ESM 215: Landscape Ecology

Winter 2022 course syllabus

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This course will explore emergent patterns in landscape structure and linkages to ecological processes. The coupling of ecological pattern and process will be explored in terms of mass and energy transfers, disturbance regimes, species' persistence, land use change, and landscape planning and restoration.

Course Prerequisites: ESM 201, and ESM 263 or equivalent.

Course content includes:

- Required as well as supplementary readings from the scientific literature
- Pre-recorded lectures and live discussions
- Lab-based training in landscape mapping and modeling, including 7 lab exercises.

Course assessment: Performance in the class is based on 7 lab exercises and participation in online discussions. The class has no midterm or final exam.

Focal topics:

- Origin and role of environmental heterogeneity
- Disturbance regimes
- Road system ecology
- Habitat fragmentation effects on organisms and populations, including edge effects
- Land use change, urban landscapes
- Landscape dynamics under climate change
- Landscape restoration and management

Labs (with % contribution to final grade):

- Landscapes in Google Earth (10%)
- Physical controls on landscape pattern (10%)
    - Mutual Information Analysis for ecological land classification
- Quantifying landscape pattern (10%)
    - Introduction to fragstats software and landscape pattern metrics
- Modeling edge and road effects (10%)
    - Application of ArcGIS and fragstats
- Modeling habitat connectivity (10%)
    - Circuitscape analysis of landscape connectivity
- Designing habitat corridors (10%)
    - Using Linkage Mapper in ArcGIS
- Modeling vegetation and fire dynamics (2 weeks) (20%)
    - Introduction to the Landis II Landscape Change Model
    - Application of Landis II to study effects of landscape fragmentation on wildfire regimes

Weekly schedule

January 3- 9	Introduction to Landscape Ecology
January 10 - 16	The Biophysical Template
January 17 - 23	Disturbance Regimes
January 24 - 30	Ecological Edge Effects
Jan 31 - Feb 6	Road Network Ecology
Feb 7 - 13	Populations, metapopulations and metacommunities
February 14 - 20	Ecosystem processes and services
February 21 – 27	Urbanizing landscapes
Feb 28 - March 6	Landscapes in a changing climate
March 7 - March 13	Landscape restoration