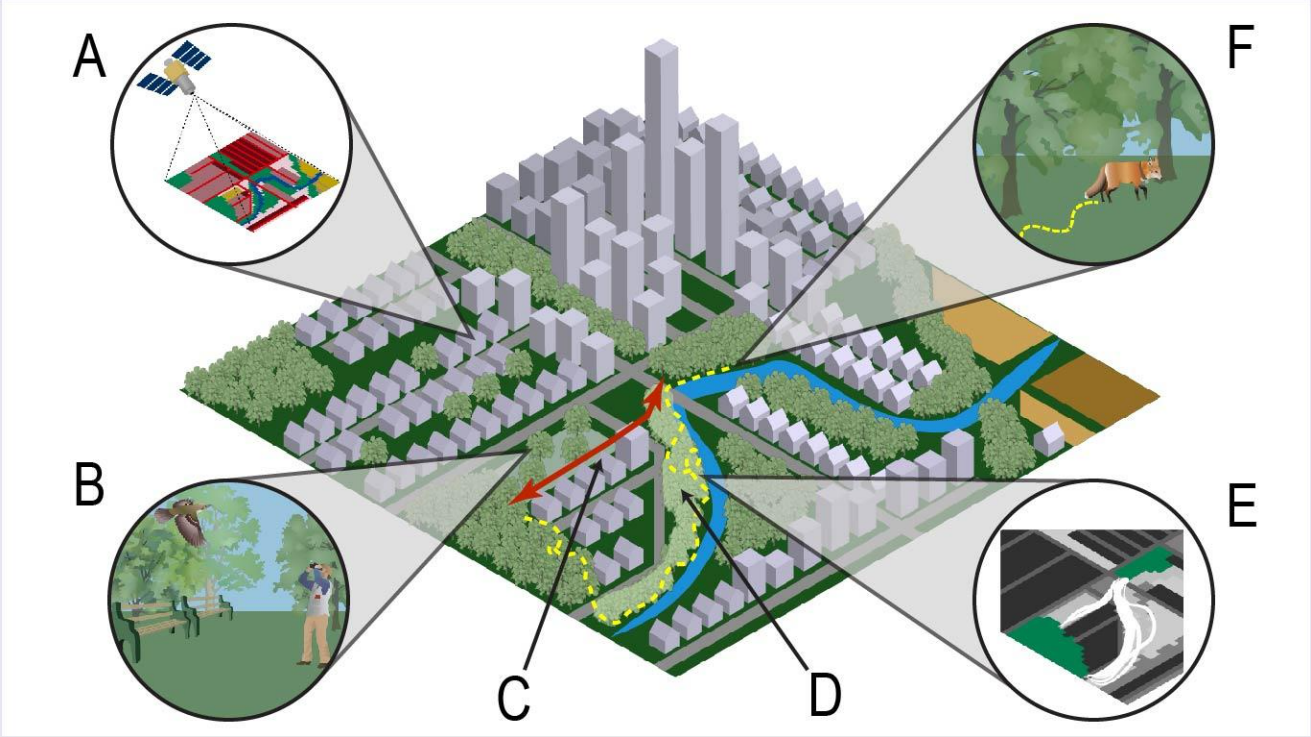
LANDSCAPE ECOLOGY
GEOG/BIOL 315

Course Description and Syllabus
(Fall 2022)



COURSE OBJECTIVES:

Upon completion of the course, students will:

- understand the evolution of landscape ecology as a field of study and practice;
- understand the scientific principles that govern the reciprocal relationship between spatial pattern and ecological processes;
- relate landscape ecology to grand challenges in ecology such as land use change and fragmentation, climate change, and species invasions;
- access and critically interpret primary sources of scientific literature;
- identify and use analytic tools for specific applications of landscape ecology theory; and
- develop skills in natural resource assessment and scientific communication.

Landscape ecology is an applied science and this class is an applied, project-based course. In addition to the regular lab assignments, each student will participate in a semester long project group focused on tree planting in the city of Richmond.

Table of Contents

LOGISTISTICS

Instructor:

Dr. Todd Lookingbill (he/him/his)
University of Richmond
Department of Geography & Environment
311 Carole Weinstein International Center
phone: (804) 289-8265
e-mail: tlooking@richmond.edu

How to Reach Me:

Office hours: Wednesdays noon-1:00 pm or TTh after class
Carole Weinstein International Center Room 311
Pop in or if you know ahead of time you'd like to chat at a specific time, email me first
I make a point of trying to respond to all correspondents within 24 hours (48 hrs on weekends). So if you do not hear back from me in that time, feel free to ping me again.

