Summer Session 2017

BIOE 451 Landscape Ecology

3 credits; Lectures, Labs, Field Work
Course dates: July 10–July 21, 2017
Instructor: Dr. Solomon Dobrowski
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Prerequisites: One year of college-level biology, chemistry, and mathematics, and an ecology course (can be met via BIOE342 Field Ecology at FLBS) or equivalents; or consent of instructor.

Course Description:

The objective of this course is to understand the physical and ecological processes that shape landscapes, how these biological and physical processes interact, and how they are responding to global change. We will examine how plants and animals are distributed across landscapes, how the physical template of the environment shapes species distributions and how biotic feedbacks can influence the physical environment. We will examine processes of pattern formation in the environment such as disturbance from fire and how landscape pattern can affect both physical and biological processes. Field trips will underscore concepts and allow data gathering and interpretation by students. Students are introduced to both satellite and airborne remote-sensing tools used in a GIS environment. Students will analyze and interpret spatially explicit data through analyses and oral presentations.

Landscape ecology focuses on the causes and consequences of spatial patterns in landscapes, and originated from the recognition by ecologists that spatial heterogeneity in ecosystems can be assessed and should not be ignored. Landscape ecology examines concepts, theory, and methods for characterizing spatial heterogeneity, its effects on the dynamics of ecosystem processes, and how these may vary through time. The fundamental concepts of landscape ecology are the basis for decision-making in many contemporary problems in conservation science and resource management.

This course will be principally focused on exploring landscapes of the Northern Rockies firsthand. We will spend a great deal of time hiking through landscapes, discussing concepts, and at times collecting data. We will utilize geospatial technologies to assist with this process where appropriate but these technologies are not the focus of this course. The course will entail generally short lectures that introduce a concept, a field trip related to that concept, data collection, and a written lab assignment that reinforces the focal concepts presented. Much of this learning will occur out in the field so students should be prepared to take notes and ask questions while hiking. Along with a basic understanding of landscape ecology, students will gain exposure to the natural history of the Crown of the Continent Region. This will include basic knowledge of the geologic history, climate, disturbance regimes, flora, and fauna of the area. This information will be reinforced with daily quizzes.

Required Text: A textbook is not require although Turner's (below) is a good general resource.
Turner, M. G., R. H. Gardner, and R. V. O'Neill. 2001. Landscape ecology in theory and practice. Springer-Verlag, New York.

Reference Texts: Electronic and hard copies of reference readings will be provided by the instructor. This course will emphasize readings from the primary literature. A paper or two will be assigned to read, prior to

each field trip, related to the concepts that will be emphasized during that field trip. Students are expected to read the assigned reading prior to the field trip.

Course and Field Supplies/Equipment: (*available for purchase at the FLBS Bookstore) This field course requires a lot of hiking both on and off trail. Students must be prepared for the rigors of steep terrain, inclement weather, and field data collection. We will hike up to 15 miles in a single day over steep terrain. Additionally, we will camp away from the Bio Station. Students must be prepared for spending time in the field. It is important that students adequately prepare for field trips by making certain they have the appropriate equipment and resources for the trip. Weather in the N. Rockies is highly variable and can change quickly so students should always carry layers for warmth and rain gear. Students should bring the following supplies:

- Rite in the Rain field notebook with pencils*
- Hiking boots & hiking socks (wool, not cotton socks)
- Good water shoes for fording streams and rivers
- Day pack
- Field clothing for overnight trips
- Warm jacket and rain gear
- Sun hat for field use
- Lunch pack-up resealable container(s)
- Water bottles to hold 2 liters of drinking water
- Personal tent, sleeping bag and sleeping pad
- Personal mess kit – plate, cup, silverware
- Headlamp and extra batteries
- Insect repellent and sun screen
- Laptop computer (recommended)
- Bear spray (optional)
- First aid kit (optional)
- Map of Glacier Park trails and day hikes (optional)
- Camera, memory chip, film, binoculars (optional)
- Hip boots or waders (optional)
- Handheld GPS (optional)

- REQUIRED Overnight Field Gear and Other Items to Bring Checklists: (Click to view)

Student Learning Outcomes:

After taking this course students will be able to: 1) Identify and describe many of the physical, biological, and anthropogenic processes that shape landscapes of the Northern Rockies, 2) Be able to identify common plant species of the Northern Rockies, 3) Understand basic tenets of landscape ecology such as island biogeography theory, understand the importance of scale in studying ecological processes, 4) Apply geospatial technologies used in studying landscapes such as collecting spatial data with a GPS, utilize this data within a GIS framework, and conduct simple spatial and raster analysis for problem solving 5) understand the role of landscape ecology in contemporary conservation and resource management science such as characterizing habitat isolation and connectivity.

Evaluation and Grading:

1) Participation in class and discussion – 10%
2) Daily Quizzes – 30%
3) Labs – 60%

Course Policies:

Schedule: (Tentative to be revised late Spring 2017.)

Date	Lectures/Lab/Field Work

10-Jul-17	*Lecture and discussion* What is a landscape and what is landscape ecology? *Fieldtrip* - FLBS Station Grounds: Plant ID, orienteering *Reading- Readings* -Turner 1989, Korner 2007
11-Jul-17	Fieldtrip- Bear Trap Mtn Hike: vegetation communities along an elevation transect. Vegetation and site characteristic sampling. Reading - Yu and Lei 2001
12-Jul-17	Fieldtrip - Wild Horse Island Lecture and discussion Island Biogeography and landscape conservation Readings – Swanson et al. 1988; Dobrowski 2011
13-Jul-17	Lecture and discussion The Physical Template: climate, topography water, soils. Lab 1- Extrapolating climate -MTCLIM and vegetation communities of Beartrap Mtn. (due monday) Readings – Schwartz et al. 2009
14-Jul-17	Fieldtrip – Glacier Lake, Marshall Lake. Landscape Conservation in the Seeley Swan Valley.
17-Jul-17	Fieldtrip - Nyack Research Natural Area. Landscape dynamics of an alluvial floodplain. Camp at Two Medicine Lake Readings – Pederson et al. 2005
18-Jul-17	Fieldtrip - Pitamakan Pass. Environmental Gradients, regional climate, glacier dynamics, climate change. Camp at Two Medicine Lake Readings - Reice 1994
19-Jul-17	Fieldtrip- West Glacier NP: Fire and disturbance as an agent of landscape pattern formation. Avalanche Creek. Readings – Turner et al. 1993
20-Jul-17	Lecture and discussion Disturbance regimes and landscape equilibrium Lab 2 - Intro to GIS and Disturbance in GNP (due Friday)
21-Jul-17	Lab 2 Report writing Course review