

COURSE SYLLABUS

TIME: LECTURES: Mondays & Wednesday, 2.30-4 pm
LABS: Wednesdays, 4–6 pm

PLACE: Mondays: Dana 1024
Wednesdays: Check the schedule. Most Wednesdays at Matthaei Botanical Garden and the Nichols Arboretum (Arb)
Bus departs at 2.30 pm at the Michigan League - 911 N University Ave

INSTRUCTOR: Sara Adlerstein, School for Environment and Sustainability
Dana Building G524
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OFFICE HOURS: Mondays 4 – 5 pm and by appointment

GSI: Gillian Moore School for Environment and Sustainability
Dana Building (TBD)
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OFFICE HOURS: TBA and by appointment



COURSE DESCRIPTION

The course offers an introduction to the natural science, engineering, policy, and social issues around ecological restoration. Restoration ecology is a relatively new field that relies on fundamentals of ecology and draws from other disciplines including engineering, landscape architecture, social sciences, economics, environmental education and the arts to assist the recovery of ecosystems that have been degraded, damaged, or destroyed. Ecological restoration is a fundamental element of ecosystem management. It is an intentional activity that initiates or

accelerates an ecological pathway or trajectory through time towards a reference or desired state. In this capstone course, you will draw on your foundation studies in the natural sciences, social sciences, and culture to help you assess real-world problems in local ecosystems.

At the heart of the course, is the question: can we repair some of the damage done to ecosystems and biodiversity? Restoration ecologists generally embrace the notion that our environment can be repaired, but their goals and methods vary widely. We will cover basic principles of the field of ecological restoration, but we will also take a broader look at what restoration means in the context of urban areas and agriculture, and briefly address the extent to which issues of environmental justice may be involved. Along the way, we will consider the following questions about restoring areas:

- What needs to be restored? What should we restore to, and how?
- Who decides and how is decided what and how to restore?
- What to do about invasive species?
- What does restoration mean in a changing world? In natural vs. agricultural vs. urban areas?
- Why should we restore?
- Who will work on or restore a site, who will use it?
- How can restoration be sustainable?

We begin by focusing on how to use knowledge of ecosystem function to facilitate recovery of disturbed and damaged ecosystems. We examine and discuss restoration projects through guest lectures from local practitioners of restoration ecology, use of case studies, and fieldwork. We will discuss application of ecological principles to restoration design, implementation, and monitoring. Field exercises will be mostly at Matthaei Botanical Gardens and Nichols Arboretum (MBGNA). Students will practice applying acquired skills through working in teams to develop a restoration and management plan for MBGNA sites.

The course is structured as a theory & practice class that integrates concepts addressed in lecture with participation in related activities at MBGNA sites and projects as much as possible. Students do course-related activities most Wednesdays that relates to MBGNA restoration work and does something useful for MBGNA (includes measuring/monitoring; burns/follow up and seed-collecting/cleaning). Activities will cover terrestrial, and aquatic system, has one module on First Nation's perspectives. Activities involve MBGNA personnel as guest lecturers and as “client” for the “Restoration Management Plan project (RMP)” to help lay the groundwork for student teams to propose parts of restoration concepts/plans for specific areas. These potential projects will be presented to the students during Wednesday visits.

COURSE GOALS AND OBJECTIVES

- Understand ecological principles, philosophies, and sociopolitical aspects of restoration.
- Understand the importance of history of ecosystem use, reference conditions, and goals and objectives for ecological restoration planning.

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- Become aware of difficulties associated with restoration.
- Develop common sense and a creative spirit.

The field activities will offer opportunities to

- Explore and assess local restoration projects at the MBGNA that demonstrate prairie, wetlands and riparian restoration, and agriculture and open space initiatives.
- Learn practical elements of restoration including planning, assessment, implementation, monitoring.
- Practice and learn techniques to implement restoration plans.
- Assess and present methods, results, and interpretation of restoration activities.

In addition, you will gain practical skills in ecological restoration and sustainable ecosystems through guest speaker presentations. You will...

