NREM 682 - RESTORATION ECOLOGY (CRN 78748)

PROFESSOR: Dr. Creighton M. Litton
CONTACT INFO: Office: Sherman Laboratory 240
Phone: 956-6004
email: litton@hawaii.edu
Course website: www.ctahr.hawaii.edu/LittonC/teaching.html
CLASS HOURS: T 1:30 – 4:00 p.m. (Sherman 111)
OFFICE HOURS: M 11:00 – 12:30 p.m. (or by appointment)

COURSE OVERVIEW

This is a 3-credit graduate level seminar course that will explore the foundations of restoration ecology and the application of ecological theory to the practice of ecological restoration. Application of ecological principles to restoring Hawaiian and other island and continental ecosystems will be considered. Restoration ecology is the scientific discipline dealing with the restoration of ecological systems. It requires *a priori* knowledge of ecological theory, and provides the basis for application of this theory to "design" or modify ecological systems to overcome degradation (i.e., ecological restoration).

PREREQUISITES

Advanced upper-division ecology course and graduate standing, or consent. Completion of NREM 480 (Applied Forest Ecology), NREM 680 (Ecosystem Ecology), or any other upper-division or graduate-level Ecology course highly recommended.

READINGS

Required Textbook: Falk, D.A., Palmer, M.A. and Zedler, J.B., eds. 2006. Foundations of Restoration Ecology. Island Press, Washington, DC, USA.

Supplemental Reading: (1) The Society for Ecological Restoration website (http://www.ser.org/reading_resources.asp), including *SER International Primer on Ecological Restoration*, and *Guidelines for Developing and Managing Ecological Restoration Projects*, (2) individual journal articles available as course handouts and/or PDFs on the course website.

STUDENT OBJECTIVES

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (SER, 2004). Restoration ecology, in turn, provides the theoretical principles underpinning the field to inform the restoration of ecosystems (i.e., ecological restoration).

Through completion of NREM 682 students will: (*i*) understand the basic theoretical underpinnings of restoration ecology; (*ii*) understand how ecological principles are applied to restore ecological systems; and (*iii*) demonstrate comprehension, skill, and competency in the following:

1. The historical development and empirical foundations of restoration ecology
2. Relationship between "restoration ecology" and "ecological restoration", including the role and value of science in restoration
3. Use of reference ecosystems as endpoints for ecological restoration
4. How a subset of ecological principles in soil science, ecosystem ecology, population biology, community ecology, etc. are used to inform ecological restoration
5. Current and future research efforts and needs in restoration ecology

STUDENT EVALUATION

Grading will be assessed by giving equal weight to each of 4 categories: (*i*) discussion leader, (*ii*) discussion participation, (*iii*) mid-term exam, and (*iv*) final exam. **Class attendance is mandatory. In addition, all students are expected to read all required materials prior to class, and come prepared to critically analyze and discuss the topics, literature, and/or case studies for that day.** Students are responsible for obtaining readings, notes, & handouts from the instructor, their classmates and/or the course website, and for keeping track of all assignments and due dates.

A typical week will include the first half of class devoted to a lecture presented by the instructor based on assigned readings and supplemented with additional information from the primary and secondary literature. These lectures are primarily meant to provide a basis for understanding the foundations and principles of restoration ecology.

For most weeks, the second half of class will consist of a student(s)-led discussion of a reading from the primary literature. Specifics will be provided early in the semester, but the role of the discussion leader(s) will primarily entail: (***i***) choose an article and distribute it ≥1 week prior to the discussion; (***ii***) provide a brief (~15 minute) introduction to the article and presentation of important information, including that gleaned from other primary and secondary sources; (***iii***) a brief handout outlining the justification, methodology and important take-home-points from the article; (***iv***) preparation of a list of ~10-12 questions to stimulate group discussion (to be handed out ≥1 week in advance of the discussion); and (***v***) an abbreviated bibliography (~15-20 citations) pertinent to the discussion topic. Discussion leaders are expected to read additional literature, background articles, etc. to facilitate discussion by developing "expertise" in the assigned topic area.

GRADING SUMMARY

Activity	Quantity	Points	% of Grade
Discussion Participation*	All semester	100	25
Discussion Leader	1	100	25
Mid-term Exam	1	100	25
Final Exam	1	100	25
		400	**100.0**

*****Participation will be based on attendance, punctuality, attitude, and, in particular, active engagement in instructor- and student-led lectures and discussions throughout the semester.

Grading Scale (based on a total of 400 points)

A+	$x \geq 97\%$	B+	$90 > x \geq 87$	C+	$80 > x \geq 77$	D+	$70 > x \geq 67$
A	$97 > x \geq 94$	B	$87 > x \geq 84$	C	$77 > x \geq 74$	D	$67 > x \geq 64$
A-	$94 > x \geq 90$	B-	$84 > x \geq 80$	C-	$74 > x \geq 70$	F	$x < 64\%$

EXPECTATIONS

Students: Students are expected to: (*i*) come to class each week, and be on time; (*ii*) complete assigned readings prior to lecture/discussion, and be prepared to participate in class discussions; (*iii*) be respectful of fellow students and the instructor during all class activities; and (*iv*) be an active participant in all class activities.

Instructor: The primary responsibility of the instructor is to make the course useful and, ideally, enjoyable. The instructor will: (*i*) be punctual, prepared, and enthusiastic of course activities; (*ii*) communicate clearly the course objectives, policies, and assignments; (*iii*) listen carefully to questions and concerns; (*iv*) grade assignments fairly and return them in a timely manner; and (*v*) be available to provide assistance during office hours (or by appointment).

