

BIOL 4920/6920: Restoration Ecology

<i>Instructor</i>	Dr. Leighton Reid	<i>Term</i>	Spring 2017
<i>Office</i>	R228	<i>Meetings</i>	Mon/Wed
<i>Office hours</i>	By appt: Mon 11:10-12:10, Wed 9:30-10:30	<i>Time</i>	8:00-9:15 a.m
<i>Email</i>	reidjl@umsl.edu	<i>Location</i>	Benton Hall 445
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Sign up for Office Hours at <http://tinyurl.com/jbol4rt> or with the QR code on your phone.

The next century, I believe, will be the era of restoration in ecology.

-E. O. Wilson (1992)

Course Description

This course aims to introduce students to key concepts and applications in the science and practice of ecological restoration. The goals of the course are for students:

1. *To achieve competency in natural and social dimensions of ecological restoration*
2. *To critically evaluate and appreciate the role of ecological restoration in conservation, globally and locally*

To meet these goals, students will be expected to:

- *Explain key terms and concepts in ecological restoration*
- *Evaluate ecological restoration as a strategy for conserving biodiversity*
- *Critically evaluate alternative restoration strategies for a given ecosystem*
- *Participate in a local restoration project*

Readings

Many readings will come from Susan Galatowitzch's excellent textbook (Galatowitzch, S. M. 2012. Ecological Restoration). Additional readings from the popular and scholarly literature may be provided as pdfs.

Instructional Strategy

I expect that the general flow of this course will run like this: On Mondays, we will start with a short reading quiz (see below). We'll grade the quiz in class and use it as an opportunity to discuss the material for the week as a group. I may give one or two short lectures in order to review, clarify, or expand on the information in the text book. On Wednesdays, I will try to talk less and have you talk more. Undergraduate students will present Virtual Field Trips to restoration projects in different parts of the world. Graduate students will give guest lectures on theoretical aspects of restoration ecology. We will also have several guest speakers from outside

of the university. I hope that this structure will provide some predictability to the course as well as adding some diversity.

Work party

Each student is required to participate in a work party on a local restoration project. Projects and dates will be provided on the course website, and additional opportunities will be announced in class. For your work party, wear long pants, long sleeves, and close-toed shoes. Bring water, lunch, rain gear, sunscreen, and insect repellent. Students are required to write a one-page reflective essay on their work party and turn it in within one week of completing the work party. This essay should describe what you did, but it should go beyond a statement of the facts and also include a reflection on what you learned, whether it agreed with or refuted what you had learned in class, and what you might do differently if you were in charge of the restoration project.

Quizzes

Each week we will start one class period with a brief (~10 min) quiz. Students will be asked to identify and describe species, people, organizations, projects, and terminology. Part of the remaining class period will be dedicated to grading and discussing quizzes. Quizzes are cumulative and will draw on information from previous weeks. Species should be identified by common and Latin names. The purpose of weekly quizzes is to reinforce understanding of key terms and concepts. I anticipate that there will be 10 quizzes, and they will be worth 2% of your final grade each. I will drop your lowest score at the end of the semester. Generally, quizzes cannot be repeated, revised, or done at a later date. If you must miss a class section, I will make a new quiz for you to take at a later date but only if you give me >24 hour notice that you will miss class and/or if you have a signed note from student health services.

Grading

Letter grades in this course will follow the standard rubric: A (93-100%), A- (90-92%), B+ (87-89%), B (83-86%), B- (80-82%), C+ (77-79%), C (73-76%), C- (70-72%), D+ (67-69%), D (63-66%), D- (60-62%), F (<60%). 100% is the highest grade possible in this course.

Assessment	Percent of Final Grade
Participation	15
Mid-term exam	15
Quizzes 1-10	20
Assignments 1-4	30
Final exam	20

Assignment	Percent of Final Grade
1. Endpoints of restoration essay	3
2. Virtual field trip	6
3. Aerial herbicide debate	9
4. Restoration plan	12

Participation

There are many ways for you to participate in class. One of the simplest is to ask questions and engage in class discussions. We have several guest speakers coming, and I encourage you to write down a question while the speaker is talking, then ask it at the end.

Assignments

This course includes four major assignments, each of which addresses a primary course goal.

1. ENDPOINTS OF RESTORATION ESSAY (Outline due 2/1; Final due 2/8)

Ecological restoration has traditionally been guided by the idea of a reference system – a historical or less-disturbed contemporary analogue to a degraded ecosystem. However, the reference concept is challenged by paleoecological evidence that any given place has previously hosted multiple types of ecosystems; thus, restoration “targets” are constantly moving. Moreover, many or most ecosystems have experienced changes that are practically irreversible, including extinctions, invasive species, and severe pollution. As such, there has been a great deal of debate about whether rapid biosphere changes have outpaced and rendered obsolete the notion of a historically-derived reference ecosystem. In your opinion, are historical reference systems still useful for ecological restoration in most, some, or few cases? Cite at least three reasons to support your point of view, and also address one or two potential criticisms of your opinion. 800 word max.

