turner, M.G., 2010. Disturbance and landscape dynamics in a changing world. *Ecology* 91, 2833-2849.
- White, P., 1979. Pattern, process, and natural disturbance in vegetation. *Botanical Review* 45, 229-299.
- Wiens, J., 1989. Spatial scaling in ecology. *Functional Ecology* 3, 385-397.
- McKenzie, D and Kennedy, M.C. 2011. Scaling laws and complexity in fire regimes. in The Landscape Ecology of Fire.