Introduction to Landscape Ecology and GIS
GEOG 5015C/6015C - EVST 5015C
Fall 2024
Department of Geography - University of Cincinnati

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Required Materials

- GIS Tutorial for ArcGIS Pro 3.1. Wilpen L. Gorr; Kristen S. Kurland

  You can buy the ebook at Amazon:
  https://www.amazon.com/GIS-Tutorial-ArcGIS-Pro-3-1-ebook/dp/B0C7BZ7S18/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=1680055793&sr=8-1

- Turner, MG, Gardner, R and O'Neill, R (2001). Landscape Ecology in Theory and Practice, Springer.
  Link to download the book:
  https://link.springer.com/content/pdf/10.1007/978-1-4939-2794-4.pdf

- Gergel, S. E., & Turner, M. G. (2002). Learning landscape ecology: A practical guide to concepts and techniques. New York: Springer. *Link to download the book:*
  https://link.springer.com/book/10.1007/978-1-4939-6374-4 (need to be connected to a UC network to download the book)

- Laptop computer

Also, you need to download and install in your laptop the data used for lab tutorials and assignments from: https://learngis.maps.arcgis.com/home/item.html?id=21777534c47e4bce878fa499e3bda141

Course Objectives

Landscape ecology has risen in importance as it has been recognized the influence of geographical processes on population dynamics, community assembly, and ecosystem functions in general. Space has also been recognized as a key component in conservation of species and biodiversity planning, as well as a fundamental element for understanding the ways people interact with nature. Based on these previous arguments, this course will examine the structure, function, and the functioning of natural and human-modified communities in a geographical context. The course will focus on spatial patterns and processes of landscapes as the framework of interacting ecological communities. The course will consider the critical role that the landscape and geographical patterns play in shaping the functional interactions among species and the dynamics of ecosystems and will provide students with the principles and applications of landscape ecology and a firm understanding of spatial analysis techniques using GIS for studying ecological processes. Discussion of metrics for spatial pattern and models for landscape-scale dynamics will also be an important element of the course. It will also include a discussion of key concepts of landscape ecology, methods, and approaches currently used to describe and understand ecological landscapes. We will also examine the strategies and goals of landscape management in preserving biodiversity and ecological communities. This course will focus on using the **ESRI ArcGIS Pro** to explore topics within Landscape Ecology through lab assignments, leaving students with a firm grasp of contemporary ecological issues and spatial analytical methods that can be used to solve them.

Specific goals for this course includes:

1. Expand on fundamental concepts in ecology and environmental science, with special focus on spatial concepts.
2. Teach technical skills, including the use of GIS methods and software, image processing, spatially explicit modeling, and spatial analysis.
3. Introduce a variety of spatial approaches for addressing problems in environmental sciences.

Learning Outcomes

The expected main learning outcomes of the course will be:

- Describe the foundational concepts and theories of landscape ecology.
- Apply landscape and ecology methods on geographic pattern analysis, conservation, landscape and natural resource management, and other related fields.
- Identify the Causes of landscape pattern.
- Use data for studying landscapes (GIS, remote sensing).

- Get familiar with ArcGIS software
- Measure landscape pattern (spatial statistics, landscape pattern analysis).
- Understand Landscape disturbance dynamics and the effects of landscape pattern on organisms, populations, communities and ecosystem processes.
- Apply concepts related to conservation ecology and conservation planning.

Course Structure

- Some chapters from the books will be reviewed during the eight weeks of the course.
- Lecture videos discussing main terminology and concepts, and video tutorials will be uploaded to Canvas every week.
- Data for lab tutorials and assignments will be available in Canvas
- Office hours can be requested by email and will be through Teams.

Assignments

Six lab assignments, and five written assignments each one with a value of 10 points. Two practical assignments each one with a value of 20 points

Research Projects

Project Objectives: Students will use landscape-level theory or approaches in a series of problems (*3 in total*), thereby allowing them to apply what they are learning in the course to study real life problems. Students will gain experience with the primary phases of conducting a research study: preparation of a proposal; execution of the study, and preparation of a paper based on the study.

Format for Final Project Reports: Reports must be double-spaced with one-inch margins. Projects should not exceed 10 pages of main-body text excluding the cover sheet, abstract, references, figures, and tables.

Grading

The points available for the course are divided among the following activities.

Completing lab tutorials, written and practical assignments – 70%
Research projects – 30%

All graded material will be assigned a numerical value on a scale of 100% points.

Letter grades are given as follows:

93 points and above	A
92 to 90 points	A-
89 to 87 points	B+
86 to 83 points	B
82 to 80 points	B-
79 to 77 points	C+
76 to 73 points	C
72 to 70 points	C-
67 to 69 points	D+
63 to 66 points	D
62 to 60 points	D-
Less than 60 points	F

Schedule

Week	Topics and readings
Week 1 – October 16-18	*Lecture* **Chapter 1 - Introduction to Landscape Ecology** and Scale. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. *Lab* GIS Tutorial 1. "Chapter 1: Introduction"
Week 2 – October 21-25	*Lecture* **Chapter 2 - Causes of Landscape Pattern**. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. *Lab* GIS Tutorial 1. "Chapter 2: Map design" • **Lab assignment Chapter 1 due** • **Lab assignment Chapter 2 due**
Week 3 – October 28-November 1	*Lecture* **Chapter 3 - Introduction to Models**. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. *Lab* GIS Tutorial 1. "Chapter 4: File geodatabase" • **Lab assignment Chapter 4 due**

