EE 264 Conservation Biology

Winter 2016 • 4 Units

Tu/Th 9:30-10:50am, Steinhaus (SH) 267

Course Description: This course will focus on the causes and consequences of changes in biological diversity and the concepts and theories in ecology that have the greatest potential for conserving biological diversity. The recurrent question will be: how can we apply ecology to improve conservation of species and ecosystems and maintain the services they provide? In this class, we will explore the scientific evidence showing how and why Earth's biological resources are being altered, and focus on identifying creative applications of ecology and areas of research that will mitigate human impacts on biodiversity.

Recommended text: Kareiva, P. and M. Marvier. 2015. *Conservation science: Balancing the needs of people and nature*. Roberts and Company Publishers, Inc. Greenwood Village, CO.

There are times when I will skip over what I view to be prerequisites for a graduate class, and Kareiva and Marvier is a good place to fill in any gaps. I will also use it as the base for some of my lecture materials. It is likely that any advanced Conservation Biology text could serve a similar purpose for you. I have put a copy of this text on loan at the Science Library available for checkout for a 24-hour period if you choose not to purchase it. Much of the content for this course comes directly from the peer-reviewed literature, which I will make available as PDF's on the course website.

It is expected that students will have knowledge of ecology equivalent to an undergraduate text such as *The Economy of Nature*, Ricklefs. I am happy to loan one to you if you find it is needed.

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Office: SH 361; Hours: Tuesdays 12-2pm

Course Learning Objectives:

1. Acquire a strong background in ecological principles relevant to the conservation of plants, animals and ecosystems at multiple spatial scales.
   Students will be able to:
   - Understand ecological and evolutionary principles that underlie biological diversity.
   - Explain proximate and ultimate threats to biodiversity and consequences of biodiversity loss.
   - Discuss concepts of biodiversity conservation in the context of public and private land management.
2. Understand the causes and consequences of common conservation challenges related to management of endangered species and ecosystems, and have practice developing sound approaches to address these challenges.
   Students will be able to:
   - Articulate the enormous responsibility humans have as global land stewards and the strengths and weaknesses of various approaches to land stewardship and biodiversity conservation.

- ➢ Identify linkages among conservation problems across biological scales (genes to landscapes) and geographical scales (local to global).
- ➢ Determine appropriate methods of inventorying biodiversity and selecting areas for protection in different contexts.
- ➢ Demonstrate a greater understanding of the scope of conservation challenges in countries outside the US, as well as in the US, and cultural differences in perceptions of problems and appropriate solutions.

3. Become proficient in accessing and critically analyzing primary literature related to conservation science, including the ability to identify knowledge gaps and research opportunities in the field.

Students will be able to:
- ➢ Apply critical reasoning skills to assessment, analysis, and synthesis of the scholarly literature related to conservation problems and solutions.
- ➢ Effectively summarize, present, and discuss scholarly literature with a group of their peers.
- ➢ Independently conduct literature-based research to develop a solution (e.g. research proposal, monitoring plan, etc.) that addresses an important conservation problem.

Course Structure: This course will be split between instructor-led activities and lecture (Tuesdays) and student-led paper and case study discussions (Thursdays). In general, suggested reading from the text and required literature should be completed by Tuesday and papers or case studies assigned by student discussion-leaders by Thursday each week. Each student will be required to present/lead discussion 2-3 times each quarter.

Assignments and Grading:
The grading scale will be A = 90-100%, B = 80-89.9%, C = 70-79.9%, D = 60-69.9%.

Grades will be assigned based on performance in the four categories below.

I. *Class Discussions and Case Study Presentations, 25%*
The goal of student-led class discussions and presentations of case studies is to give students practice in reading and critically evaluating scientific literature so they learn to reliably evaluate the evidence for and against certain conservation practices and begin to identify knowledge gaps and open questions in the field. There are two components to your grade for this assignment:

a) *Leading class discussion / presenting a case study (15%)*
Pairs or individual students will be assigned to lead class discussion each Thursday beginning in Week 2. This includes:
- Selecting 1-2 papers for reading with instructor approval and uploading to the course website by Sunday night prior to your assigned discussion day.
- Posting 3-5 discussion questions on the course website by Monday of your assigned week.
- Providing a concise 15-minute case study presentation related to the assigned reading at the beginning of discussion.
- Facilitating an engaging class discussion on the papers.

b) *Participating in class discussion (10%)*
Each student is responsible for completing the assigned reading before class, posting on the class discussion board each week, and coming with answers to the posted discussion questions ready along with additional questions or comments related to the reading. All students are expected to contribute to each discussion and participation will be monitored.

