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NRSM 465.01: Foundations of Restoration Ecology

Enzo P. Martelli Moya

University of Montana, Missoula, enzo.martellimoya@umontana.edu

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SYLLABUS: NRSM 465 RESTORATION ECOLOGY

SPRING 2023

Introduction

This course covers the primary ecological theories that inform the practice of ecological restoration, appropriate experimental design for making inference about the efficacy and effects of restoration treatments, and the nuts and bolts of writing a scientific research paper. Scientific concepts covered include community assembly, the dynamic nature of ecological systems, biodiversity and ecosystem functioning, ecological resilience, genetic considerations for restoration, food web dynamics, and statistical issues and study design. In addition to lectures on scientific theory and application to restoration practice, the course peer-learning activities that allow students to develop skill critiquing, synthesizing, and writing scientific information. The semester will end with four student-led debates on controversial topics within restoration ecology.

The course has a substantial focus on scientific writing and fulfills a course requirement for General Education "Distributed Writing." Intensive writing assignments include: three critical analyses of scientific articles, a debate position statement, an essay-style mid-term exam, and a 12-20 page research paper that requires submission and revision of a draft paper. Roughly 25% of class lectures are devoted to exploring the structure of research articles and best practices for technical writing. Students generally show improved writing skills through the semester.

This course is appropriate for advanced undergraduate and graduate students interested in improving their understanding of the science and practice of ecological restoration.

Prerequisites include at least one advanced undergraduate course in ecology and one course in ecological restoration. All pre-requisites must be met prior to enrollment. Graduate students are encouraged to integrate class assignments into their thesis or dissertation research.

Expectations and Time Commitment

As an advanced course, the curriculum requires that students integrate knowledge rather than just memorizing and repeating ideas presented in lecture. As such, course assignments and exams are deliberately challenging and are designed to facilitate integration of material covered in class, knowledge gained from other coursework, and relevant work experiences, if applicable.

Consistent with three credits, this course requires an average of six hours of work per week outside of class time. A commitment to coming to class prepared and eager to discuss ideas, dilemmas and solutions is necessary for success. Readings are assigned from the primary scientific literature, which generally require reading and rereading to understand content. To successfully complete the course's writing assignments, students will need to allow time for writing, re-writing, and copy editing prior to submitting assignments. Please consider this time commitment in planning your schedule.

Instructors

Lead Instructor: Enzo Paolo Martelli Moya, Graduate Student, Department of Ecosystem and Conservation Sciences, Franke College of Forestry and Conservation.

Email: enzo.martellimoya@umontana.edu

- Office Hours: Wednesday 3:30-5:30 PM
 - You must schedule a meeting in advance at <https://calendly.com/enzo-martellimoya/15min>. The scheduler allows for 15-min meeting times; if you would like to meet for 30 minutes, schedule 2 back to back appointments. Once all meetings time for a given day have been scheduled, the scheduler will no longer show that day as available.
 - If you are unavailable during office hours, other times can be arranged.

Course Logistics

Meeting Times

Tuesdays and Thursdays, 2:00PM-3:20PM. There is no class on Tuesday, March 21 and on Thursday, March 23 (“spring break” days)

Meeting Format

Class sessions through Thursday, April 27 will be held *in-person*; attendance is mandatory. Instructors will post lecture notes after each class session; these mostly will be a PDF of the slides shown during the class and complementary readings.

Course Objectives and Learning Outcomes

The objectives of this course are to provide students with foundational knowledge in restoration ecology and to improve their skill in critical thinking and scientific writing.

Specific Ecological Objectives

- To explore fundamental ecological theories and their relevance to the practice of ecological restoration;
- To explore best practices for designing experiments in restoration ecology; and
- To examine the principles of scientific inference and to critically apply these principles to both ecological theory and restoration practice.

