AU16 ENR 5560 - Rehab/Restor Ecosy (30302)

Ecosystem Restoration & Rehabilitation

The Dynamics of Ecosystem Restoration or *Why there's no such thing as a restoration recipe*

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Introduction

This course will focus on developing students' understanding of how biotic and abiotic conditions influence the response of ecosystems to varying restoration treatments. The course will consider restoration effects on both above and belowground processes to provide students with the grounding to infer how medium to long-term ecological trajectories following restoration. We will examine a range case study systems from the US and overseas. We will also pay particular attention to important ecosystem management challenges in Ohio and the Mid-West. The latter will include the rehabilitation of former minelands, the use of fire to restore hardwood forests undergoing "mesophication," and the control of regionally important invasive plants such as honeysuckle, tree of heaven, autumn olive and garlic mustard. We will consider the criteria that are used to assess restoration success including debates over the relative importance of restoration of ecosystem composition versus ecosystem function.

Prerequisites: ENR 2100 (ENR 201), ENR 2300 (ENR 203) and additional 12 cr hrs in natural resources or natural sciences or Sr or grad standing or permission of instructor. We recommend that students have completed EEOB 3410 prior to taking this course

Course Aims

The aims of the course are to:

- Evaluate how abiotic, biotic and disturbance variables interact to drive changes in ecosystems undergoing restoration
- Consider how ecological processes govern the response of ecosystems to restoration actions
- Critically assess what defines restoration "success"
- Develop students' ability to research and critique scientific literature concerning restoration
- Provide a forum for debate on the aims, objectives and practice of restoration

Teaching Methods

This course will utilise "flip-teaching" to maximise active learning, peer-to-peer communication and opportunities for discussion and debate. As we will see, decisions behind restoration treatments are often based on moral and philosophical considerations as well as our scientific knowledge. Flip teaching means that, outside the classroom, each week you'll watch a number of short video lectures, complete a quiz on the material you've watched and read a set paper. Classroom sessions will involve structured discussions and debates regarding the material you've read and group presentations based on an associated activity. Generally each week paper discussions will be held on Tuesdays and on Thursdays groups will present the product of a group activity focused on the reading. Adequate preparation and participation inside and outside the classroom is essential to your success on the course.

Intended Learning Outcomes

By the end of this course students will be able to:

1. Describe a thorough understanding of how variation in disturbances and post-disturbance restoration alters the structure and function of ecosystems.

2. Scientifically analyze the ecosystem structure and function of ecosystems undergoing restoration
3. Interpret analyses of monitoring and experimental data to assess how a diverse array of ecosystems respond to restoration challenges.
4. Formulate evidence-based strategies for the rehabilitation and restoration of disturbed ecosystems to improve their long-term stability and productivity.

Course Schedule

The course will run from August 23 to December 6. Classes are scheduled on **Tuesdays and Thursday between 12:40 PM and 1:35 PM**, meeting in Room 333 Kottman Hall. The week-to-week curriculum is shown below, but please note this may be subject to change.

Wk	Focus ecosystem	Region	Discussion topic	Video lecture(s)
1	Introduction	Global	Basis of restoration	Bradshaw's Acid Test
2	Restoration ethics	Global	Doing the right thing	The Land Ethic
3	Adaptive Management	Global	Uncertainty	Adaptive Management
4	Ecosystem history	Global	Reference states	The role of palaeoecology
5	Agroecosystems	OH	Field margin restoration	**Fieldtrip to Waterman Farm**
6	Oak-hickory woodlands	OH	Fire regimes	The fire regime concept

7	Tall grass prairies	Mid-west USA	Trophic interactions	Ecosystem interactions Grazing
8	Temperate bogs	OH	Above-below ground interactions	Peatland ecosystem function
9	Ponderosa pine	Western USA	Ecological complexity	What's a complex ecosystem? Why is complexity important?
10	Longleaf pine	Southeastern USA	Plant diversity	Why is diversity important? Diversity is not important?
11	Sagebrush-steppe	Western USA	States-and-transitions	Alternative Stable States
12	Mineland reclamation	OH	Abiotic limitations	**Fieldtrip to the Wilds**
13	Hay meadows	NW Europe	Naturalness	What is natural anyway?
14	Bottomland forests	OH	Invasiveness	Invasiveness and invasability **Fieldtrip to Wetlands Center**