- Interact with restoration experts from local organizations.
- Volunteer for local restoration projects.
- Develop a restoration and management plan for a local site

Finally, this class will encourage you to reflect on how the interdisciplinary knowledge and skills nurtured throughout your studies can be combined and focused to address the complex ecological, sociopolitical, and cultural aspects of ecological restoration.

COURSE MATERIALS

There are **no required texts** for the class. Pdfs of **course readings** (typically peer-reviewed articles and book chapters) will be posted on the Canvas course website. To facilitate class discussions, please read and come prepared to discuss materials on the day the reading is listed (that is, please **do the reading before class**). A summary of the readings will be due electronically through Canvas before the start of class. Additionally several books are recommended for students who need to review concepts covered in class. The following books are available at the Shapiro Undergraduate Library.

Apfelbaum, Steven I., and Alan Haney. 2010 *Restoring Ecological Health to Your Land*.

Washington, DC: Island Press. ISBN 978-1-59726-571-3.

<http://islandpress.org/ip/books/book/islandpress/R/bo8041031.html>.

Cole, David N. and Laurie Yung. 2010. *Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change*. Washington, DC: Island Press.

Gobster, Paul H., and R. Bruce Hull. 2000. *Restoring Nature: Perspectives from the Social Sciences and Humanities*. Washington, DC: Island Press.

Greipsson, Sigurdur. 2011. *Restoration Ecology*. Sudbury, MA: Jones & Bartlett Learning.

ISBN-13: 9780763742195. <http://www.jblearning.com/catalog/9780763742195/>

Howell, Evelyn A., John A. Harrington, and Stephen B. Glass. 2012. *Introduction to Restoration Ecology*. Washington, D.C.: Island Press.

Izaak Walton League of America. 2006. *A handbook for stream enhancement & stewardship*. McDonald & Woodward Publishing Co. 2nd ed.

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Morrison, Michael L. 2009. *Restoring wildlife: ecological concepts and practical applications*. Washington, DC: Island Press. 2nd ed.

Packard, Stephen, and Cornelia F. Mutel. 2005. *The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands*. Washington, DC: Island Press. 2nd ed.

Links to useful documents

Pesticide Applicators study materials and exam registration.

Core Manual: <http://www.nasda.org/9381/Foundation/11379/11383/30485.aspx>

Michigan Addendum to Core Manual: <http://www.scmac.org/PDF/MichiganAddendum.pdf>

Right-Of-Way Manual: <http://www.nasda.org/File.aspx?id=3941>

Exam Registration: <https://secure1.state.mi.us/opes/>

Tallgrass Prairie Restoration Handbook

<http://www.amazon.com/The-Tallgrass-Restoration-Handbook-Ecological/dp/1597260347>

For the Management Plan Project

MBGAN maps of cover-type and natural communities, plant lists, etc. as well as raw GIS data.

<http://www.lsa.umich.edu/mbg/see/gis/>

<http://www.lsa.umich.edu/mbg/see/Resources.asp>

Jeffrey Plakke thesis <http://deepblue.lib.umich.edu/handle/2027.42/61367>

COURSE REQUIREMENTS AND GRADING

- **Labs /Fieldwork.** Most Wednesdays we will conduct fieldwork at the Nichols Arboretum and Matthaei Botanical Gardens with participation of their faculty and staff and will include hands on restoration practice, some data gathering and analysis exercises. Please wear appropriate clothing to cover feet, legs and arms to protect you skin, and to keep you dry in case of rainy weather. We will suspend outdoors activities in case of thunderstorms. There will also be videos and self-guided activities. You will submit an activity summary on Canvas on the following Wednesday. The summary is up to one-page (standard 1” margins, 11pt legible font, and single space). It can include photos (including of your field notes/journal) and illustrations. The summary should include a reflection on how the activity relates to the readings (described below) and what you learned in class.
- **Readings.** You will submit a short summary of the assigned reading on Canvas before class on the day it is due. The length can be one or more paragraphs emphasizing the important take away lessons, which can include thoughts you might have and find valuable to the class.
- **Case study project.** You will group in pairs and choose a restoration case study. You will research the project background, goals, implementation and accomplishments. **Aspects to consider for the project are the origin and background of the issue, consequences, restoration actions, results, social implications.** Your research outcome is presented orally in class and should include images, diagrams, and visuals you find helpful for your talk. The team presentation are kept to 5 minutes. There will be 2 minutes for questions.