Specific Objectives Related to Writing

- To identify and pursue sophisticated questions for inquiry;
- To find, evaluate, analyze, and synthesize information from the scientific literature;
- To explore the structure of scientific research articles and practice scientific writing;
- To recognize the purposes and needs of discipline-specific audiences and adopt the appropriate voice for different kinds of science writing;
- To use multiple drafts, revision, and editing in conducting inquiry and preparing written work;
- To follow the conventions of citation, documentation, and formal presentation appropriate

to the discipline of ecology;

- To develop competence in information technology and digital literacy, including using cite-while-you-write software; and
- To manage information from diverse perspectives.

Learning Outcomes

By completing this course students will be able to:

- Integrate key ecological theories into restoration practice;
- Identify and discuss the relevance of scientific ideas for use in a practical framework;
- Analyze and succinctly summarize articles from the peer-reviewed literature;
- Use library resources and electronic databases to find scientific information;
- Use published literature to develop research ideas and answer research questions;
- Express complex scientific ideas in concise and clear writing;
- Write a research paper in a standard scientific format;
- Use electronic reference software for managing citations and preparing bibliographies; and
- Develop logical and persuasive arguments about concepts in restoration ecology and communicate ideas orally.

Course Reading

Reading Materials

- *Foundations of Restoration Ecology*. **FIRST EDITION**. D.A. Falk, M.A. Palmer and J.B. Zedler eds., Island Press. 2006. The complete edition of the book can be accessed at for free in the “lecture notes and resources” section in Moodle or at: [https://www.researchgate.net/publication/40777417 Foundations of Restoration Ecology](https://www.researchgate.net/publication/40777417_Foundations_of_Restoration_Ecology). You may need to create an account to download it.
- *Writing Scientific Research Articles*. **FIRST EDITION**. M Cargill and P. O’Connor, Wiley-Blackwell. The complete edition of the book can be accessed for free in the “lecture notes and resources” section in Moodle.
- Additional readings from the contemporary scientific literature, which are posted on Moodle (UM’s Online Course Supplement) in the “Assigned Reading” course topic. Please let the instructors know as soon as possible if there is an issue with one of the posted files. If you need technical assistance with Moodle, you can send the support team an email at courseware-support@umontana.edu, call 243-4999, or visit the [Tech Support Website](#).
- Students interested in delving more deeply into aspects of restoration can find reference information within *The Science and Practice of Ecological Restoration* book series, published by Island Press. The course instructor has a copy of all the books in the series.

Reading Assignments

Staying current with assigned reading is essential to succeed. To help maximize learning from reading assignments, a “Guided Reading Questions” Worksheet will be posted on Moodle (“Assigned Reading” topic area) the week before each reading assignment is due. Students should plan to answer the questions in these worksheets as part of their notetaking for each reading assignment. Students must submit to PackBack the “Guided Reading Questions” Worksheet for the reading that is due on Thursday, February 2 (second *in-person* class); these will not be graded, but will be reviewed and feedback provided. These worksheets will NOT be collected after that; however, students will work in groups each “lecture” class session to share their perspectives on the reading. In addition, during the class period before the exam, students will have the opportunity to lead a small-group discussion on their responses to one or more of the “Guided Question Worksheets”, as part of preparing for the exam.

Evaluation and Graded Assignments

This course is offered as traditional letter grade only. Students cannot change to credit/no credit at any time during the semester.

Letter grades will be assigned based on students’ numeric scores as follows:

A = ≥ 94%	B+ = 87-89%	C+ = 77-79%	D+ = 67-69%	F = <60%
A- = 90-93%	B = 84-86%	C = 74-76%	D = 64-66%	
	B- = 80-83%	C- = 70-73%	D- = 60-63%	

The course includes assessments in 5 areas for undergraduates and 6 for graduate students. For undergraduates the course is scored out of 100 points, so the % of the course for each course

component listed in the table below is equivalent to course points; graduate students are graded based on 110 points.

Course component	% of Grade	
	Undergraduates	Graduate students
1. Class preparation and participation	10	9
2. Seminar article critiques	24	22
3. Mid-term exam	23	21
4. Debate	15	14
5. Research paper	28	25
6. Graduate student increment	<i>Not applicable</i>	9
TOTAL	100	100

Each course component is described in general below and, with the exception of “class preparation and participation”, the detailed assignment description is or will be posted in the relevant topic area in Moodle.

