Theory and Practice of Ecological Restoration
ESRM 352
Spring 2009
last revised January 28, 2009

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Environmental Science & Resource Management Program

Class: M 12\textsuperscript{00}-2\textsuperscript{50} BT 1352 (GIS Lab)

Office Hours: M 11\textsuperscript{00}-12\textsuperscript{00} Bell Tower West 1265
M 2\textsuperscript{50}-3\textsuperscript{50} Bell Tower West 1265 or Islands Cafe

Office: Bell Tower West 1265 (805) 732-2732

Final Due: Monday May 11 at 2\textsuperscript{00}PM (note time in Final Exam Schedule is 1\textsuperscript{00}-3\textsuperscript{00}PM)

With time, and enough water, all things are possible.
—Leonarda DaVinci

We used to have swamps, only the EPA made us take to callin’ ‘em wetlands.
—X Files

Application clarifies importance.
—Chapter 1 of Jordan, Gilpin, & Aber’s 1987 Book on Restoration Ecology

Restoration practice and ecological theory are reciprocals.
—Don Falk, ESA/SER 2002 meeting in Tucson, Arizona

If you build it, it may not come.
—John Rieger, Ballona Wetlands Conference May 18, 2000

We’re not going to bring back the Giant Sloth or the Sabertooth Tiger. And we are not going to restore an empty lot with 30 feet of fill over it.
—Ruth Galanter, President Pro Tem LA City Council at the Ballona Wetlands Conference May 17, 2000

Please note that this syllabus is subject to change
A lot of salt marshes are kind of stinky places...This place is alive with weeds and their color. What will the public think when they see just a sea of green?
—James Henrickson, speaking of the Ballona Restoration Plan at the Ballona Wetlands Conference May 18, 2000

Restoring Grizzly Bears [to the Selway-Bitterroot Wilderness] is like introducing sharks at the beach.
—U.S. Representative Helen Chenoweth (R-ID)

What we have are designer wetlands. This isn't restoration. This is gardening or zoo keeping.
—Bill Mitsch, Ballona Wetlands Conference May 17, 2000

The idea of restoration is a false one...it's going to depend upon too many things. Historical contingency matters in ecology.

Here is some stuff to piss-off almost everyone: three facts and an opinion. One: Hunting and gathering does more than remove target species. Two: We cannot study these changes in real time as no wilderness remains. Three: It will be much more difficult to go back from whence we came. And lastly, an opinion: We need to intervene on a massive scale, but we don't know how to put things back together... We need to start accepting that the train left the station a long, long time ago and the tracks have been burning behind that train ever since.

INTRODUCTION

Wetlands provide a multitude of ecological functions and values to society. Despite being habitat for endangered species, nursery grounds for economically valuable fishery species, and highly productive, the amount of wetlands in existence diminishes daily. California leads the nation in wetland loss, with Ventura County having lost 56% and Los Angeles County 87% of the coastal wetland area that existed in 1800. Current state and federal laws require mitigation for all current and future losses of wetland communities. This mitigation consists of creating new wetlands from scratch or rehabilitating existing but degraded areas such that we experience a “no net loss” of extant wetland. This sounds great. The only problem is, we really don’t know how to do it.
COURSE OBJECTIVES

This is a survey course designed to give you the necessary background to begin to deal with the challenge of restoring degraded ecosystems. We will be studying restoration ecology with an eye to the realities of our time. While our discussions will take place in a biological setting, I will endeavor to impart to you the importance of legal, social, bureaucratic, economic, and logistical savvy. Restoration ecologists are challenged to bring an effective, rigorous scientific approach into an often chaotic arena. Even if you will not become a restoration ecologist per se, as a private citizen you will increasingly be called upon to evaluate such efforts and determine both public and private policy.

LEARNING OUTCOMES-CONCEPTS

By the end of this course, you should understand and be able to clearly articulate:

• why restoration efforts are needed
• the rationale behind restoration efforts
• core restoration theory and methodologies
• local, regional, and national case studies which highlight central aspects of restoration theory and/or practice
• restoration success and performance metrics
• policy, legal, and public opinion issues surrounding restoration ecology

LEARNING OUTCOMES-SKILLS

Ecology, like all foreign languages, has its own grammar, terminology, and rhetoric. To interpret the primary literature and engage in meaningful discussions, you will need to familiarize yourself with this language. As we learn about the theory and practice of restoration ecology, we will simultaneously be learning how to:

• read and evaluate scientific papers
• evaluate experimental designs and data
• collect and interpret field observations
• evaluate experimental designs and data
• have confidence in our own interpretations