- **Volunteer field work** (service learning). You will volunteer for local restoration projects (three hours) and write a 2-page report describing what you did and how it relates to concepts that you learned in class. Students interested in aquatic ecosystems should join one of the Huron River Watershed Council HRWC programs (your contact is Jason Frenzel jfrenzel@hrwc.org), and students interested in terrestrial ecosystem should join one of the Natural Areas Preservation NAP programs (your contact is Tina Stephens tstephens@a2gov.org) and potentially MBGNA programs (Christine Chessler-Stull cmchess@umich.edu). Check with instructors if you have a different organization in mind. Your report will have standard 1" margins, double-spaced, 11pt legible font and should be submitted electronically on Canvas. Include pictures if relevant.
- **Outreach creative project.** You will work in pairs to write and illustrate a children's book to communicate in simple terms some aspect of the course content that particularly interests you and that you consider is a valuable lesson towards restoration ecology. The text should be just a short paragraph per page. Illustrations can be hand drawings, collage, computer generated, photographs etc. Think about how you might explain complex topics discussed in class in simple terms. How might your book help inspire the next generation of environmental stewards? Your book can be produced as a hard copy or digital file (power point, animation, etc.). You will submit one electronic copy per team on Canvas and present the book to the class. Think beyond the box!
- **Design of a restoration management plan.** You will work in teams of three students to develop a restoration plan for a site at the Matthaei Botanical Gardens and Nichols Arboretum (MBGNA). This offers some great opportunities for explorations of properties, data gathering and presentation. Data on the Natural Areas Data Resources page at the MBGNA website provide background. Cover type, natural communities and FQI maps form a good framework for these management plans, but the plans are not completely developed yet. There is a need to refine maps, prioritization of areas and develop prescriptions and timelines for management. Jeffrey Plakke General Manager of Landscapes at MBGNA, will serve as the "client". Once you have selected the project topic and team, you will submit a short proposal description and schedule. Students should choose how to divide the collective effort.

Groups will write a report of 10 pages (double space with figures and references). The report includes a description of project background with an assessment of the issues, goals of envisioned restoration, monitoring plan needed, a description of how results will be evaluated in relationship to goals, literature review, and a reflection on skills each student brings to the project. Report drafts will be distributed to another group for review so that suggestions can be incorporated into the final report. The draft report should be marked in track changes and general comments of maximum one page added at the end. One team member uploads final reports to Canvas. Groups will present their projects in class. The presentation will be of 15 min and there will be 5 min for questions. Students will acknowledge their respective roles and the report describes the role of each team member. Contact the instructors on a timely manner if you experience issues with the contribution team members to the report: the end of the semester is too late!

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- **Participation.** Taking part in class discussions and activities is vital to your learning. Be ready to interact with guest speakers as well as other students. To maintain the interactive nature of this class we plan to assign two students to be responsible to each ask one question during a guest presentation.

Grading

ASSIGNMENT OVERVIEW	% of Grade
Field and lab exercises*	20
One page summary / entry in note book	
Paired Restoration Case Study	15
Oral Presentation	
Individual volunteer field work (service learning)	10
Volunteer service at restoration activities (min 3 hours)	
2 page paper reflecting on service work	
Team project: restoration & management plan	30
Team contract	
Literature Review	
Project draft (10 pages)	
Presentation (15 minutes)	
Final project paper	
Response to comments	
Self and team evaluation	
Paired outreach & education project	10
Children picture book. Text and illustrations	
Presentation to the class.	
Class participation and readings	15
	100

Grading scale will be: A= >90% , B= 80–89%, C= 70–79%, D= 60–69% E <60%

Pluses and minuses are also used to recognize unusual class performance, including outstanding participation and continuous improvement throughout the semester.