15	Riparian ecosystems	OH/PNW	Terrestrial-aquatic linkages	Restoring riparian ecosystems
16	Conifer plantations	Global	Novel ecosystems	The novel ecosystem concept

Course Reading

The following are the recommended texts for this course:

- Hobbs R.J. & Suding K.N. (2013) New Models for Ecosystem Dynamics and Restoration. Washington DC, Island Press.
- Leopold A. (1968) A Sand County Almanac. Oxford, Oxford University Press.

In addition we recommended that you read the following texts:

- Howell E.A., Harrington J.A. & Glass S.B. (2010) Introduction to Restoration Ecology. Washington DC, Island Press.
- Williams B.K., Szaro R.C., & Shapiro C.D. (2009) Adaptive Management: The U.S. Department of the Interior Technical Guide. Washington, DC., U.S. Department of the Interior. Available from:http://www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf

Discussion Texts

A set text will be provided on Carmen each week. An announcement will be made when they are available. The set-texts will form the basis for subsequent in-class discussions and activities. It is essential you read the set-text before coming to class.

Supplementary Materials

Additional papers, reports and multi-media resources relevant to the skills and concepts developed on the course will be provided on Canvas. You are strongly recommended to read them and to consider the results and concepts they discuss. These materials should be taken as a starting point for further reading not as an exhaustive list.

Assessment

Your final grade will consist of the following elements:

- **Lecture quiz 15% (one due each week)**
  - Short multiple-choice quizzes on the video lectures and set readings will be available on Canvas. These should be completed by the end of same week as the relevant video lectures are set. Quizzes will be graded out of ten with your best 12 scores counted towards your final grade (the worst two scores dropped).
- **Discussion questions 15% (submitted at end of Tuesday classes)**
  - Each Tuesday, following the in-class discussions you will submit your completed discussion sheets.
- **In-class activities and presentations 25% (completed each Thursday)**
  - You will complete group activities related to the discussion topic. This could be a presentation or similar task. This grade will be a 50/50 combination of an individual score and a group score.
  - A generalized rubric for grading student presentations is available for guidance  though the "Content" section of this will vary slightly from week to week depending on the specific topic.
  - Due to the size of the class, groups will not present every week. However, *all groups are required to prepare for and submit their presentations each week* - presenting groups will be chosen on the day.
  - Undergraduate groups will present a total of four times over the semester
  - Grad student groups will present a total of seven times over the semester (i.e. groups will alternate weeks)
  - Presentations should be given by two or three students from the group. All students must present at least twice during the semester
  - In weeks you present you will be given feedback and your group and combined scores.*Presentation scores are not directly equivalent to a grade*.
  - Your final grade will be calculated as the average of your two best combined (group + team) scores. Final grades will be assigned by distributing the scores on a curve.
- **Final exam 35%**
  - Exam questions will be released in class during the last week of the course with the exam held in exam week. You will answer one of four essay-type questions. Your are expected to research your chosen exam question and provide an answer that builds on evidence from the primary literature. You should bring a one-page (max 250 word) essay plan into the exam along which **MUST** be submitted with your exam paper. Additional written materials such as scientific papers and textbooks

may also be brought in. Electronic devices (e.g. phones, tablets and laptops) are not permitted.

- **Participation 10%**
  - Participation will be evaluated through a register of class attendance, tracking of student contributions to in-class and on-line discussions, and evaluation of engagement with materials provided on Canvas. Peer evaluation will be used to assess students' participation in group activities and ensure that all students have contributed adequately to the completion of each week's activity.

Letter grades will be returned for most assessments with scores given as follows: A (100-93%); A-(92-90%); B+ (89-87%); B (86-83%); B-(82-80%); C+ (79-77%); C (76-73%); C-(72-70%); D+ (69-67%); D (66-60%); E (below 60%).