COURSE MATERIALS

Readings in Blackboard (in eReserve Section)
$45 Foundations of Restoration Ecology by Falk, et al. at CSUCI Bookstore
$10 Tidal Wetland Restoration by Zedler is available at CSUCI Bookstore
$9 The Elements of Technical Writing by Blake & Bly available at CSUCI Bookstore
COURSE STRUCTURE

Our course will alternate between lectures, in-class discussions, and field trips/activities. Primarily, we will have lectures at the start of each class and then move into an extended class discussion of weekly readings for the remainder of our meeting time. **This is, above all else, a participatory endeavor.** Each day, you should be prepared to explore concepts and perspectives aggressively and not worry about saying the “wrong” thing. It is expected that each student will maintain an attitude of respect and courtesy within our classroom to foster an atmosphere conducive to learning.

LEADING IN-CLASS DISCUSSIONS

In-class participation will consist of both impromptu and planned discussions. Planned, student-led discussions will generally occur in the latter half of each class session and focus upon our weekly readings. One student will be assigned to each of the two papers to be discussed that day. This student will be in charge of orchestrating an approximately 15 minute discussion of this assigned paper. In addition, the student will have found **at least one** additional paper from the primary literature (approved ahead of time by Dr. Anderson) to bolster discussion of the assigned paper. This additional paper may support or counter arguments put forth in the assigned paper or may be an outgrowth of the assigned paper. All additional papers, a draft of your discussion presentation, and a list of at least five “no one is talking” questions need to be approved by Dr. Anderson by the Thursday before your discussion.
Suggestions for Journals that publish peer-reviewed restoration ecology papers:
- Restoration Ecology
- Ecological Restoration
- Restoration and Management Notes
- Ecological Applications
- Ecology
- Ecological Monographs
- Conservation Biology
- Journal of Experimental Marine Biology and Ecology
- Wetlands
- Estuaries

FIELD TRIPS

We will be making as many field trips as we can over the course of the semester. Attendance is mandatory. The purpose of these trips is to get you out into the field to show you examples of “healthy” wetlands as well as those in the process of being restored. Additionally, these field trips will help demonstrate basic wetland assessment methods and general approaches to restoration design.

Whenever we are in the field, please be sure to bring or wear:

- field notebook, pen, clipboard, and large rubber band
- camera (not necessary, but may help you remember info for your write-up)
- hat, sunscreen, and windbreaker
- water bottle
- hiking boots or other study shoes able to get wet and muddy (NO FLIP FLOPS)
- towel/bag for muddy stuff on your drive home
- a huge smile

READING SUMMARIES

Reading scientific papers can be quite difficult. It is very easy to get bogged down in the many details of a particular paper and lose sight of the main points. Consequently, reading a paper front to back does not necessarily guarantee understanding. Often you just need to mull it over in your head for a while. To make sure you have done so, you will turn in a one-half to one page summary of your impressions of a given week’s readings (any one of the papers assigned...
that week) **prior** to our in-class discussion of those readings. **No late summaries will be accepted.**

Use this example below as your guide to writing your reading summary:

**Lecture Notes & Active Learning**

I will post abbreviated versions of *some* of my lectures on Blackboard (under the Lectures tab) just before or soon after a given lecture. I have ceased posting my complete lecture notes as this encouraged many students to not take their own notes. Active note taking greatly improves retention and comprehension of information. In a similar vein, I discourage you from reading with highlighters. Instead, please use a pencil, pen, or pdf markup tool to underline
important sections of text and comment upon them. Reading with a pen, pencil, or markup tool encourages you to annotate any given section: “three key points here almost identical to Chapter 5” is much better and easier to review than a series of fluorescent lines in the middle of a page.

Note taking is an essential skill but one that appears to be on the way out in our Internet Age. I strongly encourage you to be an active note taker throughout our class. Following a lecture or lab session, you should copy over or (re)type up those notes. This process amounts to a study session where you organize the information in a manner most helpful to you (not necessarily in the order in which I presented it). Lecture slides that are extremely definition-heavy or composed of complex graphs may be included in my posted lecture notes. Please be advised that simply downloading posted lecture notes, etc. is in no way a substitute for coming to class or learning.

Please note that in addition to posting lecture notes, I will be experimenting with podcasts of some of our lectures this semester. These may be subsets of a given lecture, live recordings made during class, or more in-depth versions of these lectures recorded outside of class. As these are still an experiment in teaching, they should be viewed as a supplement to our class-based lectures and discussions. Please give me any and all feedback about these podcasts; what is helpful, what doesn’t work very well, technical issues, aesthetic concerns, etc.