COURSE POLICIES

Attendance and Participation: Attendance in class counts toward your participation grade. If you have more than two unexcused absences, your participation score will be reduced to zero. Attendance to labs is mandatory. For an absence to be “excused,” you must contact Gillian and me by email **in advance**. Students should contact the instructors for opportunities to make up excused absences and those who miss more than two labs will be given a failing grade.

Lecture slides will be posted on CANVAS when guest speakers provide them. If you miss class, please review slides and speak with classmates about the material. If you are still unclear about what was covered in class, come to office hours to discuss it. We are also exploring options to record classes.

Deadlines: In case of extenuating circumstances, you must contact Gillian and me **before** the due date to discuss whether accommodation will be possible.

Academic: If you have questions about proper use of citations and allowable use, bring up your questions in class so that we can review these issues together, or check with us for clarification. If you have questions about plagiarism, many sources show proper use of citations and explanations about plagiarism vs. allowable use. Please refer to these:

[Proper citation methods \(http://www.lib.umich.edu/shapiro-undergraduate-library/academic-integrity-resources-students\)](http://www.lib.umich.edu/shapiro-undergraduate-library/academic-integrity-resources-students)

[Types of plagiarism \(http://www.lib.umich.edu/shapiro-undergraduate-library/types-plagiarism\)](http://www.lib.umich.edu/shapiro-undergraduate-library/types-plagiarism)

[Examples of plagiarism \(http://www-personal.umich.edu/~mmanty/teaching/integrity2.html\)](http://www-personal.umich.edu/~mmanty/teaching/integrity2.html)

[LSA academic integrity \(http://www.lsa.umich.edu/academicintegrity/\)](http://www.lsa.umich.edu/academicintegrity/)

Written assignments should exhibit college-level quality writing: legible and proofread. If there are significant number of errors or if the paper is difficult to read, it will be returned to you for changes, with a recommendation that you consult the Sweetland Writing Center or work closely with teammates to improve writing. Alternatively, if you are concerned about the quality of your writing, you may submit a draft to us in advance for comments and suggestions.

RESOURCES

- **Be ready to interact with guest speakers as well as other students.**
- **Check Canvas for announcements, assignments, and additional resources.** Explore all resources for the class, as well as other printed or internet sources available through the library.
- **Course texts and supplemental readings are available at the Shapiro Library.** While we make many materials available on Canvas, we cannot provide lengthy sections of books.
- **Attend office hours** for more individualized attention about course issues.
- **Consult Sweetland Writing Center.** Remember that free, professional assistance with writing and revision is available Monday through Friday at the Sweetland Writing Center (764-0429; <http://www.lsa.umich.edu/swc/>). The Center offers various online writing guides (<http://www.lsa.umich.edu/sweetland/undergraduate/writingguides>) and in-person consultation (<http://www.lsa.umich.edu/sweetland/undergraduate/inpersonwritingsupport>).

Proposed Schedule—Lectures, Labs, Readings, Assignments

The proposed schedule will be adjusted according to weather or as other opportunities arise. Labs are an integral part of this class, allowing you to gain on-the-ground experience in restoration.

