EAS 539: Landscape Ecology

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Winter 2021 A, 2 credit hours
Class meets Tuesday and Thursday 2:30 – 4:00 Jan 19th – March 4th

This course will be fully remote due to COVID, taught over Zoom. For the Zoom link, go to the course Canvas site and click on Zoom in the menu bar at left. The password is 'mosaic'.

Office hours: A weekly Zoom session will be set up for office hours. Meet with me to discuss course material or any other topic you'd like to discuss. Join the session at any time. If you have a conflict, email me to set up an alternative time.

Description

Landscape ecology is a question-driven discipline in which the central question is 'how does landscape structure affect ecological processes?' This includes ecological processes at the population, community, and ecosystem levels. At the population level, we might ask whether landscape structure affects reproduction or dispersal. At the community level we might ask whether landscape structure affects predator-prey interactions or the success of invasive species. At the ecosystem level we might ask whether landscape structure affects NPP (net primary productivity), evapotranspiration, nutrient cycling or carbon sequestration.

This course covers key concepts in the field of landscape ecology (LE) and their historical development. It introduces empirical research in LE, theory in the field of LE, some modeling, and it covers applications of LE principles for land management and wildlife conservation.

Learning goals, approaches and outcomes
The course has these main learning goals:

- Learn to think like a landscape ecologist
- Learn to understand, use, and apply key concepts of landscape ecology. Be articulate in using these concepts
- Learn to critically assess recent papers in the literature using key concepts of landscape ecology
- Learn to synthesize basic research and applied work on a key topic in the field
- Gain basic literacy regarding empirical work in the field, theory, and some modeling
- Learn how LE concepts and principles are applied to land management and to conservation of plant species and wildlife by management agencies and NGOs

This course takes a systematic approach to covering the field of LE, beginning with the most basic concepts and going into layers of increasing detail each week. The lecture material is not tied to specific dates, but instead to topics that we will cover in order. Material will be covered at a pace driven in part by student questions and discussions. This 2-credit, 7-week course will provide a solid foundation and introduction to the field, without getting very deep into advanced applications. There are no lab activities. The order of topics loosely follows that in a new textbook, Essentials of Landscape Ecology, by Kimberly A. With 2019 (Oxford University Press). There is no need to purchase the textbook, but of course you are welcome to do so if it will help you to learn the material or if you wish to have the book for future reference.

You are encouraged to ask questions and make comparisons in class. As we discuss examples of research, concepts, and principles in the field, various theories will be presented and discussed as they arise. Students will see the role of theory as an effort to generalize from empirical and modeling studies and synthesize understanding so it can be used in applied problems.

By the end of this course you will have learned to recognize and to formulate the types of questions that are asked in landscape ecology and describe some of the methods used to address them effectively. You will have learned to understand many of the key concepts in landscape ecology and how to use and apply them correctly to current questions and issues both in basic science and in applied projects and land management. You will improve your ability to read and critically evaluate papers in the primary ecological literature as well as agency reports. You will come away with a new understanding of scale, environmental heterogeneity, and how these interact with ecological processes across levels of ecological organization.

Assignments

Quizzes

Post-lecture quizzes will follow most lectures. These are quizzes / assignments in Canvas, due before the start of the next class (see the Canvas site Quiz tab or Assignments tab to complete these). The quiz will ask you to explain one or two specific concepts or issues that were covered in class. Most questions should be easily answered in 25-75 words; write your response in the text window for the quiz in Canvas. If completed by the due date / time, post-lecture quizzes will simply be marked as completed and given full credit. Prof. Currie's answers will be either visible in the Quiz tab after you submit your response, or posted as a Quiz Answers discussion thread in Canvas. These are open-book, open-notes, but challenge yourself to write your best response without looking at notes and then after you upload it compare it against Prof. Currie's answer. The purpose of these is to generate some reflective thought after class, give you practice in articulating some of the concepts you are learning, and allow you to gauge your own understanding as the course goes forward. The quiz responses will also allow me (Prof. Currie) to gauge student learning. As part of a review at the start of the next class, students may be called on to explain their responses.