II. *Review Connectivity Conservation Plans, 25%*

Conservationists have created many plans to conserve corridors, stepping stones, or a permeable matrix between natural areas. We call these connectivity conservation plans (CCP). A new project (led by the IUCN's Connectivity Conservation Specialists Group) will catalog CCPs around the world, and characterize each CCP according to its conservation goals, models and methods, types of authors, degree of stakeholder participation, spatial extent, and other attributes. More importantly, the project will determine which of these attributes (if any) are correlated with the extent to which the connectivity plan has been implemented as evidenced by government policies and conservation on the ground. The team has accumulated > 100 CCPs so far, and they need enough volunteers to ensure that at least 3 independent scorers estimate the attributes of each plan. Our class will participate in the attribute scoring and evaluation of several of these CCPs. Each student will be responsible for the evaluation of two CCPs, presenting a brief description of their assigned plans and evaluation to the class, and providing the scoring and evaluation data to the IUCN's project team. Further details on the assessment of this assignment will be provided in the project description on Canvas.

III. *Independent Conservation Project (one of two options), 25%*

Option 1. (required for MCRS students, non-MCRS students can choose between Options 1 and 2)

Each student will select a species of concern from the list of target species for the Central/Coastal Orange County NCCP (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=65723&inline). Should you have good reason / interest to select a species outside of the scope of the Orange County NCCP/HCP, please speak with the instructor for approval.

For your selected species, you will design a conservation-focused research, monitoring, or management project related to either (1) the restoration / conservation or assessment of suitable habitat for the species and/or (2) research on the ecology/behavior of the species which would produce necessary information for determining conservation or management recommendations. After conducting literature-based research on your selected species, you will write a concise project proposal that includes (at a minimum) the following:

a) A brief introduction that summarizes the scholarly literature related to your proposed project in which the need for the project, gap in knowledge, etc. is clearly articulated
b) A scope of work describing project activities, proposed timeline and expected outcomes
c) Assessment plan that identifies metrics for determining project success
d) Other relevant components depending on the focus of the project (e.g. maps, sample data)
e) Literature cited

Option 2. (appropriate for students conducting independent thesis or dissertation research; must be approved by the instructor)

You will design either (1) a conservation-focused research, monitoring, or management project related to the general topic area / study system / overarching questions of your thesis/dissertation research and/or (2) a conservation-focused education and outreach project related to the general topic area / study system / overarching questions of your thesis/dissertation research. It is my hope that this assignment will provide the foundation for continued/future research or broader impacts related to the student's ongoing thesis/dissertation work.

After conducting literature-based research on your approved project topic, you will write a concise project proposal that includes (at a minimum) the following:

a) A brief introduction that summarizes the scholarly literature related to your proposed project in which the need for the project, gap in knowledge, etc. is clearly articulated
b) A scope of work describing project activities, proposed timeline and expected outcomes
c) Assessment plan that identifies metrics for determining project success
d) Other relevant components depending on the focus of the project (e.g. maps, sample data, educational materials)
e) Literature cited

Grading breakdown for Independent Conservation Project:

- Written project draft, 5%
- Peer-review of project draft, 5%
- Written project final, 10%
- In-class presentation of final project, 5%

IV. *Midterm and Final Exams, 25%*
You will be given a take-home problem-based midterm and final exam which you will have at least 5 days to complete.