The following resources may be helpful for this assignment. PDFs will be sent via email.

- Hobbs, R. J., E. Higgs & J. A. Harris. 2009. Novel ecosystems: implications for conservation and restoration. *Trends in Ecology & Evolution* 24: 599-605.
- Murcia, C., J. Aronson, G. H. Kattan, D. Moreno-Mateos, K. Dixon & D. Simberloff. 2014. A critique of the ‘novel ecosystem’ concept. *Trends in Ecology & Evolution* 29: 548-553.
- Miller, J. R. & B. T. Bestelmeyer. 2016. What's wrong with novel ecosystems, really? *Restoration Ecology* 24: 577-582.
- Higgs, E., D. A. Falk, A. Guerrini, M. Hall, J. Harris, R. J. Hobbs, S. T. Jackson, J. M. Rhemtulla & W. Throop. 2014. The changing role of history in restoration ecology. *Frontiers in Ecology and the Environment* 12: 499-506.

2. VIRTUAL FIELDTRIP (Due at midnight before your presentation; dates will be assigned in class on 1/25)

Each student must present to the class a virtual fieldtrip to an ecosystem under restoration. Presentations should be 10-12 minutes and should include a locator map and photographs. Presentations should be in PDF or Powerpoint form and should be emailed to me by midnight the day before the class. In class on 1/25 you will select a case study from Susan Galatowitsch’s textbook (there are 19 options). If there is another case study that you would strongly prefer to present, please discuss it with me during office hours.

Information to include in your presentation

- What was the project’s goal(s)?
- Who is affected by the restoration and how were they involved in decision making?
- What techniques were used to restore the site?

- How was the project monitored and what criteria were used to evaluate success in achieving the project's goal(s)?
- What lessons can be learned from this project to improve ecological restoration at similar sites or the practice of ecological restoration in general?
- Name one thing that you particularly liked about this project as well as one thing that you think could be improved.

3. AERIAL HERBICIDE DEBATE (Due in class on 4/17)

Bush honeysuckle (*Lonicera maackii*) is aggressively invading woodlands in eastern and central Missouri, and one proposed restoration method is to reduce honeysuckle cover by spraying herbicide from airplanes and helicopters. On April 17th, students will debate whether the Missouri Department of Conservation should use aerial herbicide applications to restore Missouri woodlands at Busch Conservation Area in St. Charles. One group will argue that the pros of aerial spraying outweigh the cons; whereas the other group will argue that the cons outweigh the pros. Both groups should weigh aerial spraying against other options, like cutting stems and applying herbicide manually. Groups will have 12 minutes to present their arguments, with 5 minutes afterwards to field questions from the panel of judges (graduate students) and the opposing team. Each group should provide at least three arguments to support their position. Presentations will be graded on the basis of thoughtful content, persuasive argumentation, response to critical questions, and participation (all group members need not speak, but all must contribute equally). There is no written assignment to turn in; grades will be assigned on the basis of the presentation only.

4. RESTORATION PLAN (Outline due 3/22; Final due 5/3)

In class on 3/1, I will divide the class into several teams and distribute maps of local, degraded areas in need of restoration. During the remaining two months of the semester, each team will write a restoration plan for that degraded site. Details of the assignment will be presented in class on 3/1.

Tweet for Extra Credit

I will give a maximum of 1 point of extra credit towards your final grade if you tweet a photo of an organism in a restored ecosystem. Use #RestorationEcologyUMSL. Include a (correct) identification and the name of the restoration site. Organisms do not have to be native, but they should be wild. I will not consider *Homo sapiens* or *Canis lupus familiaris* (or other pets). 100 is the maximum grade you may achieve in the course.



Accommodations

I am happy to work with students who have physical or learning disabilities that may influence class performance. If you have a disability, please contact me by the second day of class so that we can discuss accommodations. Please be aware of [UMSL's policy on disability accommodations](#): *It is the student's responsibility to self-identify, to provide current and adequate documentation of his/her disability, and to request classroom accommodation, through the Disability Access Services (DAS) office.*

Expectations

- **Academic integrity.** Students are expected to conduct themselves with integrity; academic dishonesty will not be tolerated. UMSL defines academic dishonesty as *any form of cheating, plagiarism or sabotage which results in students giving or receiving unauthorized assistance or receiving credit for work which is not their own.* Please contact me if you are uncertain about proper citations or test preparation. For more information, see the University of Missouri [Standard of Conduct website](#). Recall that *Plagiarism* is, essentially, using someone else's ideas or words without properly crediting them.
- **Class conduct.** To facilitate a safe, productive learning environment, students are expected to arrive on time and to share their comments with the entire class. Students who choose not to respect these requests be penalized on their participation grade.
- **Due dates.** Assignments are due on MyGateway by the start of class on the day listed on the syllabus. Assignments will lose 10% of points for each day they are late, including weekends.

