

Climate Change and Ecosystem Conservation
CEE 273E | ESS 173E | Summer 2016

Instructor: Dr. Lauren E. Oakes | Office Hours TBA | leoakes@stanford.edu
 Mon/Wed. 3:30pm - 5:20pm | Meeting Location: TBA | Office Hours: TBD

Course Description

This course examines social and ecological effects of climate change on forest ecosystems and recommendations on management and conservation practices in a changing climate. The first part of the quarter will focus on broad-scale climate/forest interactions and the emergence of novel plant communities, change in species ranges, and climate-induced tree die-off. Students will learn about ecological thresholds and species vulnerabilities triggered by drought, fog pattern changes, snow-cover loss, and other secondary factors. The latter part of the course will focus on understanding and assessing the implications of these emerging dynamics in the human dimension. Students will utilize an ecosystem services framework to learn the ways in which impacts on forest ecosystems can affect people and consider new approaches to resource management and conservation under climate change. In-class exercises and discussion will complement lectures. The course will culminate with team-projects centered on specific species, such as Joshua tree (*Yucca brevifolia*), ancient bristlecone pine (*Pinus longaeva*), coast redwood (*Sequoia sempervirens*), or bishop pine (*Pinus muricata*). In these projects students will examine the effects of climate change on the ecosystems these species inhabit and make recommendations on conservation and management practices for species of interest.

Course Objectives

In this course, students will:

1. Develop an understanding of social and ecological importance of forest ecosystems
2. Gain an appreciation for the complexities of resource management and conservation in a changing climate
3. Build skills relevant to researching and interpreting climate change impacts in the human dimension
4. Cultivate an interest in interdisciplinary research on environmental issues through a problem-solving social-ecological approach
5. Expand effective writing and oral communication skills

Course Schedule

Week	Topic
Week 1	Session 1 – Introduction
	Session 2 – Forests and climate feedbacks: Trees in the Carbon Cycle
Week 2	Session 1 – Basic forest ecology and stand dynamics
	Session 2 – Climate stressors, thresholds, and vulnerabilities
Week 3	Session 1 – Forests in a changing climate Part 1: Novel communities, invasive species, shifting ranges
	Session 2 – Forests in a changing climate Part 2: Climate-induced forest mortality, drought and wildfire
Week 4*	Session 1 – Cascading effects: Climate stressors, ecological components and processes, ecosystem services
	Session 2 – Values of nature
Week 5*	Session 1 – Climate change in coastal California and intro to case studies
	Session 2 – Adaptation

Week 6*	Session 1 – Challenges for resource management and conservation
	Session 2 – Protected areas and “the human-dominated managed landscape”
Week 7	Session 1 – Old paradigms and new (preserve, conserve; retrospective, prospective; resist, restore, facilitate)
	Session 2 – Controversy, interventions, and policy lags
Week 8	Session 1 – Final project presentations
	Session 2 – Final project presentations

* Optional field trip will be scheduled mid-quarter, based on availability of guest instructors and arrangements with park naturalists

Final Project

Throughout the quarter, students will work in teams to provide a written report and presentation that addresses the following questions.

1. How has climate change affected your species of interest and its broader ecosystem, and what do you expect to see in the future?
2. What kinds of benefits (i.e., ecosystem services) are people deriving from your species of interest and its broader ecosystem? How might these services be impacted and where?
3. Based on the ecosystem services you identify, who are the stakeholders? (Think across scales, such as local, regional, or global.)
4. Can you find any examples of stakeholders and managers adapting practices to the impacts already occurring? Are there any “interventions” under consideration? