Applied Ecology

EHS 212
Winter 2018

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Class meeting: Mon/Wed 1:00-2:50 pm
71-257 CHS
Office hours: By appointment

Course overview

The objective of *Applied Ecology* is to provide insight into how ecological theory and principles can be applied to solving environmental problems. *Applied Ecology* covers a variety of current environmental issues, organized into the following four general themes: (1) methods for detecting environmental impacts, (2) conservation biology, (3) restoring damaged ecosystems, and (4) ecological effects and mitigation alternatives for global climate change.

Course Philosophy

This course is designed to provide students with opportunities for active engagement in learning the material. Class participation is critically important, as is appropriate preparation before class.

Lectures will focus on providing a high-level overview of topics, with much of the class time devoted to discussions. It is essential that students do the readings before class so they will be prepared to contribute to the discussions. Course effort will include compilation and critical evaluation of the applied ecological literature on specific topics, in-class discussions, presentations, and effective writing for scientific and general audiences.

In addition to the specific subject matter, this course emphasizes the development of two skills that are essential for the success of every scientist: critical thinking, and clear written and oral communication.

Prerequisites

This course assumes knowledge of the basic ecological principles that provide the foundation for applied ecology, including population growth and dynamics, species interactions (such as competition, predation and mutualism), community structure, and ecosystem processes. Students without a firm ecological background will need to acquire a working knowledge of this material through additional reading; any good ecology textbook (such as Ricklefs' *Economy of Nature*) will suffice.

Reading

Required readings will be available on the course CCLE site (available through My UCLA or https://ccle.ucla.edu/course/view/18W-ENVHLT212-1). Class discussions depend on the assigned reading, so all of the readings for each class session must be completed **before** class.

Course Learning Objectives

Upon completion of this course, you should be able to demonstrate the skills listed as "Course Learning Objectives" below. These learning objectives were selected to help you build competencies required for the MPH, MS and PhD programs (see http://ph.ucla.edu/current-students/programmatic-competencies). Note: the listed competencies have been developed to identify the competencies master's and PhD students in Environmental Health Sciences should have developed by the time they graduate; they have no direct relevance to students in other graduate programs, although of course many would be useful for any environmental scientist.

COURSE LEARNING OBJECTIVES
1. Understand different approaches for assessing environmental impacts, with an emphasis on sampling design, including the assumptions and limitations of common assessment methods; evaluate the appropriateness of a particular sampling design for assessing a specific environmental impact; and design a rigorous impact assessment study based on general ecological and statistical principals.
2. Articulate the basic elements of restoration ecology and how to mitigate environmental impacts.
3. Articulate the basic elements of conservation biology, focusing on scientific aspects of the biodiversity crisis, including analytical approaches to preserving species and communities and designing refuges.
4. Understand the ecological aspects of global change, including ecologically based methods for mitigating greenhouse gas emissions and approaches for managing natural resources in a changing world.
5. Synthesize applied ecological principals and knowledge in order to solve novel ecological problems.
6. Present information about a complex topic in an organized formal presentation (written and oral).
7. Critically evaluate and discuss popular and scientific literature about applied ecological issues.

HOW THESE LEARNING OBJECTIVES ALIGN WITH COMPETENCIES FOR SPECIFIC DEGREE PROGRAMS IN THE SCHOOL OF PUBLIC HEALTH			
MPH Core Competencies (for all MPH students)	***EHS MPH Discipline-Specific Competencies (for MPH students in the EHS concentration)***	***EHS MS Competencies***	***EHS PhD Competencies***
A9. Interpret results of statistical analyses found in public health studies.	I9.1. Explain climate change and likely direct and indirect impacts on environment and health.	A1. Retrieve and organize literature; synthesize and critically evaluate scientific literature in environmental health, public health and other relevant fields.	A1. Judge, critique and interpret reports of individual environmental health studies; evaluate strengths and limitations of environmental health reports.
A10. Develop written and oral presentations based on statistical analyses for both public health professionals and educated lay audiences.	I9.2. Define major approaches for climate change mitigation and adaptation in California and internationally.	A3. Evaluate seminars and presentations in environmental health and distill the critical and salient issues from them.	D1. Apply scientific and statistical reasoning and methods to address, analyze, and solve problems in public health.
C1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents.	I10.1. Organize information and data, prepare technical reports and give oral presentations on environmental contaminants and impacts.	B2. Evaluate the scientific merit and feasibility of study designs.	D3. Make appropriate policy recommendations on the basis of research results and interpretation.
F5. Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities.	I10.2 Communicate effectively with diverse audiences.	B4. Identify potential sources of systematic error (bias) as well as random error.	E1. Gauge the cultural background, knowledge base and skills of an audience to appropriately customize communications for the target audience.
F8. Engage in dialogue and learning from others to advance public health goals.	I11.1 Present cogent and well substantiated arguments for actions to address environmental health concerns.	D1. Make reasonable inferences from results of analysis of observational and analytic studies.	E2. Organize and make oral presentations to professionals ranging from brief scientific presentations of research findings to longer presentations.
		E1. Prepare presentation materials including outlines, posters, and Powerpoint presentations.	
		E2. Deliver effective oral presentations individually and as part of a team.	
		E3 Explain and interpret research findings for students, professionals, the public, and media.	