Course Material:
The web site for the class can be found on Blackboard. The daily schedule maintained there will be updated throughout the semester:
http://blackboard.richmond.edu/

Text Book: *Learning Landscape Ecology: A Practical Guide to Concepts and Techniques*, Sarah E. Gergel and Monica G. Turner (eds). 2017. Springer, New York, 2nd edition. We will use this book for the majority of our homework and in-class lab assignments. It will be supplemented liberally with readings from other texts and from the primary literature. These additional reading will be posted on Blackboard.

Prerequisites:
GEOG/ENVR 250, ENVR 201, BIOL 202 or 207, or permission of instructor

Attendance:
Class meets Tues/Thurs, 12:00-1:15 in GOTW A201. Classes will be highly interactive, so attendance is critical. We continue to face a challenging situation in which all of us are called on to make a good faith effort to be flexible and to make decisions in the best interest of the community, including staying home when sick. If you are sick, you should not attend class. You will not be required to provide formal documentation from a health care provider, and will not be penalized for absences.

However, you should:

- Stay in close communication with me, including notifying me in advance of the absence if possible.
- Contact the Student Health Center if sick.
- Keep up with classwork and attend class online if you are able to do so.
- Submit assignments digitally on time whenever possible.

This attendance policy puts everyone on their honor. Falsely reporting a reason for an absence is an honor code violation.

NOW, WHAT IS THIS COURSE ALL ABOUT?
Course Description:
Landscape ecology is the study of how the spatial patterning of the environment influences ecological processes and how ecological process, in turn, shape the patterns that we observe on the landscape (see simplified definition that we derived together as a class during the first week). It is an applied science that focuses on the creation, consequences, and management of environmental patterns. These patterns include the spatial distributions of species and the environmental resources upon which they depend. Although the focus is typically on relatively large landscapes like cities or national parks, careful attention is paid to the influence of scale in natural resource management. Because nearly all of the earth's landscapes have been altered by human activities for some time, landscape ecology also emphasizes the role of humans in the environment. The goal of this course is to provide a firm grasp of the concepts of landscape ecology and of how these concepts can be used to enhance the effectiveness of environmental policy, assessment, and management.

The course will use a combination of lectures, discussions, and hands-on activities to study topics including: habitat loss and fragmentation; methods for describing spatial variability and characteristic scale of environmental variables; the role of disturbance in ecosystems; the distribution of species; the impacts of a changing climate; and, broadly, the application of landscape ecology to monitoring, conservation, and restoration. We will place special emphasis this semester on urban environments and urban heat islands. Special projects will focus on tree planting as an effective strategy for mitigating the effects of urban heat islands.

Course Schedule:
A more detailed schedule will be updated continuously throughout the semester on Blackboard:

Week	Topic
	Introduction and Foundations
1 – Aug 23, 25	*An Introduction to Landscape Ecology - What is It? A History, Some Definitions and a Prospectus*
2 – Aug 30, Sept 1	*Scale and Hierarchy - Why is Scale Important? Cartographic vs. Ecological Scale, Grain and Extent, Scaling; Hierarchical Levels of Organization: Populations, Communities, Ecosystems, Landscapes*
	Causes of Landscape Pattern
3 – Sept 6, 8	*Introduction to the Agents of Pattern: Landscape Structure, Function, and Change* *Landscape Structure - Abiotic Setting, What are the Components? (Climate, Landforms, Soils) How is it Organized? (Patches vs. Gradients)*
4 – Sept 13, 15	*Landscape Function - Biotic Processes, How do Species Respond to and Shape the Physical Environment? Competition and Dispersal*
5 – Sept 20, 22	*Landscape Change - Humans and Land Use Change; Disturbance and Succession; Landscape Disturbance Dynamics, Disturbance Regimes*
Sept 21 6:00-8:00 pm	*"Richmond Tree Equity Score Analyzer Workshop," Gottwald Auditorium (bring your own laptop)*
	Landscape Models and Metrics
6 – Sept 27, 29	*An Introduction to Landscape Models - Why and How do We Use Them? Types of Landscape Models, Markov Models.*
7 – Oct 4, 6	*An Introduction to Landscape Metrics - Why and How do We Use Them? Measures of Composition, Configuration, and Connectivity*
	Organisms on Landscapes
8 – Oct 13	*Visit with RES to observe fish shocking and macroinvertebrate sampling in the Little Westham Creek; ArborDay RVA – Work on Special Projects.*
9 – Oct 18, 20	*Connectivity continued, Theory of Island Biogeography and Metapopulations, Mobile Species, Species Invasions*
10 – Oct 25, 27	**Review and Exam**

