



Agents of Pattern Formation

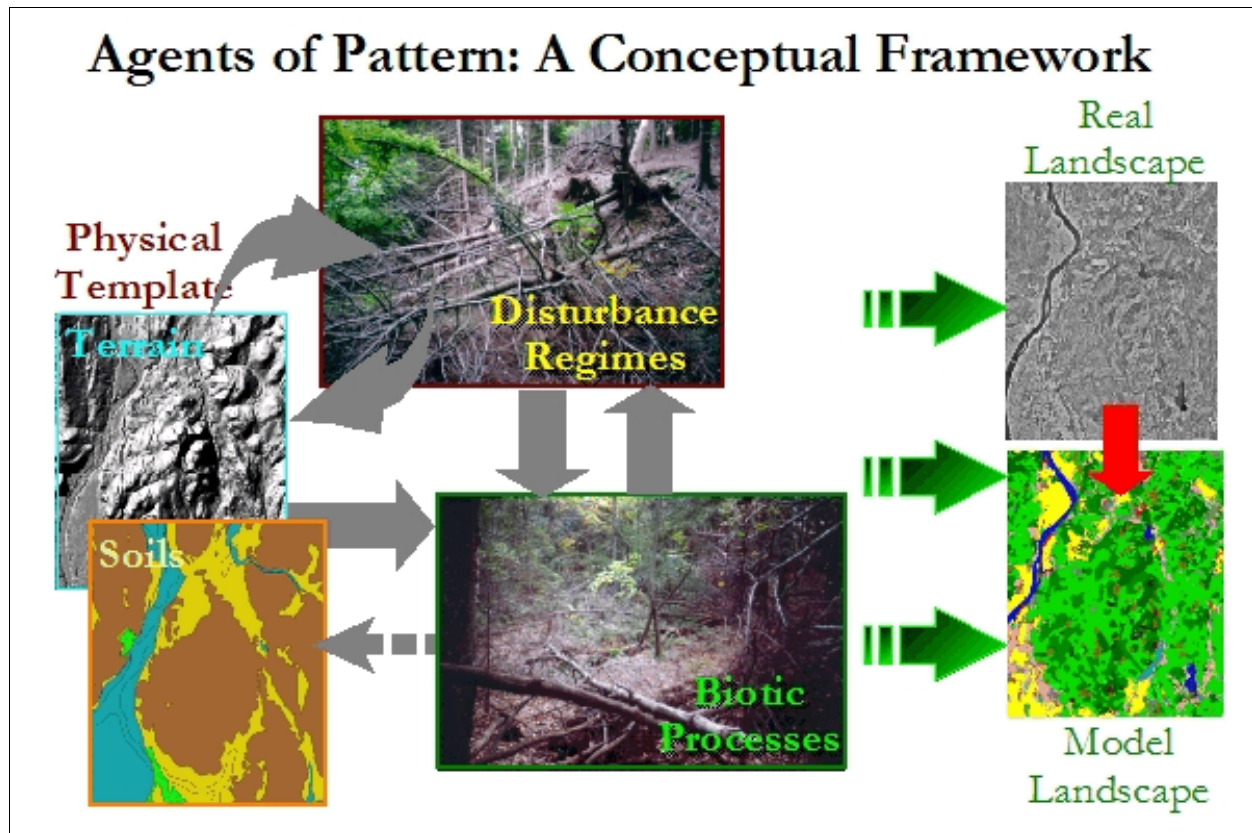
Instructor: K. McGarigal

Assigned Reading: Turner et al. 2001 (Chapter 4)

Objective: Provide a conceptual framework for the agents of landscape pattern formation which will serve as the organizational framework for the next three lectures.

Topics covered:

1. Conceptual and organizing framework.



Given the myriad ways to define landscapes, it should not be too surprising that there are numerous agents operating at a wide variety of scales in space and time to create the heterogeneous patterns we observe and seek to understand. For heuristic purposes, it is useful to organize these pattern-forming agents into a conceptual framework to facilitate discussion, even though we acknowledge that this framework is an artificial construct that vastly oversimplifies how patterns are formed.

Nevertheless, we recognize three primary agents of pattern formation in landscapes. The abiotic environment presents a *physical template*, the arena in which *biotic processes* and *disturbance regimes* interact to generate pattern. These agents will occupy us for the next three lectures.

We begin by considering the *physical template* of landscapes, especially in terms of the manner in which terrain influences microclimate and edaphic factors. These features of the physical template have implications for studies that attempt to explain vegetation or landscape pattern, especially if those studies involve assessments of potential future scenarios of land use management or climatic change.

Agents of Pattern: Focus on Vegetation



Next we will consider the physical template of abiotic environmental heterogeneity as the arena in which a variety of *biotic processes* interplay to contribute to landscape pattern. Here we will consider just some of these biotic processes. For vegetation pattern, these processes include the demographics of establishment, growth, and mortality as well as dispersal; competition may also play an important role. We will also be concerned with the interplay of these demographic processes and the way in which they interact with the physical template.

In the third section, we will layer *disturbance regimes* onto the pattern generated by abiotic constraints and biotic processes. Here we will consider disturbances only briefly, as disturbance regimes will be examined in much greater detail in subsequent sections.

In this section of the course, we will focus in two ways:

1. First, we will focus on the role of these factors in pattern formation; the ecological consequences of those patterns will be the subject of subsequent sections.
2. Second, much of what we humans observe as landscape patterns is actually the spatial distribution of dominant vegetation types; e.g., forest versus grasslands versus desert. The dominant vegetation establishes the resource base for the rest of the ecosystem. The pattern in the dominant vegetation, therefore, affects the spatial patterning of all components of the system. Therefore, it behooves us to focus on the major factors affecting vegetation patterns.