Course Schedule (subject to change): all PDFs will be made available in Canvas

Week	Day	Topics	Required Readings	Supplemental Readings
1	Tu	The history of conservation / State of the planet	Kareiva & Marvier = "K&M" K&M Ch. 1 Mace 2014	Soule 1985 Meine et al. 2006 Kareiva and Marvier 2012 State of the Planet
1	Th	Biodiversity and The Endangered Species Act	K&M Ch. 2, 4 Skim sections 2-5 from the Endangered Species Act Evans et al. 2016	Schwartz 2008
2	Tu	Global Conservation Hotspots and Priorities Biodiversity and Habitat Loss	K&M Ch. 6 Myers et al. 2000 Cardinale et al. 2012	Cincotta, et al. 2000 Myers 2003 Ceballos and Ehrlich 2006
2	Th	Presenter: Group 1 *1. Wetland Conservation status, 2. Amphibians as indicator species, 3. CA*	Reis et al. 2017 Wang et al. 2011	

		Tiger Salamander case study		
3	Tu	Population Viability Assessments I. Overview; Counts II. Demographic Analysis III. Metapopulation Dynamics	K&M Ch. 8, 9, 10	
3	Th	Assessing sensitivity or vulnerability to climate changes Presenter: Group 2	Jensen et al. 2018 Epps et al. 2004	
4	Tu	Conservation Genetics - Vulnerability assessment - Effective population size - Fragmentation - Connectivity - Assisted migration **Connectivity Conservation Plans Assigned**	K&M, Ch. 7, 10 Leidner & Haddad 2010, 2011	Keyghobadi 2007 – Review of genetic implications of habitat fragmentation for animals
4	Th	No Class- CNPS Conference		
5	Tu	Terrestrial Reserve Design CA Essential Habitat Connectivity Project case study	K&M Ch. 5, 13 Beier et al. 2008 Shafer 2001	Gilbert-Norton et al. 2010 Resasco et al. 2014 Haddad et al. 2015
5	Th	**CCP Reviews DUE** **Student Presentations on CCPs** **Take Home Midterm**		
6	Tu	Marine Reserve Design	K&M Ch. 5 pg 138-142; Ch. 6 pg 175; Ch. 15 Almany et al. 2009 Game et al. 2009	Game et al. 2008
6	Th	**Midterm Due** Independent Project Assignment Description Presenter: Group 3 *Barrier Reef Conservation and Economics Case Study*	Viana et al. 2017 White et al. 2017	
7	Tu	Invasive Species	K&M Ch. 17 Davis et al. 2011 Auema et al. 2011 Haavik et al. 2014	Sakai et al. 2001 Caut et al. 2009 Simberloff et al. 2014

7	Th	Presenter: Group 4 *Impacts of invasive species on ecosystem services and human well-being* *Marbled Crayfish case study*	Pejchar & Mooney 2009 Gutekunst et al. 2018 + newspiece	
7	Fri	**5pm Project Proposal Drafts DUE**		
8	Tu	Natural Resources Conservation - Soils - Air quality - Water supply - Sustainable harvesting - Environmental quality assessments	K&M Ch. 3, 16, 18	
8	Wed	**5PM Project Proposal Peer Reviews DUE**		
8	Th	Presenter: Group 5 *Biodiversity and Human Health impacts of woodfuel harvesting* *Bears Ears/Navajo case study*	See individual discussion roles and reading assignments from email	
9	Tu	Conservation Planning and Management for Ecosystem Functioning and Ecosystem Services	K&M Ch. 3, 12 Cardinale et al. 2012 Costanza et al. 1997 Daily et al. 2009	Nelson et al. 2009
9	Th	Presenter: Group 6 *Human perceptions, behaviors, and the intrinsic value of nature*	McDonald et al. 2014 Vucetich et al. 2015	
10	Mon	**5PM Final Project Proposals DUE**		
10	Tu	Conservation in the Anthropocene / Ex-situ Conservation Or Student Choice **Take Home Final Distributed**	K&M Ch. 11, 18, 19 Hoegh-Guldberg et al. 2008	Coral Restoration link Torreya guardians link Vitt et al. 2016 Turner et al. 2010
10	Th	**Final Project Presentations**		
Finals	Mon	**5PM Take Home Final DUE**		

Conservation Science Resources for students including literature, website links, etc. will be posted and updated on the Canvas course space.