1. Class Preparation and Participation (10 course points)

Coming to class prepared to participate is mandatory. Inform the course instructors in advance if you have a legitimate need to miss a class session or assignment. Course points will be assigned for both course preparation and participation as detailed below.

Class preparation is worth 5 course points. Preparation will be evaluated based on micro-quizzes on assigned readings that include open ended, short answer (1-3 sentence) questions, designed to be answered in just a few minutes. Micro-quizzes will be assigned for most classes designated as “lecture” or “research workshop,” and will be distributed via a link or QR code at the start of the class session (2:00). The quiz will close 5 minutes after class starts (2:05). There will be 12 micro-quizzes during the semester, each of which is worth 0.5 points. Each student’s lowest 2 micro-quiz scores of the semester will be dropped.

Micro-quizzes will be graded as follows:

Performance	Points
Complete credit: all questions are thoughtfully answered	0.50
Partial credit: some, but not all, questions are answered; or all questions are answered but responses don’t demonstrate comprehension	0.35
No credit: no questions are not answered or responses don’t demonstrate comprehension	0.00

Class participation is worth 5 course points and will be evaluated based on class attendance and contributions through the entire semester.

Performance	Points
Attend all class sessions/regularly and thoughtfully contribute to class discussions	5.0
Attend all class sessions/not a regular active participant in discussions	4.2
Miss up to 2 class sessions/regularly and thoughtfully contribute to class discussions	4.2
Miss up to 2 class sessions/not a regular active participant	3.8
Miss 3 or more class sessions/regularly and thoughtfully contribute to the class sessions attended	Variable
Miss 3 or more class sessions/not an active participant	

2. Seminars (24 course points)

This course includes three seminars during which students will apply concepts from course lectures and readings to scientific articles. For each seminar, students will be expected to read a technical article and submit a written critique that: 1) critically evaluates the scientific merits and contributions of the article paying particular attention to whether the data support the conclusions drawn by the author(s), and 2) evaluates the organization, structure and format of the article. Reviews are due at the beginning of each class session during which a seminar will be held. *Please expect to spend 4-5 hours on your review.* A detailed hand-out describing the assignment and expectations will be posted in the “Seminar” topic area of Moodle. During the in-class seminar discussions, students will have the opportunity to share and discuss ideas from their written critiques. Students generally show measurable improvement through the semester in their ability to critique the scientific literature and understanding of the structure of research articles.

3. Mid-term Exam (23 course points)

There will be an essay-style, open-book, mid-term exam. Students will need to log in to Moodle and finish within the class period. Please notify the course instructors if you do not have access to a laptop for the exam and we will make sure to find one you can use.

4. Debates (15 course points)

Students will participate in one of four in-class debates at the end of the semester. Each student will be assigned to a debate team and will have the opportunity to work with their team to go head-to-head debating another team. Prior to their assigned debate, students will work with their team to develop arguments; however, each student will independently write and submit a 750-word debate position statement. During the 3 debates in which a student is not debating, students will participate as audience members and evaluators. Students will be evaluated based on the written statement that they prepared for their debate, as well as their evaluation of the other debate sessions (i.e., students will not be evaluated based on their team performance). Class sessions have been set aside for debate teams to prepare for the debates; there should be no need for team members to meet outside of class periods. A detailed hand-out describing expectations will be posted in the Moodle “Debate” topic area after the mid-term exam.

5. Research Paper (28 course points)

Each student will write a ca. 12-to-20-page paper in which they answer one or more research questions using published literature (i.e. a synthesis or meta-analysis paper). Several course sessions will be devoted to the process of conducting this type of research, including specific methods for conducting a formal literature search, developing research questions, analyzing data, structuring a paper, and using reference software. In addition to writing their paper, each student in the course will review the first draft of another student's paper. The complete assignment includes 7 steps, with due dates for each step throughout the semester. A detailed hand-out describing the assignments and expectations is posted in the "Research Paper" topic area of Moodle.