Assigned groups

Students will be randomly assigned to six groups in Canvas, with about 4-6 students each. These groups will be used to assign topics for writing assignments. Students will have time to meet in these groups during class time and these assigned groups will also be used whenever we do breakout groups in class.

Table 1. Assignments (described below) assigned to groups:

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Topic #1 (TBD)	blog post (week 3)	blog post (week 3)	blog post (week 5)	blog post (week 5)	synthesis paper	synthesis paper
Topic #2 (TBD)	blog post (week 5)	blog post (week 5)	synthesis paper	synthesis paper	blog post (week 3)	blog post (week 3)
Topic #3 (TBD)	synthesis paper	synthesis paper	blog post (week 3)	blog post (week 3)	blog post (week 5)	blog post (week 5)

The way these assignments are structured is a little complicated, but we'll go over this in class until it is clear and I will give reminders in class. Each student will write one synthesis paper and two blog posts overall. The topics you will address are determined by which group your are in (Table 1). In the synthesis paper you will synthesize the state of the art of a selected current topic in the field. The specific topics are TBD (to be determined), selected by consensus among the students who will write the synthesis papers, chosen from a list provided by Prof. Currie. Groups will meet together in class to discuss and agree on a topic. Each student will turn in their own synthesis paper, but you will have time in class to meet within your groups and work together on fleshing out the topic. In addition, in writing the synthesis paper you will draw on research conducted by four other groups writing blog posts on that topic (Table 1).

For example, if groups 5 & 6 decide to take the topic "Wildlife corridors" for their synthesis papers, then all of the students in groups 1, 2, 3, and 4 will each write their own blog posts on some aspect of wildlife corridors, enabling the students in groups 5 & 6 to draw on this broad set of blog posts (see below for more explanation).

All of the synthesis papers are due at the end of the term. The first set of blog posts are due at the end of the third week, and the second set of blog posts are due at the end of the fifth week. Topics of the blog posts will be decided by the other groups and will differ depending on which group you are in (Table 1). Note that Table 1 is set up so that each of the three topics will have half of the blog posts posted in week 3, allowing all students to get an early start on research for their synthesis paper.

Assignment: Synthesis papers

This assignment focuses on synthesizing a broad range of material to flesh out the state of the art in the use of landscape ecology (LE) concepts and approaches regarding a current topic. The specific topics are TBD (to be determined); early in the course, students will select their chosen topic by consensus (or voting) from a list provided by Prof. Currie. Write a thoughtful, well-researched paper that describes and illustrates how the current state of concepts, research, and applications of LE principles relate to the selected topic. All synthesis papers are due at the end of the course (see Canvas for firm due dates).

These synthesis papers should be **about 1,500 words.** (Tables or figures, images, and the list of references cited see below do not count toward the word count). Longer papers are OK, but only if the information content justifies greater length. Students will work in breakout groups to discuss their topic, but **each student must turn in their own paper that is their own original, written work** (you may not exchange written drafts with anyone). This is the rubric that will be used in assessing the papers:

1. Do your own research that draws on a mixture of sources including primary literature (journal articles) and review papers (journal articles) if available, agency and NGO websites, agency or government reports, and other reliable sources. Textbooks or other books can be used if published within the last 15 years. Conference proceedings can be used. Cite your sources carefully (see Citing Sources below).

2. Focus on the use of landscape ecology concepts and approaches in research and applications related to this topic. Include empirical work, theory, models (where applicable), and applications. Focus on papers and reports published within the last 15 years. It is OK to occasionally cite older material if it contains a key empirical study that is still widely cited or if it contains the description of a theory that is still widely used, but avoid citing older material otherwise. Be sure to include (a) academic or scientific works and also (b) applied examples, for

example agency or NGO websites describing their applied activities that are relevant to the topic.

