Rehabilitation & Restoration of Ecosystems

ENR 5560

Fall Semester
2015
Introduction
This course will introduce students to the concept and practice of ecological restoration. Focusing first on the theoretical scientific and philosophical underpinnings of restoration the course will go on to examine the successes, and failures, of attempts at restoration in a range of case-study ecosystems.

There are no active prerequisites for this course but ENR 2100 (201), ENR 2300 (203), and an additional 12 credit hours in natural resources or natural sciences; or grad standing; are recommended.

Course Aims
The aims of the course are to:
- Evaluate the theoretical, philosophical, practical and ecological constraints on restoration
- Consider how ecological processes govern the response of ecosystems to restoration actions
- 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. Communicate a thorough understanding of the extent and magnitude of ecosystem disturbance, both natural and human-related.
2. Scientifically analyze the ecosystem structure and function of disturbed ecosystems.
3. Formulate strategies for the rehabilitation and restoration of disturbed ecosystems for long-term stability and productivity

Course Schedule
Course dates
The course will run from Tuesday 25th August 2015 to Tuesday 8th December 2015. Classes are scheduled on Tuesdays and Thursday between 12:40 pm and 1:35 pm. The week-to-week curriculum is shown below, but please note this may be subject to change.
<table>
<thead>
<tr>
<th>Week</th>
<th>Focal topic and video lectures</th>
<th>Date</th>
<th>Class discussion/activity topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course introduction week (no lectures)</td>
<td>25-Aug</td>
<td>Course Introduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27-Aug</td>
<td>Researching scientific literature</td>
</tr>
<tr>
<td>2</td>
<td>Philosophy of restoration - why care? 1. The Land Ethic 2. Peoples’ connection to nature</td>
<td>01-Sep</td>
<td>Land Ethic - discussion</td>
</tr>
<tr>
<td></td>
<td>Reference states 1. What is a reference ecosystem 2. The role of palaeoecology 3. Human landscapes 4. What is naturalness?</td>
<td>08-Sep</td>
<td>Disturbance and tracking ecosystem change - discussion</td>
</tr>
<tr>
<td></td>
<td>The challenges of restoration 1. Working with people 2. making trade-offs 3. Highly degraded landscapes</td>
<td>10-Sep</td>
<td>Disturbance and tracking ecosystem change - presentations</td>
</tr>
<tr>
<td></td>
<td>Fire regimes and prescribed burning 1. The fire regime concept 2. Public acceptance of fire 3. Planning a burn</td>
<td>17-Sep</td>
<td>Choosing a reference state/system - presentation</td>
</tr>
<tr>
<td>5</td>
<td>Reference states 1. What is a reference ecosystem 2. The role of palaeoecology 3. Human landscapes 4. What is naturalness?</td>
<td>26-Sep</td>
<td>Fieldtrip to The Wilds (Saturday, all-day class)</td>
</tr>
<tr>
<td></td>
<td>Fire regimes and prescribed burning 1. The fire regime concept 2. Public acceptance of fire 3. Planning a burn</td>
<td>01-Oct</td>
<td>Reviewing restoration plans - presentations</td>
</tr>
<tr>
<td></td>
<td>Invasive species 1. Invasiveness and invasability 2. Invasives as an organising concept</td>
<td>06-Oct</td>
<td>Oak-hickory woodlands - discussion</td>
</tr>
<tr>
<td></td>
<td>Species diversity 1. Why is diversity important? 2. Why diversity is not important</td>
<td>08-Oct</td>
<td>Oak-hickory - presentations</td>
</tr>
<tr>
<td>8</td>
<td>Invasive species 1. Invasiveness and invasability 2. Invasives as an organising concept</td>
<td>13-Oct</td>
<td>Field visit to ORWRP – honeysuckle invasion</td>
</tr>
<tr>
<td></td>
<td>Carbon-rich ecosystems 1. Intro to peatland ecology</td>
<td>15-Oct</td>
<td>No class (Autumn Break)</td>
</tr>
<tr>
<td>9</td>
<td>Ecological complexity 1. What is a complex ecosystem? 2. Why is complexity important?</td>
<td>20-Oct</td>
<td>Longleaf pine - discussion</td>
</tr>
<tr>
<td></td>
<td>State and transition models 1. Stable states 2. State and transition models</td>
<td>22-Oct</td>
<td>Longleaf pine - presentations</td>
</tr>
<tr>
<td>10</td>
<td>Trophic interactions 1. Ecosystem interactions 2. Grazing (MD)</td>
<td>27-Oct</td>
<td>Ponderosa pine – discussion</td>
</tr>
<tr>
<td></td>
<td>State and transition models 1. Stable states 2. State and transition models</td>
<td>29-Oct</td>
<td>Ponderosa pine - presentations</td>
</tr>
<tr>
<td>11</td>
<td>Trophic interactions 1. Ecosystem interactions 2. Grazing (MD)</td>
<td>03-Nov</td>
<td>Sage-steppe -discussion</td>
</tr>
<tr>
<td></td>
<td>State and transition models 1. Stable states 2. State and transition models</td>
<td>05-Nov</td>
<td>Sage-steppe -presentation</td>
</tr>
<tr>
<td>12</td>
<td>Trophic interactions 1. Ecosystem interactions 2. Grazing (MD)</td>
<td>10-Nov</td>
<td>Prairie -discussion</td>
</tr>
<tr>
<td></td>
<td>State and transition models 1. Stable states 2. State and transition models</td>
<td>12-Nov</td>
<td>Prairie -presentations</td>
</tr>
<tr>
<td>13</td>
<td>Carbon-rich ecosystems 1. Intro to peatland ecology</td>
<td>17-Nov</td>
<td>Peatland - discussion</td>
</tr>
<tr>
<td></td>
<td>Trophic interactions 1. Ecosystem interactions 2. Grazing (MD)</td>
<td>19-Nov</td>
<td>Peatland -presentation</td>
</tr>
</tbody>
</table>
Course Reading
The following is the recommended text for this course:


In addition we recommended that you read the following texts:


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.

Recommended additional reading
Additional papers, reports and multi-media resources relevant to the skills and concepts developed on the course will be provided on Carmen. You are strongly recommended to read them and to consider the results and concepts they discuss. These papers 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 will be available on Carmen. 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**       40% (completed each Thursday)
  o Each week you will complete a group activity 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, awarded to students in the weeks in which they lead a presentation, and the average of the score awarded to groups each week.

• **Final paper**       20% (final week)
  o A final paper will be set in class during the last week of the course. You will answer one of four essay-type questions. Questions will be released one week prior to the class to give you time to research your answers. You will be permitted to bring a one-page (max 250 word) essay plan into the class.

• **Participation**       10%
  o Participation will be evaluated through a register of class attendance and tracking of student contributions to in-class and on-line discussions. 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.

**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.
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.

Dr. G. Matt Davies
4128 Kottman Hall
Tel: 614 292 3567
E-mail: davies.411@osu.edu

Dr. Charles Goebel
135 Williams Hall (Wooster Campus)
Tel: 330 263 3789
E-mail: goebel.11@osu.edu