Week 4 – November 4-8	*Lecture* **Chapter 5 - Spatial Statistics**. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. *Lab* GIS Tutorial 1. "Chapter 6: Geoprocessing" • **Lab assignment Chapter 6 due**
Week 5 – November 11-15	*Lecture* **Chapter 4 - Landscape Metrics**. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. *Lab* GIS Tutorial 1. "Chapter 9: Spatial analysis" • **Lab assignment Chapter 9 due**
Week 6 – November 18-22	*Lecture practical* **Introduction to landscape metrics.** Chapter 4 in Gergel, S. E., & Turner, M. G. (2002). Learning landscape ecology: A practical guide to concepts and techniques *Lab* GIS Tutorial 1. "Chapter 10: ArcGIS Spatial analysis" • **Lab assignment Chapter 10 due**
Week 7 – November 25-27	*Lecture* **Chapter 6 - Landscape Disturbance Dynamics**. In Turner, MG, Gardner, R and O'Neill, R, (2001). Landscape Ecology in Theory and Practice. **Research project I.** Use interpolation to analyze dissolved oxygen levels in Chesapeake Bay.
Week 8 – December 2-6	**Research project II.** Plan a timber harvest. **Research project III.** Map the impact of roads on deforestation in the Amazon rain forest.

Course and Instructor Policies

- **Late assignments: Late assignments will not be accepted without a written and signed from a doctor, university official, or similar person of authority**.
- Cheating and plagiarism: Students who cheat will receive an F on the relevant assignment. A student caught teaching twice will receive an F as a final grade. Please refer to the Student Code of Conduct for more information: https://guides.libraries.uc.edu/prevent-plagiarism/integrity
- General student issues: If students have any questions or issues not covered in the syllabus, they are expected to email the professor.
- Disability services: Please feel free to contact or speak with the professor about any disability services.

Diversity and Inclusion Statement

Diversity and inclusion are important, in both school and work environments diverse groups have been shown to improve decision-making and problem solving. To that end we have the goals for the class as a whole and for your individual group are: everyone is allowed to feel they can work and learn in a supportive and safe environment; everyone respects varied races, ethnicities, classes, genders, physical and mental abilities, and sexualities; everyone matters and therefore all individuals are to be respected and treated with dignity and civility; and everyone shares the responsibility for making our class a positive and better place to be, work and learn.

Academic Integrity Policy

The university rules, including the Student Code of Conduct (https://www.uc.edu/campus-life/conduct/student-code-of-conduct.html) and other documented policies of the department, college, and university related to academic integrity will be enforced. Any violation of these regulations, including acts of plagiarism, fabrication or cheating, will be dealt with on an individual basis according to the severity of the misconduct. Sanctions range from receiving a zero for the specific assignment involved to failure for the course.

All written work and assignments, unless specifically stated otherwise in the assignment instructions on Canvas, submitted by students in this class will be generated in the student's own words. This applies when students are working individually or in groups. Use of artificial intelligence (AI) tools including ChatGPT, BARD, HuggingChat, Jasper, Copy.ai, Anyword, Grammarly, Wordtune or similar platforms, to generate any portion of an assignment is strictly prohibited. This will be considered a violation of the Student Code of Conduct, and will result in failure of the assignment (s). A second violation will result in failure of the course.

Special Needs and Accommodation policy

If you have any special needs related to your participation in this course, including identified visual impairment, hearing impairment, physical impairment, communication disorder, and/or specific learning disability that may influence your performance in this course, you must register with the Student Disabilities Office (http://www.uc.edu/disability.html) and meet with me to arrange for reasonable provisions to ensure an equitable opportunity to meet all requirements of this course.

Counseling Services

Students have access to counseling and mental health care through the University Health Services (UHS), which can provide both psychotherapy and psychiatric services. In addition, Counseling and Psychological Services (CAPS) can provide professional counseling upon request; students may receive five free counseling sessions through CAPS without insurance. After hours, students may call UHS at 513-556-2564 or CAPS Cares at 513-556-0648. For urgent physician consultation after-hours, students may call 513-584-7777.

Title IX

Title IX is a federal civil rights law that prohibits discrimination on the basis of your actual or perceived sex, gender, gender identity, gender expression, or sexual orientation. Title IX also covers sexual violence, dating or domestic violence, and stalking. If you disclose a Title IX issue to me, I am required forward that information to the Title IX Office. They will follow up with you about how the University can take steps to address the impact on you and the community and make you aware of your rights and resources. Their priority is to make sure you are

safe and successful here. You are not required to talk with the Title IX Office. If you would like to make a report of sex or gender-based discrimination, harassment or violence, or if you would like to know more about your rights and resources on campus, consult the website www.uc.edu/titleix or contact the office at 556-3349.

Electronic Communication

The course website is on Canvas (https://canopy.uc.edu/). All course announcements will be sent via Canvas so make sure that your correct email address is registered with Canvas.

Religious accommodations

Ohio law and the University's Student Religious Accommodations for Courses Policy 1.3.7 permits a student, upon request, to be absent for reasons of faith or religious or spiritual belief system or participate in organized activities conducted under the auspices of a religious denomination, church, or other religious or spiritual organization and/or to receive alternative accommodations with regard to examinations and other course requirements due to an absence permitted for the above-described reasons. Not later than fourteen days after the first day of instruction in the course, a student should provide the instructor with written notice of the specific dates for which the student requests alternative accommodations. For additional information about this policy, please contact the Executive Director of the Office of Equal Opportunity and Access at (513) 556-5503 or oeohelp@ucmail.uc.edu

Note: Syllabus is subject to change according to particular considerations and unexpected events