

Course Name: Ecological Restoration

Course Number: FES 445 & FES 545

Credits: 4

Instructor name: Seema Mangla

Instructor email: seema.mangla@oregonstate.edu

Instructor phone: 541 737 6029

Prerequisites

BI 370 Ecology or equivalent is suggested. A basic understanding of ecological concepts and terminology is expected.

Course Description

"Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." - Society for Ecological Restoration International.

Human activities have altered natural environments at many scales. We have removed entire mountaintops in search of coal; we have modified hydrologic processes through urban sprawl and creation of impervious surfaces. We have disrupted ecological functions by suppressing natural disturbance factors, like fire and flooding; and by introducing other disturbance factors, such as logging and grazing. However, the vital services that functional ecosystems provide to society - clean water, decomposition, protection against erosion, to name but a few - as well as concern over dwindling biodiversity, may justify the cost of restoring species composition, structure, and ecological processes to even heavily modified landscapes. This course covers the fundamentals of why, and how, damaged ecosystems may be restored. Key issues, such as habitat fragmentation and invasive species, will be discussed.

Measurable Student Learning Outcomes

Upon completion of this course, you should be able to develop a comprehensive, integrative restoration plan that demonstrates your understanding of:

- the importance of stakeholder involvement and local leadership in planning and implementing restoration activities,
- available sources of funding, expertise, and labor,
- key ecological principles and major practices and approaches used for restoration of terrestrial and aquatic ecosystems in North America,
- the role conservation and restoration play within the larger context of natural resource management, and
- how to assess management alternatives in terms of ecological, economic, and social sustainability.

Additional objectives, for graduate (FES545) students completing this course, are that you will be able to:

- explain key restoration ecology theories, and
- apply them in the design of your restoration plan.

Course Format

This is a 4 credit course, which would normally have a lab or field component if it was being taught on campus. Content and interaction are based on Canvas course website. Lectures are comprised mostly of PowerPoint slides and detailed notes, supplemented by assigned readings. There will be occasional streaming video lectures by distinguished guest speakers. The lab component of the course involves literature review, self-directed field investigations, and development of an original, detailed restoration plan for a site of your choice. There will be periodic discussion on course content and timely topics. You should expect to devote an average of approximately 12 hours per week to this course. Active and regular participation each week is important.

Topic Outline

- Week 1:** Introduction; why restoration is important; course logistics
- Week 2:** Definition of terms; role of restoration in natural resource management
- Week 3:** Process overview; planning models
- Week 4:** Policies, laws, and regulations relating to restoration
- Week 5:** Stakeholder involvement
- Week 6:** Ecological principles related to degradation and restoration
- Week 7:** Tools for terrestrial and aquatic restoration
- Week 8:** Assessing and monitoring restoration success
- Week 9:** Case studies (interspersed throughout course)

GRADUATES ONLY: Reading & Synthesis (Falk, et al.)

Each week you will be expected to read and synthesize a chapter from Falk et al. *Foundations of Restoration Ecology*. This is designed to give you a stronger background in the theory underpinning the practice of ecological restoration. By Wednesday of the following week, you are responsible for emailing the instructor a synthesis of what you learned from your reading. Minimum length: 500 words.

- Week 1:** no assignment this week
- Week 2:** Ch. 2 Population and ecological genetics in restoration ecology
- Week 3:** Ch. 3 Ecophysiological constraints on plant responses
- Week 4:** Ch. 12 Restoring ecosystems affected by invasive species
- Week 5:** Ch. 4 Implications of population dynamic and metapopulation theory
- Week 6:** Ch. 5 Restoring ecological communities: theory to practice
- Week 7:** Ch. 7 Topographic heterogeneity theory
- Week 8:** Ch. 8 Food web approaches
- Week 9:** Ch. 9 Dynamic nature of ecological systems
- Week 10:** see below

For week 10, select a key theory from your readings, and discuss it in the context of the goals, implementation, and expected outcomes of your restoration plan. This can take the form of an addendum to your restoration plan, and is due at the same time as the final plan document. Minimum length: 500 words.

Textbook

Graduate students only (FES545) should purchase the following text:

- *Foundations of Restoration Ecology*. 2006. Donald A. Falk, Margaret A. Palmer, and Joy B. Zedler (eds). Island Press, ISBN: 1-59726-017-7 (paperback).

There is no required textbook for undergraduates (FES445). Readings will come from recent peer-reviewed publications, available online either from the OSU library or as pdf files on Canvas course website. However, if you want to have a good reference text, there are several good books from which to choose:

1. *Ecological Restoration: Principles, Values, and Structure of an Emerging Profession (2nd edition)*. 2013. Andre F. Clewell and James Aronson. Island Press, ISBN: 978-1610911689 (paperback).

This course is offered through Oregon State University Extended Campus. For more information, contact:
Web: ecampus.oregonstate.edu Email: ecampus@oregonstate.edu Tel: 800-667-1465

2. *Repairing Damaged Wildlands: a Process-Oriented, Landscape-Scale Approach*. 1999. Steven G. Whisenant. Cambridge University Press, ISBN: 0-521-66540-X (paperback).
3. *Stream Corridor Restoration: Principles, Processes, and Practices*. 2001. Federal Interagency Stream Restoration Working Group (15 federal agencies). GPO Item No. 0120-A. Available for free download at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044574.pdf
4. *Handbook of Ecological Restoration Volume 1, Principles of Restoration*. 2002. Martin R. Perrow and Anthony J. Davy (eds). Cambridge University Press, ISBN: 0-521-79128-6 (hardback).