6. Graduate Increment (graduate students only; 10 points)

Graduate students will conduct an additional assignment related to the course debate: writing an annotated bibliography on their assigned debate topic that includes at least 10 references, to be submitted the class session before the first scheduled debate. This annotated bibliography should include articles related to both the "pro" and "con" perspectives on their debate topic. For each article, the student must provide a brief (ca. 300-500 word) assessment of the authors' arguments related to the pros and cons of the debate topic. The submitted annotated bibliography will be shared with all students in the course.

Learning objectives of this increment include: 1) advanced training in critical analysis of opposing scientific viewpoints, and 2) application of concepts from the scientific literature to developing ecological arguments.

General Course Guidelines

Course accommodations due to COVID19 or other unexpected life situations

If you are experiencing an unexpected life circumstance that is affecting your academic program, due to COVID19 or other factors, please do not be shy about communicating with instructors so we can help. Accommodations will be provided on a case-by-case basis. Definitely ask if you need support.

Disability modification

If you are a student with a disability and wish to request reasonable accommodations for this course, contact the course professor privately to discuss the specific modifications. You will need to provide a verification letter from Disability Services for Students. If you have not yet registered with Disability Services, located in Lommasson Center 154, please do so in order to coordinate your reasonable modifications. For more information, visit the Disability Services website at [Disability Services Link](#).

Assignment due dates

Assignments must be completed and submitted at the beginning of class on the day the assignment is due, unless the course schedule states otherwise. If you are aware of a conflict with an assignment due date, please contact the course professor by the second week of the

semester to arrange an accommodation. Late assignments will not be accepted without prior arrangement.

Moodle organization: how to find your way around

The course Moodle has been set up by assignment type rather than by week of the semester. The first Moodle “topic area” includes the course information (zoom links), and the syllabus and course schedule. The second topic, “lecture notes and resources” is where instructors will post PDF of class lectures and any resources mentioned in lecture. The third topic area is where all the assigned readings and “Guided Reading Questions” worksheets will be posted. The fourth is the “Research Paper” topic (which includes all the components of the Research Paper Assignment), and the fifth is “Seminars.” Just before the Midterm, two additional topic areas will be added: “Midterm Exam” and “Debates”.

Please make sure you take the time to navigate Moodle as soon as possible, so that you are aware of where to find all course materials.

Assignment submission

All assignments should be uploaded to the relevant course topic area in Moodle. Activities evaluated through Packback can be accessed through Packback login directly or a link located in their respective Moodle section.

Communication

All official course communications outside of class will be sent to students’ University of Montana email accounts. It is your responsibility to regularly check your University email. In general, the instructors will aim to respond to emails within 24 hours during the business week, but as a rule will not respond to email sent over the weekend. **If your email is not returned after 36 hours (excepting weekends), please resend it, as it may have gotten lost in the email stack.**

Class attendance policies

Students who are registered for a course but do not attend the first two class meetings may be required by the instructor to drop the course. This rule allows for early identification of class vacancies to permit other students to add classes. Students who are required to drop due to lack of attendance must complete a drop form or drop the course through CyberBear to avoid receiving a failing grade. Students who know they will be absent should contact the instructor in advance.

Students are expected to attend all class meetings. Occasional absences due to illness, injury, family emergency, religious observance, participation in a University sponsored activity (e.g., field trips, ASUM service, music or drama performances, and intercollegiate athletics), military service or mandatory public service will be excused without penalty. Please inform the instructor as soon as possible if you need to miss a class. Unexcused absences will result in lost participation points (see evaluation section above).

Classroom environment

Students at University of Montana are diverse in many ways, including race, gender, age, religion, preparedness, and mobility. Please help create a respectful learning environment by honoring all student contributions and expressing your views in ways that do not diminish other students' perspectives.

Plagiarism

All students must practice academic honesty, including taking care not to plagiarize the words or ideas of others (i.e. submitting a direct quotation from a source without using quotation marks and citing the original document; or submitting text based on someone else's ideas without proper citation). Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review on line at: [Student Conduct Code Web Page](#).

The penalty for plagiarism in this course is zero credit on the plagiarized assignment, in addition to any consequences per the Student Conduct Code.