	Landscape Ecology in a Changing World
11 – Nov 1, 3	*Biogeochemistry, Fluxes of Carbon and Nutrients, Spatial Patterns of Biomass and Productivity*
12 – Nov 8, 10	*(GO VOTE!) Ecosystem Services, Landscape Sustainability, and Landscape Restoration*
13 – Nov 15, 17	*Landscape Conservation, Monitoring, Indicators, and Climate Change*
Nov 15, 4:30-6:00 pm	*“"Conserving and Restoring Biodiversity: From James River Sturgeon to New Zealand Kiwi Birds”, Gottwald Auditorium*
14 – Nov 22	*The Future of Landscape Ecology*
15 – Nov 29, Dec 1	**Review and Final Exam Distribution; Take-home Final Exam Due Dec 5 at 5:00 pm**

WHAT WILL WE BE DOING?

Course Structure:

The course will meet Tuesdays and Thursdays. Each week will cover a new topic. The first class of the week will be a more formal lecture. The second class will focus more on discussion of articles from the primary literature and exercises drawn from the book *Learning Landscape Ecology*. These exercises will be introduced in class and continued as a series of homework assignments. Each of you will take turns leading on of the lab exercises in weeks 5-8. The mid-term exam will be more content based, and the final exam will provide a set of applied challenges in landscape ecology that will tie together many of the themes studied in the course. *Each project group will require at least one meeting outside of regular class hours, for example, to attend a community engagement workshop or participate in a tree planting with the local community. Also note the two required evening events in Gottwald Auditorium on 9/21 and 11/15.*

Reading Assignments:

Selected readings from the text and the primary literature will be assigned with each weekly unit. Every student is expected to have read the assignments before class (backgrounds readings should be completed by the Tuesday class period and primary literature or lab exercise readings should be completed by the Thursday class period). Reading reflections, when required, should be posted to Blackboard by **10:00 am on Thursday**.

A good written reflection will be approximately 200 words, free of grammatical and spelling errors, have a clear thesis statement articulating an original idea or claim stimulated by the reading. Your argument should be supported by evidence from the reading, your experiences, and/or other sources. The writing style should be formal. The purpose of these exercises is to provide an opportunity to critically examine what you have learned in class. A secondary goal is to practice generating and articulating new ideas in writing. These exercises will help develop higher level analytical, critical thinking, and communication skills. I encourage you to read over your classmates’ posts before writing your own. By reading your classmates posts, it will also help you to get to know each other and hear multiple points of view on our readings.

Some ideas to help stimulate your reflections include: (1) if multiple papers provided on a similar theme, identify which paper was your favorite (or least favorite) of the group and explain

why, (2) describe something that was unclear or confusing about the readings, (3) identify something in the readings that was new to you and/or that changed the way you think about things, (4) identify a topic from the readings that you would like to know more about, (5) describe a connection between the readings and something you know about outside of class (e.g., from other classes, news stories, your own personal experiences, etc.).

Class Exercises and Homework Assignments:
In week 2, I will lead the class through the first exercise in *Learning Landscape Ecology*: Chapter 1, Introduction to Remote Sensing. Later in the semester you and a partner will have the opportunity to lead one of the lab exercises yourself. These exercises will include practice in using remote sensing, tools for citizen science, landscape pattern metrics, connectivity tools, and landscape change models. Exercise leaders should become familiar with background materials, administer a short five-question pop quiz on the background material at the beginning of class, run the exercises themselves ahead of time, and select parts of the exercises to be done in class and as homework assignments. Leaders should submit their assignments to me by **5:00 pm on Tuesday** of that week. I encourage all exercise leaders to also meet with me during office hours on Wednesday to finalize plans for the next day.