ACADEMIC INTEGRITY

Students are expected to conduct themselves with the utmost integrity. The *University of Hawai'i at Mānoa Student Conduct Code* defines cheating and plagiarism as follows:

> **CHEATING** includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations; (2) use of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; (3) the acquisition, without permission, of tests or other academic material belonging to a member of the UH faculty, staff or student (4) engaging in any behavior specifically prohibited by a faculty member in the course syllabus or class discussion..
>
> **PLAGIARISM** includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

If you ever have any questions about what constitutes fair academic play, please come and talk to the instructor. Cheating or plagiarism will result in an F for your final grade in the course. It may also lead to other serious academic repercussions (see *University of Hawai'i at Mānoa Student Conduct Code*; http://studentaffairs.manoa.hawaii.edu/policies/conduct_code/).

ACCOMMODATIONS FOR DISABILITIES:

If you feel you need reasonable accommodations because of the impact of a disability, please: (1) contact the KOKUA Program at 956-7511 or 956-7612 in room 013 of QLCSS; and (2) speak with the instructor privately to discuss your specific needs. I will be happy to work with you and the KOKUA Program to meet access needs related to your disability.

FINAL CAVEAT

All material on this syllabus is subject to change at the discretion of the instructor to suit the needs of the course.

COURSE SCHEDULE

Week (Date) **Topic / Reading Assignment**

1 (8/23) **Introduction** (introduction to course content and format; discussion of expectations; background "quiz")

2 (8/30) **Foundations of restoration ecology** (definitions; historical context; what is "natural"?; what are we trying to restore?; "reference ecosystems"; restoration ecology vs. ecological restoration)

Lecture: (***i***) *Ch. 1: Ecological theory and restoration ecology*; (***ii***) *SER International Primer on Ecological Restoration (http://www.ser.org/pdf/primer3.pdf)*; and (***iii***) *SER Guidelines for Developing and Managing Ecological Restoration Projects (http://www.ser.org/pdf/SER_International_Guidelines.pdf)*

3 (9/6) **What is the role of science in restoration?**

Discussion (Class Debate): (***i***) Cabin 2007. Science-driven restoration: A square grid on a round earth? Restoration Ecology 15:1-7; (***ii***) Giardina *et al.* 2007. Science driven restoration: A candle in a demon-haunted world - Response to Cabin (2007). Restoration Ecology 15:171-176; and (***iii***) Cabin, R.J., 2007. Science and restoration under a big, demon haunted tent: Reply to Giardina et al. (2007). Restoration Ecology 15: 377-381.

4 (9/13) **Population biology in a restoration context** (populations and metapopulations; minimum viable population size; population genetics)

Lecture: (***i***) *Ch. 4: Implications of population dynamic and metapopulation theory for restoration*; and (***ii***) *Ch. 2: Population and ecological genetics in restoration ecology*

Discussion: TBA

5 (9/20) **Community ecology in a restoration context** (environmental filters; competition and biotic interactions; diversity effects)

Lecture: *Ch. 5: Restoring ecological communities: from theory to practice*

Discussion: TBA

6 (9/27) **Succession and restoration** (primary and secondary succession; multiple states and alternative trajectories; natural disturbance regimes)

Lecture: *Ch. 9: The dynamic nature of ecological systems: Multiple states and restoration trajectories*

Discussion: TBA

7 (10/4) **Plant physiological ecology in a restoration context** (resource capture and use; adaptations to stress)

Lecture: *Ch. 3: Ecophysiological constraints on plant responses in a restoration setting*

Discussion: TBA

8 (10/11) **Mid-Term Exam**

9 (10/18) **Soils and belowground ecology from a restoration perspective** (topography; soil physical, chemical and biological properties)

Lecture: *Ch. 7: Topographic heterogeneity theory and ecological restoration*

Discussion: TBA

10 (10/25) **Ecosystem ecology in a restoration context** (nutrient cycling; productivity; ecosystem services; measuring success in restoration)

Lecture: *Ch. 10: Biodiversity and ecosystem functioning in restored ecosystems: extracting principles for a synthetic perspective*

Discussion: TBA

11 (11/1) **Restoration and invasive species** (integration of a variety of issues in the context of nonnative invasions and restoration)

Lecture: *Ch. 12: Using ecological theory to manage or restore ecosystems affected by invasive plant species*

Discussion: TBA

12 (11/8) **Restoration in the context of global change biology** (integration of a variety of issues in the context of global climate change, N deposition, & increased atmospheric CO_2)

Lecture: *Ch. 15: Climate change and paleoecology: New contexts for restoration ecology*

Discussion: TBA

13 (11/15) **Restoration from a landscape perspective** (integration of a variety of issues at landscape and regional scales)

Lecture: *Ch. 14: Ecological restoration from a macroscopic perspective*

Discussion: TBA

14 (11/22) **No Class**

15 (11/29) **Synthesis** (synthesis of theoretical aspects of restoration ecology and application to ecological restoration projects)

Lecture/Discussion: (***i***) *Ch. 16: Integrating restoration ecology and ecological theory: A synthesis*; (***ii***) Young *et al.* 2005. The ecology of restoration: Historical links, emerging issues and unexplored realms. Ecology Letters 8:662-673; (***iii***) Hilderbrand & Randle, A.M. 2005. The myths of restoration ecology. Ecology and Society 10:19; (***iv***) Davis & Slobodkin, L.B. 2004. The science and values of restoration ecology. Restoration Ecology 12:1-3.

16 (12/6) **No Class**

17 (12/13) **Final Exam** (2:15-4:15 p.m. in Sherman 111)