3. Critically assess the information that you discuss and cite. In other words, avoid presenting information as uncritical listings such as "Smith wrote X, Jones wrote Y." Provide your own critical analysis of published work and information you find on websites and synthesize the material into your own narrative.

4. Don't try to make it appear that landscape ecology concepts are being used where they are not. Instead, give an objective assessment of how well landscape ecology concepts and approaches are being used in research and applications related to the selected topic.   If an agency or NGO project is being undertaken that should use concepts from LE but does not, or if it refers to LE concepts incorrectly, that should be included in your analysis. Ask yourself, what do you think should be the LE concepts, principles, and approaches most relevant to the selected topic, and are they being used appropriately, or not used where they could be or should be? For that reason, be sure to look for papers and projects on your selected topic that may be outside of the landscape ecology literature.

5. Use concepts and principles of LE correctly and in an articulate manner.

6. Include three visuals (photographs, tables, or figures) with captions. Each visual should convey some additional information to the text (avoid using photos that, while they might be nice photos, do not convey any new information). Text in the narrative should refer to the visuals and make a clear connection to them. The source of the images or information in the visuals should be cited in the caption.

7. In your synthesis paper, cite at least 8 blog posts written by other students in the class on this topic. Make use of the research and analysis that the other students have done – think of them as your research team. Do not copy any of another student's text word for word, and do not pass it off as your own. Do paraphrase their findings and analysis in your own words and attribute it to them, citing their blog article.

8. Organize your points into a well-constructed narrative that conveys the information but also flows well and is well written. Use the paragraph as the basic unit of composition, with a good topic sentence introducing each paragraph. *For the synthesis papers, use your best, highest-quality, formal writing style*.

9. In addition to the above points, grading will be based on the overall breadth and insightfulness of the treatment of the topic, the thoroughness of the research and the relevance, quality and variety of the sources cited, the relevance, interest, and information content of images or graphs, and following the assignment directions.

Assignment: Blog posts

Each student will complete two blog post assignments. The first set of blog posts are due at the end of the third week, and the second are due at the end of the fifth week (Table 1; see Canvas assignments for specific due dates). Post your blog article on Canvas, using the Discussion feature, as a reply to the appropriate discussion thread started by Prof. Currie. Include an original title and include your name as a byline.

Topics of the blog posts that you write will be decided by the other groups and will differ depending on which group you are in (Table 1). Note that Table 1 is set up so that each of the three topics will have half of the blog posts posted in week 3 and the other half posted in week 5, allowing all students to get an early start on research for their synthesis papers.

For your blog post, do some original research on one aspect of how the current state of concepts, research, and applications of LE principles relate to research and applications on the selected topic. These blog posts are meant to be very different from the synthesis paper assignment. Instead of trying to synthesize a lot of disparate information, for the blog post pick one aspect or one example of how LE is being applied to the current research or applications on the selected topic, and go into depth on that one aspect. For example your blog post could focus on one model that is being used or one field study that has generated a series of papers, or one agency or NGO activity or report. (Avoid focusing on just one paper from the primary literature; that is too narrow). For example, suppose the topic is "wildlife corridors". One blog post could focus on how the LANDIS model does, or does not, allow modeling of wildlife corridors, citing two or three journal articles, the model's website, and one or two agency reports that used the LANDIS model applied to wildlife conservation. A different blog post could focus on how state natural resource agencies are considering (or not considering) wildlife corridors to aid wildlife migration northward in response to climate change, citing agency reports from three different states.

Focus on the current state of the art, including primarily sources published in the last 15 years. Strive to be original, taking a perspective that may be off the beaten path. Having 20 students working on blog posts on the same general topic allows us, as a class, to think about it very broadly. Try to provide valuable research for the students who are writing their synthesis papers on this topic. Taken together, the more wide-ranging the set of blog posts completed are, the better we will be able to flesh out the range of concepts, theories, models, empirical research, and applications relevant to the topic.