Written reports should be submitted for two of the four exercises (you will be leading one and you need not hand in a written report for any one of the other three, though you must do the pre-lab in-class quiz for all three). Electronic copies of your reports must be submitted to Blackboard by the due date (**10:00 pm on Wednesday of the following week**) or one point will be subtracted per day late. No advanced computer skills are required, but the homeworks may be challenging for the technophobic. *Start them early and come see me* if you are having problems. Additional homework will also be assigned from time-to-time and is mandatory.

Exams:
There will be two exams. The first will cover all content in the lectures and readings and will focus on understanding the basic concepts of landscape ecology. This exam will be given in class and will be closed-book. The final exam will be take-home and open-book. It will be cumulative covering all material in the course. Unlike the first exam, which is primarily a test of course content, this exam will focus on the practice of landscape ecology to address natural resource management challenges in the real world. Here, you will be asked to apply your knowledge to real world problems.

Special Projects:
As a special project you will explore the unequal distribution of heat in the city of Richmond. Studies by previous students have shown discrepancies in temperature to be as great as 14°F in different parts of the city. Our projects will consider what actions can be taken to address this inequality. You will choose to participate in one of the following project groups:

1) Tree planting with the *City and Chesapeake Bay Foundation* at Westover Hills. This project will focus on one of the new strategies being promoted to get even more tree into areas of need – replacing sidewalk with tree walls. If you are interested in this project, it starts right area with sidewalk removal and soil testing happening on 8/25 and 8/26. Soil

amendments to improve the quality of soil and tree planting will happen later in the semester.

2) Another tree planting will be coordinated with Groundwork RVA along Hull Street. This site in southside Richmond was identified as one with the greatest need by the earlier heat mapping project. This project team would need to work closely with *Groundwork and the State's Department of Virginia*, who is funding the work, on the logistics of the planting including what species are being planted and by whom.
3) Partner with the *Science Museum of Virginia and NOAA* to help conduct a public forum on climate science and resilience on Oct 12 from 6:00-9:00 pm. At the forum, small table of community member will play a game where they learn about and select different strategies to make Richmond a more climate resilient city. After learning the game and learning about the priorities of different members of Richmond's community, this project team will lead our class in playing the game during a class period.
4) Work with UR Facilities and the Virginia Department of Forestry Riparian Buffer Program to do a small tree planting and removal of invasive plants just upstream of the Eco-Corridor. This project is a good one if you absolutely can not make it off campus to participate in one of the other three projects.

Each of these projects will require the direct application of concepts of landscape ecology learned in class. These projects will all require some work off-campus outside of classtime. We're trying to time as much as possible to overlap with ArborDay RVA. Final write-ups will be in the form of a poster with short video describing and justifying the work. Examples of past video presentations can be found here.

Class Participation:

Class participation will be evaluated on your actively participating in in-class exercises and discussions and on active, engaged participation in the lectures. You will also have a chance for reflection on your participation and that of other group members in your leading of a lab exercise and group project work. If you are unable to attend a class, please advise by email beforehand, as participation is clearly dependent on attendance. Participation will be quantified using the following guidelines (adapted from JA Schatzel, Stonehill College):

Grade	Behavior
A	Always well prepared for class; facilitates productive peer discussions and helps others during exercises; offers reasoned responses of high quality and asks thoughtful questions on an ongoing basis.
B	Contributes regularly; generally prepared; asks questions and provides occasional responses of moderate quality; handles direct questions satisfactorily.
C	Participates infrequently; needs to be prodded; weak preparation; allows other to carry the ball in class discussions and exercises.
D	Often inadequately prepared; little involvement in class discussions; repeatedly late or leaves during class.
F	Unprepared; disruptive in class; unauthorized use of computers during class – e.g. e-mail or instant messaging; repeated talking with other students about topics not related to class.

Grading:
Grades will be assigned based on the following formula:

	Point values
Reading reflections	6 points
Class exercises and hmwks	20 points
Exam 1	25 points
Final exam	21 points
Special project	20 points
Class participation	8 points
	100 points

The grading scheme will follow standard University of Richmond guidelines (http://registrar.richmond.edu/services/policies/grading.html).

A > 93 pts	**B 87-83**	**C 77-73**	**D 67-63**
A- 93-90	**B- 83-80**	**C- 73-70**	**D- 63-60**
B+ 90-87	**C+ 80-77**	**D+ 70-67**	**F < 60 pts**

CLASSROOM GROUND RULES
Regardless of age, ability, ethnicity, race, gender, gender identity, sexual orientation, socioeconomic status, geographic background, religion, political ideology, language, or culture, we expect all members of this class to contribute to a respectful, welcoming, and inclusive environment for every other member of our class. If there are aspects of the instruction or design of this course that result in barriers to your inclusion, engagement, accurate assessment or achievement, please notify me as soon as possible.