Campus Safety

- If there is an emergency, call campus police at 314-516-5155. Remember to register your phone with campus police at <http://safety.umsl.edu/police/notifications/index.html>.

Schedule (subject to change)

Week	Date	Topic	Readings / Comments / Due Dates
1	W 1/18	<ul style="list-style-type: none"> • Course Introduction • What is Ecological Restoration? • Motivations • https://youtu.be/Mx6hBgNNacE 	
2	M 1/23	<ul style="list-style-type: none"> • Causes of Degradation • History of Ecological Restoration • Key Definitions & Documents 	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 1 (26 pages) ❖ Quiz 1
	W 1/25	<ul style="list-style-type: none"> • Virtual Field Trip: Baghmara Community Forest, Nepal • Ecological Theory and Restoration Ecology 	
3	M 1/30	<ul style="list-style-type: none"> • Diagnosis and goal setting 	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 2 (43 pages) ❖ Quiz 2
	W 2/1	The Reference Ecosystem Concept Guest speaker: Dr. James Aronson (MOBOT) <ul style="list-style-type: none"> • Virtual Field Trip 	<ul style="list-style-type: none"> ♣ <i>Assignment 1 Outline Due by 8:00 AM</i>
4	M 2/6	Planning	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 3 (20 pages) ❖ Quiz 3
	W 2/8	Regional Restoration Issues Guest speaker: Dr. Doug Ladd (The Nature Conservancy) <ul style="list-style-type: none"> • Theory guest lecture 	<ul style="list-style-type: none"> ♣ <i>Assignment 1 Due by 8:00 AM</i>
5	M 2/13	Social and Institutional Support	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 4 (33 pages) ❖ Quiz 4
	W 2/15	<ul style="list-style-type: none"> • Virtual Field Trip & Theory Guest Lecture(s) 	
6	M 2/20	Monitoring and Evaluation	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 5 (31 pages) ❖ Quiz 5
	W 2/22	Midterm Exam	
7	M 2/27	Bottomland Forest Restoration Guest Lecture: Dr. Peter Minchin (SIUE)	
	W 3/1	Restoration Plans (Description of Assignment 3) <ul style="list-style-type: none"> • Virtual fieldtrip(s) & Theory guest lecture(s) 	
8	M 3/6	Landforms and Hydrology	<ul style="list-style-type: none"> ➤ Galatowitsch Chapter 6 (58 pages) ❖ Quiz 6
	W 3/8	<ul style="list-style-type: none"> • Virtual fieldtrip(s) & Theory guest lecture(s) 	

Week	Date	Topic	Readings / Comments / Due Dates
9	M 3/13	Soil and Water Quality	➤ Galatowitsch Chapter 7 (58 pages) ❖ Quiz 7
	W 3/15	Designing Plant Populations for Reintroduction Guest speaker: Dr. Matthew Albrecht (MOBOT)	
10	M 3/20	Plants	➤ Galatowitsch Chapter 8 (57 pages) ❖ Quiz 8
	W 3/22	• Virtual fieldtrip(s) & Theory guest lecture(s)	♣ <i>Assignment 4 Outline Due by 8:00 AM</i>
11	M 3/27	SPRING BREAK	
	W 3/29	SPRING BREAK	
12	M 4/3	Invertebrates	➤ Galatowitsch Chapter 9 (34 pages) ❖ Quiz 9
	W 4/5	• Virtual fieldtrip(s) & Theory guest lecture(s)	
	S 4/8	FIELD TRIP (8:00 AM – 4:00 PM)	<i>Details will be provided on Wed 4/5</i>
13	M 4/10	Vertebrates	➤ Galatowitsch Chapter 10 (41 pages) ❖ Quiz 10
	W 4/12	• Virtual fieldtrip(s) & Theory guest lecture(s)	
14	M 4/17	Aerial Herbicide Debate	
	W 4/19	FIELD TRIP to Cavalry Cemetery	<i>Details will be provided on M 4/17</i>
15	M 4/24	Tropical Forest Restoration Guest Speaker: Dr. Zak Zahawi (American U. of Beirut)	
	W 4/26	Special Topic TBD	
16	M 5/1	Special Topic TBD	
	W 5/3	Review	♣ <i>Assignment 4 Due by 8:00 AM</i>
17	TBD	Final Exam	