Of these, I would recommend either Falk, or #1 or #2, as they are written by only one or two authors and are thus more consistent in theme and terminology. Again, these are optional; if you are not that interested in the subject of restoration, save your money! (#3, *Stream Corridor Restoration* is free to download)

Grading Basis

FES445

Grading is based on a 200-point scale:

188-200 (94-100%) = A 160-167 (80-83%) = B- 134-139 (67-69%) = D+
 180-187 (90-93%) = A- 154-159 (77-79%) = C+ 128-133 (64-66%) = D
 174-179 (87-89%) = B+ 148-153 (74-76%) = C 120-127 (60-63%) = D-
 168-173 (84-86%) = B 140-147 (70-73%) = C- 0-119 (<60%) = F

Points will be awarded on the following basis:

background research	10 (5%)
original project	85 (42.5%)
3 peer reviews	15 (7.5%)
4 quizzes	70 (35%)
5 bi-weekly discussions	20 (10%)

Note that late assignments may not be accepted, without a valid excuse (e.g. serious illness, family emergency, military deployment). If you anticipate a problem meeting a deadline, it is your responsibility to notify me ahead of time, not after the deadline has passed.

FES545

Grading is based on a 250-point scale (percentages are the same as for FES445 above):

235-250 = A 200-209 = B- 167-174 = D+
 225-234 = A- 192-199 = C+ 160-166 = D
 217-224 = B+ 185-191 = C 150-159 = D-
 210-216 = B 175-184 = C- 0-149 = F

Points will be awarded on the following basis:

background research	10 (4%)
---------------------	---------

This course is offered through Oregon State University Extended Campus. For more information, contact:
 Web: ecampus.oregonstate.edu Email: ecampus@oregonstate.edu Tel: 800-667-1465

original project 85 (34%)
3 peer reviews 15 (6%)
4 quizzes 70 (28%)
5 bi-weekly discussions 20 (8%)

9 chapter syntheses 50 (20%)

Note that late assignments may not be accepted, without a valid excuse (e.g. serious illness, family emergency, military deployment). If you anticipate a problem meeting a deadline, it is your responsibility to notify me ahead of time, not after the deadline has passed.

Assignment Overview

There are four graded components for undergraduates, 5 for graduates:

1. periodic discussions,
2. periodic quizzes,
3. background research, and
4. the term project, which is a restoration plan you will develop for a site of your choice.
5. (graduates only) synthesis of chapters in Falk, et al. *Foundations of Restoration Ecology*

Lecture & Reading Overview

Lectures are a mix of text outlines, Powerpoint files, and occasional streaming video. Outlines and/or slides are available as PDF files. There will be lots of links from within the text outlines and PPT slides to supplemental material on the Internet. Please follow these links, as your time and connection speed permit, for more illustration and depth. Generally you will be held accountable on exams only for material from lectures and required readings. If information from a particular website will be covered on one of the exams, I will point that out by use of the word "required".

Your constructive feedback on the effectiveness of the lecture material and formats will be greatly appreciated!

Required readings (may be covered on quizzes) are listed below each lecture (required and optional readings are also listed at the end of each lecture outline).

Links to **most** required readings are posted in each week's folder, below each lecture. Other readings are available through the Valley Library's online journals, as noted. This week, for example, all of the required readings are linked.

FMI on locating journal articles: <http://guides.library.oregonstate.edu/FES445-545>

Quiz Overview

There will be a total of 4 quizzes over the course of the term. Together, they will be worth a total of 70 points (out of 200) toward your grade. Quizzes will be open-book, and can be taken any time within a 2-day window, with a 1-hour time limit. Questions will be based on the learning objectives, and will be a mix of multiple-choice and short essay items. **You may only take each quiz once. Be sure you are ready before you click on the link.**

The first quiz (15 points) covers all of week 1, and the first lecture and reading from week 2.

The second quiz (15 points) covers material from weeks 2 and 3.

This course is offered through Oregon State University Extended Campus. For more information, contact:
Web: ecampus.oregonstate.edu Email: ecampus@oregonstate.edu Tel: 800-667-1465

The third quiz (15 points) covers material from weeks 4, 5, and 6.

The fourth quiz (25 points) is cumulative, although it focuses on material from weeks 7-10.

There is no final exam in this course.

Academic Integrity (OSU Policy)

Students are expected to be honest and ethical in their academic work. Intentional acts of academic dishonesty, such as cheating or plagiarism, may be penalized by imposition of an 'F' grade in the course.

Note: Assignments should be written in your own words. Direct quotes from other sources, when absolutely necessary, must be brief, enclosed by quotation marks (" "), and properly attributed. "Cutting and pasting" large blocks of text, even when the source is properly attributed, is a form of plagiarism.

FMI: <http://oregonstate.edu/studentconduct/code/index.php> (2.b.v)

Students With Disabilities

Accommodations are collaborative efforts between students, faculty, and [Disability Access Services](#) (DAS). Students with accommodations approved through DAS are responsible for contacting the instructor prior to or during the first week of the term to discuss accommodations. Students, who believe they are eligible for accommodations, but who have not yet obtained approval through DAS, should contact DAS immediately at 541-737-4098.