Week	Date	Topic	Readings & Assignments/ Canvas
1	Mon Aug 30	Introduction: What are we going to do this semester? Course Logistics, assignments.	
	Wed Sep 1	What is Ecological Restoration? An Overview –In Dana	Apfelbaum & Hanley Ch.1: Connecting with the Land (1-14p).
	Lab	Walk to Nichols Arboretum (the Arb): restoration history, stream and terrestrial restoration. Guided tour with Jeff Plakke .	Apfelbaum & Hanley Ch. 2: Ecological Restoration: An overview (15-37p) Gobster & Hull Introduction: Restoring Nature: Human actions, interactions and reactions (1-19p).
2	Mon Sep 6	LABOR DAY Holiday	
	Wed Sep 8	Introduction to Matthaei Botanical Gardens and Restoration Management Plans (RMPs). Presentation by Jeff Plakke, MBGNA	Plakke 2008. Natural Areas Stewardship at UM MBGA - Introduction (1-11p) Watch videos (Plakke, Avalos)
	Lab	Description of restoration areas at Matthaei Botanical Gardens by Jeff Plakke .	Explore: https://mbgna.umich.edu/education/natural-areas-data-resources/ Submit lab report
3	Mon Sep 13	Terrestrial Restoration – Invasive Plants Presentation by Wes Bickford UM EEB/USGS Phragmites	Cole & Yung Beyond Naturlness Ch. 10: Randall- Invasive Species Management (162-178p) Apfelbaum & Hanley Ch. 4: Implementing Restoration (99-103p) Howell et al. 2012 Ch. 8: The Implementation Plan (229-279p)
	Wed Sep 15	Terrestrial - Wildlife Habitat Restoration. Instructions for Children Book Eastern Massasauga rattlesnake, presentation by Steve Parrish, MBGNA Massasauga habitat observations, survey methods and ecological management practices by Steve Parrish	MBGA 2015. Massasauga Report (1-9p) Hallock, 1990. For general information (1-31p) Sign up Management Plan Proposal topic Submit lab report

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Week	Date	Topic	Readings & Assignments
4	Mon 20 Sep	Terrestrial Restoration - Invasive Plants Controlled fire presentation by David Borneman , Natural Area Preservation Ann Arbor (NAP) (remote or live)	Bowles & Jones 2013. Repeated burning (464-478p) Pauly 1997. The Tall Grass Restoration Handbook-Conducting burns (224-243p) Case Study Proposal for Team and Topic
	Wed Sep 22 Lab	Terrestrial Restoration -Monitoring Progress Presentation by Michael Kost, MBGNA . Field Work Site evaluation, data collection and assessment by Michael Kost .	Apfelbaum & Hanley Ch. 6: Grassland (123-139p); Ch.7: Forest Restoration (141—162p). Howell et al. 2012 Ch. 9: The Monitoring Plan (278-296p) Vegetation Monitoring ID sheet (6p). Proposal for Management Plan. Submit lab report.
5	Mon Sep 27	Restoration and People Role of NGOs & volunteers/ with Jason Frenzel Huron River Stewardship Council (HRWC); Tina Stephens Natural Area Preservation City of Ann Arbor (NAP)	Gobster & Hull 2000 Ch.13: Grese et al. On volunteering (265-280p). Check http://plantwiserestoration.com/
	Wed Sep 29 Lab	Terrestrial Restoration – Native / Invasive Plants Nurseries and restoration presentation by Bill Schneider, Wildtype Nursery . Seed collection, cleaning, stratification, greenhouse operations, propagation with Steve Parrish MBGA & Bill Schneider .	Herman et al. 2014 Source for native plants (236-238p). Howell et al 2012 Ch. 6: Master Plan (176-197p); Ch. 7: Site Plan (197-227p). Baer et al. 2005. Soil heterogeneity & Prairie Restoration (413-424p). Check http://plantwiserestoration.com/ Submit lab report
6	Mon Oct 4	Aquatic Ecosystem Restoration Programs at HRWC presentation by Paul Steen .	Apfelbaum & Hanley Ch. 8: Wetland Restoration (163-177p).
	Wed Oct 6 Lab	Stream restoration Evaluation of stream quality, macroinvertebrate sampling by Paul Steen . At Island Park.	Greipsson Ch. 13: Restoration Ecology-Aquatic Ecosystems (314-351p). Submit lab report
7	Mon Oct 11	Aquatic Ecosystem Restoration -Crane Creek Lake Erie presentation by Kurt Kowalski, USGS .	Mitsch & Wilson 1996. Improving success (77-83p).
	Wed Oct 13 Lab	Aquatic Ecosystem Restoration Presentation in Dana and walk to the Arb Stream bank restoration and soft engineering presentation by researchers Environmental Consulting & Technology (ECT) . Scaled-down demonstration, control bank erosion techniques.	Apfelbaum & Hanley Ch. 9: Stream Restoration (179-186p). Palmer et al 2005. River Restoration (208-217p). Submit lab report