QUIZZES

Quizzes are unannounced, but we may have one weekly. Quizzes function partly as a mini-review of concepts and partly as a motivator for you to not fall behind on readings and other class work. Each quiz should take no more than 5 to 10 minutes and will cover recent lecture, reading, and lab material with short answers, multiple choice, and fill-in-the-blank questions. Quizzes are usually given at the beginning of a lecture period and cannot be made up (even if you arrive in time for the lecture itself). Please arrive promptly for each class and do not run the risk of missing a quiz.

LAB WRITE-UPS

You will be turning in field trip summaries and/or lab assignment as directed over the course of semester. In general, you will need to present your observations and provide a one-page discussion of any results, summarizing the important findings and trying to interpret them in the context of the overall exercise. Lab write-ups are due at the start of class on the following Monday, one week after the lab.

EXAMS—WETLAND CHARACTERIZATIONS

The most unusual aspect of our curriculum is our take-home test format. While you will have time to complete this exam at home, it will begin with a site visit to a local wetland. Your exam will be a general wetland characterization of the site. These exams will call upon both your observational skills and your understanding of course topics. You are free to use any and all relevant sources (save your fellow students) to construct your assessment so long as you properly
reference the source. The goal here is to demonstrate to me that you fully comprehend the general concepts, have a mastery of the details to support any and all assertions, and can make a well-reasoned, cogent assessment. Please take these take-home tests seriously and budget ample time for them (at least twice as much time as you think it should take). Give yourself plenty of time to reflect upon, compose, and re-read your characterization. The purpose of such exams is to see whether or not you can synthesize information, apply concepts to new situations, and think for yourself.

**Evaluation**

You will be graded on your participation, reading summaries, quizzes, field trip/lab write-ups, discussion sessions, and exams as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Date</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>Continuous</td>
<td>5%</td>
</tr>
<tr>
<td>Field Trips/Labs</td>
<td>Dates to be determined</td>
<td>10%</td>
</tr>
<tr>
<td>Reading Summaries</td>
<td>Continuous</td>
<td>5%</td>
</tr>
<tr>
<td>Discussion Leader-Presenter</td>
<td>Date to be determined individually</td>
<td>10%</td>
</tr>
<tr>
<td>Discussion Leader-Audience</td>
<td>Continuous</td>
<td>5%</td>
</tr>
<tr>
<td>Restoration Success Article</td>
<td>Date to be determined individually</td>
<td>10%</td>
</tr>
<tr>
<td>Participation</td>
<td>Continuous</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm (Characterization)</td>
<td>March 16 (may move)</td>
<td>15%</td>
</tr>
<tr>
<td>Final (Characterization)</td>
<td>May 11</td>
<td>25%</td>
</tr>
</tbody>
</table>

Grade break down:
- A 90-100%
- B 80-89%
- C 70-79%
- D 60-69%
- F 50-59%

note: I use the “+” and “-” system (e.g. B- = 80-83%, B = 84–86%, B+ = 87-89%)

**Submitting Your Assigned Work**

Please note that any written assignments are due at the start of class on their assigned date. Material submitted after the start of class will be considered late and marked down substantially. Non-exam material submitted more than 24 hours after the due date will receive zero points. If you know you will be tardy or miss class due to illness or other unavoidable circumstance, I strongly encourage you get in touch with me as soon as possible and to submit an electronic version of your assignment via Blackboard’s Digital Drop Box utility by the start of the respective class (but such an electronic submission does not eliminate the need for you to submit your assignment in printed form before our next class meeting).

Printed assignments are to be single spaced, in 12-point (titles may be 14-point) Times or Times New Roman font with 1” margins at the top and bottom of your page and 1.25” margins on the right and left. All assignments need to be free of spelling and grammatical errors.
CHEATING, PLAGIARISM, AND OTHER FORMS OF ACADEMIC DISHONESTY

All work that you submit as your own work must, in fact, be your own work. For example, if your paper presents the ideas of others, you must clearly indicate this by citing the source. Word-for-word language taken from other sources – books, papers, web sites, people, etc. – must be placed in quotation marks and the source identified. Similarly, the source of paraphrased material needs to be correctly cited. Likewise, work on tests and exams must be your own work, not copied or taken from other students’ work, and you must comply with instructions regarding use of books, notes, and other materials.