Grading

Grades will be based on written assignments and oral presentations. Points will be allocated as indicated below.

Written assignments	
Briefing paper	150 pts
Research question and proposed study design	50 pts
Research proposal	300 pts
Presentations	
Current research lightning talks (2)	100 pts
Current controversies presentations	100 pts
Research proposal presentation	100 pts
TOTAL	800 pts

Written assignments

There will be three written assignments: a briefing paper and two assignments associated with a research proposal (a description of the research question and proposed study design, and the research proposal). Both of these papers will cover the same topic but from different perspectives. The briefing paper focuses on communicating an applied ecology topic to a non-scientific audience, while the research proposal provides an opportunity to focus on more scientific aspects of applied ecology by developing a research question and the methods to answer it.

Each student will choose a topic for the briefing paper and research proposal in consultation with the instructor. Any topic in applied ecology is acceptable, but the briefing paper will be more effective if it concerns a topic that is directly relevant to management or legislative action, particularly if there is controversy or uncertainty about the topic. (These same characteristics will make a good research proposal.) Examination of current applied ecology news can help identify good topics for the briefing paper and proposal; one good source for news is Above the Fold from Environmental Health News (http://www.environmentalhealthnews.org). Important current topics can also be identified by examining recent issues of relevant journals, including *Conservation Biology*, *Ecological Applications*, *Restoration Ecology*, *Frontiers in Ecology and the Environment*, and *Global Change Biology*.

The topic of the briefing paper and the research proposal is due January 24.

Written assignments must be uploaded to the course CCLE site by the due date; late assignments will be penalized 10% of the assignment's points per day.

Briefing paper (150 pts)

Scientists need to communicate information via a number of different means. An important skill for applied ecologists is to be able to communicate complex scientific information to managers, executives, policy makers, or decision makers in a concise and understandable manner. This is often accomplished through written briefing papers.

The briefing paper should be directed towards a decision maker such as a legislator or head of an agency. More detail about what goes into a briefing paper is provided separately, available on the course CCLE site. And example of a briefing paper is also provided on the course CCLE site. To help you organize your paper, you should develop a message box, as discussed during the Science Communication lecture. A separate page with the message box should be appended to the end of your briefing paper.

The briefing paper is due February 15. The briefing paper can be up to six pages long (12 pt font, 1" margins, double-spaced).

Research proposal

Developing compelling research proposals is an important skill for researchers from all disciplines. An effective proposal relies on a thorough understanding of the relevant literature, a clear conception of the research question, and careful development of appropriate study design and methodology. For this class, each student will write a research proposal on the general topic of the briefing paper. In contrast to the briefing paper, which focuses on communicating scientific ideas to a non-scientific audience, the research proposal is directed at a scientific audience.

There are two assignments for the research grant proposal: (1) the research questions (50 pts), and (2) the proposal itself (300 pts).

Research question and proposed methodology

A successful research proposal depends on a clear articulation of research question, which in turn depends on a good understanding of relevant literature on the topic and especially the "data gaps," or research needs that have not yet been filled. In addition, a clear, well thought-out study plan is required. The research question assignment will help you refine your research question and propose an appropriate study design for answering it well in advance of the full proposal being due. The research question assignment should be a few paragraphs (less than one page) containing the background/context for the research question (why it is important and what research need it fills), the question itself, and the proposed study design for answering the question.

The research question and proposed methodology assignment is due February 21.

Research proposal

In addition to a thorough (but targeted) literature review and clear research questions, an effective research proposal must contain a clear, well thought-out study plan. The study plan must include a description of a study design and appropriate methodology that can answer the research questions posed.

Guidelines for writing an effective proposal will be available on the course CCLE site.

The proposal is due March 19. The proposal can be up to ten pages long (12 pt font, 1" margins, double-spaced), not including the literature cited.

Presentations

Three types of presentations will be graded: (1) research lightning talks, (2) a presentation on one of the current controversies in applied ecology, and (3) a presentation on the research proposal.

Current research lightning talks (2@50 pts each = 100 pts)

Lightning talks are being used increasingly often at conferences to present research in a rapid-fire manner that keeps the audience interested and entertained and results in maximally efficient delivery of information. There are various names and formats used, but all rely on a short time to make your point. Tips for giving lightning talks can be found at http://www.perl.com/pub/2004/07/30/lightningtalk.html. Information about about how to give an Ignite talk (another name used) can be found at http://scottberkun.com/2009/how-to-give-a-great-ignite-talk/. This advice doesn't apply perfectly to the talks for this class, but the general ideas are helpful.