Ground Rules for a Safe Space:
• Be mindful of one another's privacy -- do not invite outsiders into our class
• Be respectful
• Assume good will
• Challenge with care. Approach discussion as a "think out loud". Debate the concepts not the person.
• Speak from your own experiences, not assuming others have similar experiences
• Try not to make assumptions, seek to understand, not to judge
• Be open to challenges and different perspectives as an opportunity to learn something new
• Be flexible when things don't work
• Use preferred names and gender pronouns
• No side conversations
• Be willing to work together

Academic Honesty:
The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. I take the pledge to academic honesty very seriously, do not put yourself in jeopardy for a lazy plagiarism or other violation. It is not worth it. Report any violations you witness to the instructor.
https://studentdevelopment.richmond.edu/student-handbook/honor/guide.pdf

Some of our classes and my lectures will be recorded. Recordings of any type will be made available only to students registered for the course and should be used only for personal study by students enrolled in the course. Students are not permitted to:

- Disclose, share, trade, or sell class recordings with/to any other person, organization, business, or institution; and/or
- Post/store these recordings in a location accessible by anyone other than the student, including but not limited to social media accounts.

Time-on-Task Expectations:
To be successful in this course, you should expect to devote an average of 10-14 hours each week to preparing for class (3-4 hours), participating in class lectures and exercises (3 hours), studying course related materials after class and for exams (1-2 hour), and completing course assignments and projects (3-5 hours). If you find you are spending significantly more than this amount of time averaged over the semester, please let me know. It is expected that you will have completed all reading assignments before class to participate actively in the classroom discussions and exercises.

If you experience difficulties in this course, do not hesitate to consult with me. There are also other resources that can support you in your efforts to meet course requirements.

Academic Skills Center (asc.richmond.edu): Academic coaches assist students in assessing and developing their academic and life-skills (e.g., critical reading and thinking, information conceptualization, concentration, test preparation, time management, stress management, etc.). Peer tutors offer assistance in specific subject areas (e.g., calculus, chemistry, accounting, etc.) and will be available for appointments in-person and virtually. Peer tutors are listed on the ASC website**. Email** Roger Mancastroppa (rmancast@richmond.edu) **and** Hope Walton (hwalton@richmond.edu) **for coaching appointments in academic and life skills.**

Boatwright Library Research Librarians: (library.richmond.edu/help/ask/ or 289-8876): Research librarians help students with all steps of their research, from identifying or narrowing a topic, to locating, accessing, evaluating, and citing information resources. Librarians support students in their classes across the curriculum and provide individual appointments, class library instruction, tutorials, and research guides (libguides.richmond.edu). Students can contact an individual librarian(library.richmond.edu/help/liaison-librarians.html) or ASK a librarian for help via email (library@richmond.edu), text (804-277-9ASK), or chat (library.richmond.edu/chat.html). Geography's dedicated librarian is Samantha Guss (sguss@richmond.edu).

Career Services: (careerservices.richmond.edu or 289-8547): Can assist you in exploring your interests and abilities, choosing a major or course of study, connecting with internships and jobs, and investigating graduate and professional school options. We encourage you to schedule an appointment with a career advisor early in your time at UR.

Counseling and Psychological Services: (caps.richmond.edu or 289-8119): Assists currently enrolled, full-time, degree-seeking students in improving their mental health and well-being, and in handling challenges that may impede their growth and development. Services include brief consultations, short-term counseling, skills-building classes, therapy groups, crisis intervention, psychiatric consultation, and related services.

Disability Services: (disability.richmond.edu): The Office of Disability Services works to ensure that qualified students with a disability (whether incoming or current) are provided with reasonable accommodations that enable students to participate fully in activities, programs, services and benefits provided to all students. Please let your professors know as soon as possible if you have an accommodation that requires academic coordination and planning.

Speech Center: (speech.richmond.edu or 287-6409): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions are offered by teams of trained student consultants. During scheduled appointments, consultants assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations. We look forward to meeting your public speaking needs.

Writing Center (writing.richmond.edu or 289-8263): Assists writers at all levels of experience, across all majors. Students can schedule appointments with trained writing consultants who offer friendly critiques of written work.