Landscape Ecology

ENV 714: Course Synopsis

Course Objective

Landscape ecology embraces a diverse range of topics concerned with the causes and consequences of spatial heterogeneity and pattern in natural systems as well as those shaped by human activities. This course is intended to provide a foundational understanding of how landscape pattern is generated and why it matters to populations, communities, and ecosystem processes. Along the way, this will require some consideration of scale and pattern in general. This understanding is built on conceptual models and illustrated with biophysical, statistical, or ecological simulation models as appropriate. The overall aim of the course is to revisit the core concepts of population, community, and ecosystem ecology and reinterpret these from a spatial perspective. Because landscapes are large by conventional definitions, we also will spend some time on integrating ecological processes from the local scale of field studies to their implications at the landscape scale and at levels where management and policy operate.

All federal agencies and most nongovernmental organizations who manage land now declare an intent to manage landscapes (although they all use different terms to say this). The content of this course is aimed directly at professional development toward these career goals.

Fundamental Premise and Organizing Theme

This course is based on a simple premise: that each landscape is unique but that all landscapes work in essentially the same way. That is, there are high-level principles that apply to every landscape, but the way these principles play out in any given landscape depends on the particulars of that landscape: its climate, topography, biogeography, and history. This course aims to instill an appreciation for the basic principles, and an ability to translate these principles as they apply to any particular landscape. I use two devices to this end.

First, most topical modules include a *model template* (I am grateful for Steward Pickett for this phrase), a high-level (and sometimes somewhat abstract) construct that lays out the main principles that govern that topic and identify the key decision points or variables that need to be specified to apply that model to any given landscape. This device reinforces the ‘all the same, each different’ perspective on landscapes: the model template applies to all, but each realization is specific.

Second, I encourage students to ‘adopt’ a landscape for the duration of this course. In weekly reflections, the assignment is to translate the examples from lectures and background readings to the student’s personal landscape. This forces the translation across landscapes, typically via the model templates.

Course Materials

All materials for this course are available via an internal website. The course is modular, and each module includes the necessary background reading, lecture materials, and details on any assignments. I am currently finishing a textbook that essentially *is* this course, and draft chapters are made available as the semester unfolds. Typically, we cover one chapter each week.

A gateway (webpage) to each module provides a guide to the background reading, as well as some guidance about how the readings relate to lectures and exercises. For most modules, there might be one or more short lectures that introduce topics and highlight points that I want students to focus on in the readings.

Beyond the (required) book chapters that underlie each of the modules, there are a few other kinds of supplemental readings. A very few key papers are central to the topic of each module: these are tagged in the gateway; these papers underlie key topics in my book. I encourage students to read some of these in their original voices (rather than my translation). Some of the papers are the basis for exercises we do during the class sessions, and I highlight these as appropriate. There are also references that provide additional depth for students who are particularly interested in that topic. The review of these references in the gateway helps students decide which papers to target. Again, almost all of the info students need *should* be in my book (that's the whole point!); the other readings are supplemental.

The gateway also includes links to detailed instructions for assignments. We do exercises almost every week. These are be completed as short writing assignments (and see below).

Course Format and Classroom Dynamics

This class uses a 'not-quite-flipped classroom' format with some reading and preparation for in-person class sessions. This format requires that students finish (or at least skim) the background reading and preparation *before* the class session meets. I have all materials available a few days before the start of each module, which gives students time to finish the reading and prepare. To reinforce the main points of the reading, there typically are be very short writing assignment for each module. These *reflection papers* are due at the end of each module.

In class sessions, I usually present short lectures intended as a quick reminder of the main points of the readings. We also take whatever time is needed to clarify questions that arise from the readings. For most modules, we do small-group exercises in class. Exercises are hands-on activities designed to illustrate or reinforce fundamental concepts. These typically are short, small-group discussions initiated in class and finished outside of class. Exercises are focused on questions motivated by practical applications on landscapes. Occasionally, small groups focus on focal landscapes in exercises that translate concepts and tasks from the classroom to a new study area or a new application.

For the course, each student 'adopts' a focal landscape and uses this to help translate material to a new landscape. Sometimes students do this by themselves (i.e., in their reflection papers), but occasionally they do this for a focal landscape selected from among those represented in a small group.

We cover a lot of material during this course. This requires some diligence in reading and participation. The small-group exercises are designed, in part, to help students learn the material: talking through complicated topics in a group of peers with different backgrounds and perspectives is a great way to share and helps everyone learn more effectively.

Diversity and Inclusion

The Nicholas School is committed to diversity, equity, and inclusion and this applies to this class as well. Here, diversity applies to personal background: country or culture of origin, race and ethnicity, and values placed on natural and cultural landscapes, as well as any other dimensions of how students self-identify. The school is interdisciplinary and international, and this

invites a range of opinions on the course material. All such opinions are welcome and are encouraged.

In small-group exercises, diversity of opinion and perspective, if openly embraced, results in richer understanding of foundational concepts and their management implications. This is true no matter how brilliant any one student might be: nobody knows everything, and everyone is an expert on something. Students are encouraged to bring their experiences to class, and to bring an appetite for the experiences of others.

Learning Styles

Everyone learns in a different way, and this implies that different teaching methods are more effective for some students than others. My approach to this class is to provide information and give students multiple opportunities to engage more interactively with the material, often in collaboration with classmates. My personal bias toward evaluation methods—and it *is* a bias—is to *not* rely on quizzes and exams, but to ask students to demonstrate their grasp of the material via writing assignments that focus on *how they think* as much as *what they know*.

But learning styles also have implications for how students study, even how they should read background materials. I point students at to this website: *www.webtools.ncsu.edu/learningstyles/*. This is a short questionnaire (a quiz!). Once completed, students have access to some useful tips about how to get the most out of this (or any) class: whether they should read materials before or after class sessions, whether they should focus on the figures instead of the text, whether they should study by themselves or with a partner, and so on.

Student Evaluation

Grades are assigned based on a variety of criteria including reflection papers, write-ups of exercises, and participation in discussions.

• *Reflection papers* for each module are intended to highlight key ideas in each module and to help students translate the material from lectures or background readings, to their adopted landscape. These reflections often seed helpful in-class discussions.

• *Exercises* are aimed at reinforcing key concepts in each module. But they are also designed to help develop critical skills in analysis, synthesis, and communication. I try to point out explicitly the intent of every assignment. Often, the actual result of the exercise is not as important as the process that generates the result.

Some exercises also are designed to provide training in how to work in groups. Today, essentially all work is teamwork. Practice helps. We discuss a few techniques for effective teamwork along the way.

The short write-ups are assigned as either solo- or group-authored. There are 4 possible kinds of assignments: solo or group ‘think’, and solo or group ‘write’. Most exercises are either ‘group think/solo write’ or ‘group think/group write’. Detailed instructions are provided via the gateway for each module.