Graduate students will be expected to perform at a higher level than undergraduates on assignments and will be graded accordingly.

Extra credit

Extra credit is available for documented participation in additional activities relevant to restoration (e.g. seminar/webinar attendance or volunteering). A list of restoration events in Columbus requiring volunteers is available on Canvas.

Deadlines and penalties

Quizzes should be submitted before the end of the week in which they are set (exact times/dates will be given on Carmen). Students may be granted an extension to the deadline if a good reason is given. Extensions will not be given in retrospect. Quizzes cannot be completed late and you will receive a grade of zero for any not completed. Uncompleted quizzes will count towards the two quiz scores which can be dropped (see above).

Plagiarism

The University's degrees and other academic awards are given in recognition of a student's personal achievement. All work submitted by students for assessment is accepted on the understanding that it is the student's own effort.

Plagiarism is defined as the submission or presentation of work, in any form, which is not one's own, without acknowledgement of the sources. Plagiarism includes inappropriate collaboration with others. Special cases of plagiarism can arise from a student using his or her own previous work (termed auto-plagiarism or self-plagiarism). Auto-plagiarism includes using work that has already been submitted for assessment at this University or for any other academic award.

The incorporation of material without formal and proper acknowledgement (even with no deliberate intent to cheat) can constitute plagiarism. Work may be considered to be plagiarised if it consists of:

- a direct quotation;
- a close paraphrase;
- an unacknowledged summary of a source;
- direct copying or transcription.

With regard to essays, reports and dissertations, the rule is: if information or ideas are obtained from any source, that source must be acknowledged according to the appropriate convention in that discipline; and any direct quotation must be placed in quotation marks and the source cited immediately. Any failure to acknowledge adequately or to cite properly other sources in submitted work is plagiarism.

Plagiarism is considered to be an act of fraudulence and can result in a charge of academic misconduct. More information on avoiding plagiarism can be found here: http://library.osu.edu/projects-initiatives/copyright-resources-center/using-materials/plagiarism

Fieldwork Safety

Safety during fieldwork is the prime responsibility of the individuals undertaking the fieldwork. Safe conduct extends to journeys to and from field locations. Responsible and careful behaviour is thus an obligation for all students at all times. Infringement of this safety code, or indulging in any activity which is prejudicial to safety during a field course, will be regarded as a very serious matter.

Specifically all students must:

1. Ensure they have read the risk assessments before fieldwork commences. Risk assessments will be available on Moodle and will be distributed at the start of the course.
2. Obey all safety instructions given by the course convener and relevant land/property owners and managers.
3. Wear appropriate clothing for the type of weather and terrain likely to be encountered. For any research in which fieldwork is conducted in the countryside the following guidelines should be followed. Wind and waterproof outer jacket and trousers are necessary. Walking boots (not Doc Martins!) should be worn for work off surfaced roads or paths. An appropriate number of layers of warm clothing and waterproofs should be taken.
4. When working in hot and sunny conditions, ensure you have a plenty supply of fluid, and take care to avoid exposure to strong sun – wear sunscreen and a hat
5. If instructed to do so, wear required personal protective equipment in the field until such time as the responsible party instructs that it is safe to remove them.
6. Report any injury or illness to the course convener immediately, however trivial.
7. Inform the course convener about any prior illness or medical condition which might re-occur during the fieldwork. It is the student's responsibility to ensure that they have an up-to-date record of vaccination cover (such as for tetanus).
8. Conduct themselves properly and with respect for others whilst in field residences or host organisation. Anti-social behaviour is likely to lead to deterioration in safety and will not be tolerated. Follow rules and guidelines given by property owners or managers.

Disabilities Statement

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. You are also welcome to register with Student Life Disability Services to establish reasonable accommodations. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Questions, Advice and Suggestions

We welcome suggestions for improving this course! Any questions concerning the course should be directed to Matt Davies or Charles Goebel. If this is not possible, or desirable, comments concerning the course should be raised with your academic advisor.