In each blog post, provide two visuals (photographs, tables, or figures) with captions. Use these to break up the text (i.e. don't put them at the end). Each visual should convey some additional information to the text (avoid using photos that, while they may be nice photos, do not convey any new information). Text in the narrative should refer to the visuals and make a clear connection to them. The source of the images or information in the visuals should be cited in the caption.

Use clear, well-organized writing, but it does not need to be your best formal writing. Use more casual writing appropriate to a blog article. Each blog article should be **about 750 words.**

Citing Sources in blog posts and synthesis papers

To cite a source, include an in-text citation, accompanied by a full citation at the end of the article or paper, in an alphabetical list of references cited. The in-text citation should consist of the last name of the lead author and the year of the work. It appears in parentheses at the end of a sentence, or beneath a figure or table, like this: (Fargione et al. 2009).

The full citation at the end of the article or paper should list all of the authors in order, the year of the work, the title of the work, the source (in this case the journal Science), followed by indexing information that allows the reader to find the work (in this case, issue 319, pages 1235-1238).

> Fargione, J., J. Hill, D. Tilman, S. Polasky, and P. Hawthorne. 2008. Land clearing and the biofuel carbon debt. Science 319:1235-1238.

The format above shows a paper in the primary scientific literature. In this course you may be citing a wide variety of sources including online articles and blog posts, websites, government reports, press releases, podcasts, videos, and more. Try to make the citation follow the primary-literature format where possible: lead author, additional authors, year of the work, title, source, and indexing information.

Example full citation of an online article:

> Wilson, Gary. 2018. Is Wisconsin moving too fast to tap the Great Lakes? Greatlakesnow.org, April 30, 2018. Web URL: https://www.greatlakesnow.org/2018/04/rapid-approval-for-new-lake-michigan-diversion/ (Accessed 8/21/19).

Note that the citation above includes a web URL and the date accessed. These are usually good to add if the work was an online article; in a citation, more information is almost always better.

Citing other students' blog articles from this class:

> Smith, A. 2/1/21. "Title of blog article." Class blog, EAS 539.

Grading

Quizzes: 12 @ 1 point each
Blog article posts: 2 @ 24 points each
Synthesis paper: 40 points
Total 100 points.

The gradebook will be on Canvas, updated regularly.   Final grades will be based on this standard scale:

A + = instructor discretion	B + = 87- 89.9	C + = 77-79.9	D + = 67-69.9
A = 93-100	B = 83-86.9	C = 73-76.9	D = 63-66.9
A - = 90-92.9	B - = 80-82.9	C - = 70-72.9	D - = 60-62.9

Schedule

All class sessions are remote, over Zoom, due to COVID-19. For the Zoom link, go to the course Canvas site and click on Zoom in the menu bar at left. The password is Michigan.

Week 1: Class meets Jan 19 & 21.
Handout: Key concepts in Landscape Ecology (Currie) -- on Canvas site.

Week 2. Class meets Jan 26 & 28

Week 3. Class meets Feb 2 & 4
First round of blog posts due at the end of week 3 (Table 1; See Canvas for specific due dates).

Week 4. Class meets Feb 9 & 11

Week 5. Class meets Feb 16 & 18
Second round of blog posts due at the end of week 5 (Table 1; See Canvas for specific due dates).

Week 6. Class meets Feb 23 & 25
Feb 24: SEAS student well-being break

Week 7. Class meets March 2 & 4
Synthesis papers due at the end of week 7 (See Canvas for specific due dates).

No final exam.

Readings

Textbook (optional): [Essentials of Landscape Ecology. Kimberly A. With, 2019.] (Oxford University Press.)

Other introductory readings (optional)
- Ecology of Hierarchical Landscapes. Chen et al. 2006. Available on Canvas.
- Fragstats documentation. McGarigal 2014. Available on Canvas.

Journal articles: Numerous journal articles, to use as a starting point for assignments, will be provided on Canvas.