For this course, lightning talks will focus on current applied ecology research. Lightning talks will be given for two of the themes in the course: conservation biology (on Feb 7) and restoration ecology (on Feb 26). Each student will present a lightning talk on each date. Students will pick a paper published in a recent issue of a relevant journal; a list of possible journals will be provided. Students will present the essential results and lessons from the research paper, bringing in additional context as necessary, in a lightning talk that lasts 5 minutes. Each talk will have 10 slides, which will advance automatically every 30 seconds.

Current controversies debate (100 pts)

The current controversies presentations will cover controversial topics currently being vigorously debated in the applied ecology literature. There will be two students presenting for each current controversies topic, each arguing one side of the controversy. This should be viewed as a debate about the topic, so each student should argue their position as persuasively as possible. Each student will participate in one current controversies presentation.

There will be a current controversies discussion for three of the four main themes of the course (conservation biology, restoration ecology and global change). Relevant papers will be chosen by the student and posted by the instructor on the class CCLE site. Note that the assigned readings for the course provide an introduction into each controversy for the whole class, but the debating students are expected to conduct their own research into the topic to support their positions.

These presentations will be structured like a debate. Each speaker will have five minutes for an opening statement, followed by 2 minutes for a response, and then a final two minutes for a closing statement. There will be class discussion and peer evaluation of the presentation after the discussion.

Research proposal presentation (100 pts)

At the end of the course (March 14), each student will present the highlights of their research proposal.

Each student's presentation should be no longer than 5 minutes. There will be a brief class discussion after each presentation and peer evaluation of the presentation after the discussion.

Because it can be challenging to fit all the presentations and discussions into one class period, students must submit their presentations to the instructor ***before*** the class period. Presentations must be emailed to the instructor by NOON on March 14.

Class participation

Class participation is essential for this course. Every student is expected to be an active and well-informed participant in all class discussions. Class participation includes discussion of news reports, questions and discussion about lecture material, discussion about paper critiques, questions and discussion about class presentations, and critiques of student presentations.

Completing the assigned reading before class is essential for you to be a well-informed participant.

Note about file names: Do not name your files with a generic name such as "assignment 1.docx". There may be files with the same name from ten different students! Your file names should include your last name, a descriptive title, and often the date (to keep track of versions, such as "Smith briefing paper 2-14-15.docx". This is good practice for naming all of your files, not just the files for this course.

Date	Class Topic	Reading (CE=critical evaluation)
Jan 8	**Introduction and Overview** Course overview Human impacts and environmental sustainability	WWF 2016 (Chapters 2 & 4)
Jan 10	**Environmental assessment** Overview	Karr 1991
Jan 15	Martin Luther King Holiday	
Jan 17	**Environmental assessment** Statistics, impact assessment designs	Schroeter et al. 1993 CE: Shaffer and Buhl 2016 HOMEWORK: statistical power
Jan 22	**Environmental assessment** Statistical power: Homework small group discussion Other types of environmental assessments	Wiens and Parker 1995
Jan 24	**Environmental assessment** Study design in-class exercise **Conservation Biology** Overview ***Topic for research proposal and briefing paper due***	WWF 2016 Chapter 1
Jan 29	**Conservation Biology** Threats to biodiversity Biology of Extinctions	CE: Edwards et al. 2017
Jan 31	**Conservation Biology** Current controversies	TBD
Feb 5	**Science communication** **Conservation Biology** Conservation biology solutions	Whiteley et al. 2015 Seddon et al. 2014
Feb 7	**Conservation Biology** Conservation biology lightning talks **Restoration Ecology** Overview	Palmer et al. 1997 Perring et al. 2015
Feb 12	**Restoration Ecology** Case studies ***Briefing paper due***	Moore et al. 1999 CE: Vincent et al. 2015
Feb 14	**Restoration Ecology** Current controversies	TBD

Feb 19	Presidents Day Holiday	
Feb 21	**Restoration Ecology** Restoration ecology solutions **Developing research questions** ***Research question and proposed study design due***	O'Connor et al. 2015 Elwha Dam Removal: http://projects.seattletimes.com/2016/elwha/
Feb 26	**Restoration Ecology** Restoration Ecology lightning talks **Writing research proposals**	
Feb 28	**Global change** Overview Ecological effects of global climate change	Sheffers et al. 2016 CE: Doropoulos et al. 2012
Mar 5	**Global change** Mitigation and adaptation	Murdiyarso et al. 2015 Cheong et al. 2013
Mar 7	**Global change** Current controversies: Geoengineering Assisted migration	TBD
Mar 12	**Global change** Global change solutions	Matzek et al. 2015
Mar 14	**Research proposal presentations** ***Research proposal due March 19***	