In accordance with the CSU Channel Islands policy on academic dishonesty, students in this course who submit the work of others as their own (plagiarize), cheat on examinations, help other students cheat or plagiarize, or commit other acts of academic dishonesty will receive appropriate academic penalties, up to and including failing the course and expulsion.

Assignments with plagiarized ideas or language will be graded “F” and must be rewritten with proper use of quotations and referencing. The grade of “F” will remain the recorded grade on that assignment. Plagiarism or cheating on exams will result in an “F” on that exam, very likely resulting in a lower or possibly a failing final grade in the course overall. In cases where I have reason to believe the cheating or plagiarism was premeditated or planned, students may receive an “F” for the course.

Please see Dr. Anderson about when and how to document sources if you have any possible questions about what might constitute an act of plagiarism or cheating.

GETTING HELP WITH ANY OF YOUR WRITTEN ASSIGNMENTS

It is always helpful to have multiple reviewers look over your work and give you their input. I strongly encourage you to have your roommate, sister, friend, or whomever look over your drafts. There is absolutely nothing wrong with this, and indeed it is the exact same thing other scientists and I do when we write our scientific papers. Another venue for getting feedback here on campus is the CSUCI Writing Center. You may drop in anytime to the Writing Center (Broom Library, 2nd Floor north) for feedback on one of your drafts. If possible, make an appointment ahead of time with the Writing Center switchboard (x8409) or e-mail (Writing.Tutors@csuci.edu).

DISABILITY STATEMENT:

I am committed to equal educational opportunities for all of my students. Students with disabilities will receive reasonable accommodation for learning and evaluation. Students with disabilities should contact our Disability Accommodation Services in BT 1541 or phone them at x3331 anytime between 8:30 AM and 5:30 PM AM. Anyone interested in being a note taker for Disability Accommodation Services for this or any other class should feel free to contact them (they will even pay you for your notes).
COURSE LOGISTICS

Please note that any written assignments are due at the start of class on their assigned date. Material submitted after the start of class will be considered late and marked down substantially. Non-exam material submitted more than 24 hours after the due date will receive zero points. If you know you will be tardy or miss class due to illness or other unavoidable circumstance, I strongly encourage you to submit an electronic version of your assignment via Blackboard by the start of the respective class (but such electronic submissions do not eliminate the need for you to submit your assignment in printed form before the next class meeting).

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HOW TO DO WELL IN THIS COURSE:

Focus on learning, not on your grade. Make sure you complete all of the assignments on time and do a thorough job. If you interact with the material and complete all course assignments, a good grade should come naturally. If you focus on cramming for quizzes or exams, you will miss out on most of what you are here for. This course should be fun and rewarding. Although it needs to be taken seriously and responsibly, this course should not create undo stress and anxiety. If you are having trouble with the assignments, not doing well on the exams, or having any other problems, please talk to me after class or in my office hours.

Please note that this syllabus is subject to change.
Sample Wetland Characterization Template (used for exams):

Wetland Profile Assignment
Dr. Anderson’s Spring 2008 ESRM 352 Course

Current Status

Site Name:

Location (County and 1-sentence description of location):

Lat & Lon (center of site):

2008 Wetland extent (in ha):

1850 wetland extent (in ha):

Wetland Type (riparian, salt marsh, etc):

Map (include arrows to show major surface inflows/outflows):

Directions to access (or view) site:

Photos (≥2 general landscape, 1 “characteristic” image, 1 aerial CaliforniaCoastline.org, Google Earth, or similar):

Overall current assessment of this site in 2008 (1 sentence):

Current Site Summary (1 paragraph):

Restoration Activities to Date (or Potential Actions) Summary (1-3 paragraphs):

Management History (including significant dates of actions, and publications about the site):

Ecological Community Characterization:

Landscape Context:

Major Hydrologic Constraints:

Restoration Planning

Your Proposed Restoration Efforts (include justifications from theory, etc.):

Your First Three Priorities for Improved Management of Site:

Greatest Current or Future Impediment to Restoration of Ecological Function:

Species Lists (highlight any species of special concern):

Community Use, Perception, and Support for Site:
I have read our syllabus and now know what to expect from this class, both in terms of the general layout of our course and desired learning outcomes. I am aware that it is my responsibility to keep up with all assigned reading and submit all my assignments by their deadlines. Missing deadlines or not keeping up with our readings will harm both my assignment grade and overall performance in our course. I also understand that studying in groups, frequently reviewing past material, and copying over/revising my notes is a great way to improve my grade and (more importantly) boost my comprehension of Restoration topics.

Name (please print neatly): _________________________________________

Signature: _______________________________________________________

Today’s Date: ____________________________________________________