Agency and NGO websites: Several websites, to use as a starting point for assignments, will be provided on Canvas.

Topics covered

Explanation of assignments

Foundations and core concepts of Landscape Ecology (LE)

Scaling issues in LE

      Scale dependence and hierarchy of scales

      Upscaling and downscaling

Landscape heterogeneity and dynamics

Landscape pattern analysis

Landscape connectivity

Landscape effects on movement and dispersal

Landscape effects on population distribution, dynamics and gene flow

Landscape effects on community structure and dynamics

Landscape effects on ecosystem structure and function

Additional Course Expectations

Attendance, Participation, and Universal Learning
Attendance and participation are expected in this class so that I am able to interact with you to help you better learn the course material. If you must be absent because of an emergency or illness, I appreciate being notified but at the same time there is no need to notify me unless it happens frequently. Recorded class sessions will be available on Zoom; for class sessions you miss, watch these recordings.

Quizzes are graded all or nothing; they will not be accepted late because the purpose is to stay continuously engaged with the course material and review concepts from one class session prior to the next. Blog posts and synthesis papers turned in up to 72 hours late will be graded normally, then points deducted for lateness as follows:

- 20%: 0 to 24 hours late
- 40%: 14 to 48 hours late
- 60%: 48 to 72 hours late; not accepted (zero grade) after 72 hours late.

Exceptions can be made in the case of medical or other emergencies.

I am committed to the principle of universal learning. This means that our classroom, our virtual spaces, our practices, and our interactions be as inclusive as possible. Mutual respect, civility, and the ability to listen to others carefully are crucial to universal learning. Active, thoughtful, and respectful participation in all aspects of the course will make our time together as productive and engaging as possible.

Your success in this class is important to me. If there are circumstances that may affect your performance in this class or if you have a particular need, please let me know as soon as possible so that we can work together to develop strategies for adapting assignments to meet both your needs and the requirements of the course.

Academic and professional integrity
Students are expected to understand and follow Rackham guidelines for academic and professional integrity. Take a few moments to familiarize yourself with these rules, outlined here: https://rackham.umich.edu/academic-policies/section8/

Students should pay particular attention to rules regarding plagiarism and original work. Students may work together on assignments, may ask for help from students or others outside the class, and may draw on any information in the library or on the internet. However, the assignment that you present and turn in must be your own individual work in your own words. **You may not borrow from published work in any assignments without clearly attributing it to the authors.** The way to attribute ideas or results in published work is to cite the source. If you copy a source word for word, <u>cite the source and *also* put the text in quotation marks</u>. Similarly, you may clearly cite work that you find on web pages (list the URL and the date as you would a citation), but you may not borrow text, figures, or other graphics from a web page without clearly attributing it to the source.

Disability Statement

The University of Michigan is committed to providing equal opportunity for participation in all classes, programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G664 Haven Hall. The SSD phone number is 734-763-3000. Their website is: http://ssd.umich.edu/

Once your eligibility for an accommodation has been determined you will be issued a verified individual services accommodation (VISA) form. Please present this form to me at the beginning of the term, or at least two weeks prior to the assignment for which an accommodation is needed.

Mental Health and Well-Being

Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressures and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc. If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers a variety of resources, many which are listed on the Resources for Student Well-being webpage. You can also search for additional well-being resources here.

Land Acknolwedgment

The University of Michigan is located on the territory of the Anishinaabe people. In 1817, the Ojibwe, Odawa, and Bodewadami Nations made the largest single land transfer to the University of Michigan, ceded through the Treaty of Fort Meigs, so that their children could be educated. We recognize the history of displacement of Native communities that facilitated the founding of the University of Michigan. We acknowledge the sovereignty of tribal lands, and we reaffirm contemporary and ancestral Anishinaabek ties to this land as well as the profound contributions of Native Americans to this institution.

-- President's Commission on Carbon Neutrality (Draft), University of Michigan, 2020.