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Week	Date	Topic	Readings & Assignments
8	Mon Oct 18	FALL BREAK	
	Wed Oct 20 Lab	Terrestrial Restoration: Invasive Plants Woody species removal, herbicide application, with Steve Parrish MBGA Consultation of Management Plan Project (if time allows)	Reo & Ogden 2018. Indigenous perspective on invasive species (1443-52) Invasive Species Control Techniques (3p) Invasive Species Removal (23p) Restoration Management Plan: Team Contract and Topic Submit lab report
9	Mon Oct 25	Terrestrial Restoration: Agriculture and restoration Presentations by Ivette Perfecto, SEAS and Jeremy Moghtader MBGA Campus Farm.	Farmscaping to Enhance Biological Control ATTRA 2000 (37p) Browse Biointensive Integrated Pest Management (IPM) ATTRA 2001 (52p) Volunteer Work Report on Canvas
	Wed Oct 27 Lab	Urban gardens and Restoration Presentation by Robert Grese Agriculture and Restoration at Campus Farm Jeremy Moghtader MBGA.	Gobster 2012 Ch.8. Urban areas restoration (155-176p). Browse NYC Parks and Recreation 2014. Restoration Management Plan: Literature Review Submit lab report
10	Mon Nov 1	Student presentations Case Study	Children's Book Team Partner & Topic Proposal on Canvas
	Wed Nov 3 Lab	Fire and Restoration: Prescribed burn training by NAP Burn Boss Michael Hahn Meet at Island Park Pavilion.	Watch video provided by NAP (5hrs) Submit lab report
11	Mon Nov 8	Urban Restoration – Decision making Huron River Dam Removal presentation by Julia Wondolleck, SEAS.	Huron River Case for Restoration Ecology class (12p); Map of Huron River Browse HRIMP Plan Final (69p)
	Wed Nov 10	Prescribed burn- Steve Parrish, Jeff Plakke MBGNA- Meet at the Arb Alternative activity: Conservation in Botanical Gardens and Arboreta.- Stakeholders & Restoration Stakeholder Activity based on The Beholding Eye With David Michener, MBGNA.	Hardwick et al. 2010: Botanical Gardens and Conservation (266-275) Meinig 1979. The Beholding Eye (9p) Submit lab report

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Week	Date	Topic	Readings Assignments
12	Mon Nov 15	Urban Restoration – Community Engagement The Stewardship Network presentation by executive director Lisa Brush	http://www.stewardshipnetwork.org/ Monroe 2005. Tools to reach out & educate (123-136)
	Wed Nov 17	Conservation in Botanical Gardens and Arboreta.- Stakeholders & Restoration Stakeholder Activity based on The Beholding Eye With David Michener, MBGNA Alternative date for Prescribed burn Second Alternative Activity Rare Plants Botanical Gardens Conservation International, Presentation by Michael Kost and Mike Palmer MBGA - Conservatory Observations	Due: Restoration Management Plan Draft, print out and bring to class
13	Mon Nov 22	Traditional Knowledge. Remote presentation by Scott Herron , Ferris Univ.	Hunt & Berkes 2003. Anishinaabe Perceptions (18pp) Due: Restoration Management Plans Peer Edits
	Wed Nov 24	Thanksgiving Recess NO LAB	
14	Mon Nov 29	Children Book Project Student presentations	Due: Children Book Project on Canvas, Electronic Version
	Wed Dec 1 On campus	Restoration and the Humanities. Presentation by Dave Choberka , UMMA. Meet at UMMA entrance by the store.	Due: Final Restoration Management Plan Report on Canvas
15	Mon Dec 6	Wildlife Restoration Endangered Species - Great Lakes case study Cisco. Environmental grief & moving on.	Greipsson 2011 Ch.12 Endangered Animals (290-.313p). Coblentz 1978. Effect of feral goats (8p)
	Wed Dec 8	Management Plan Project Student Presentations Farewell Party	Management Plan Project Student Presentations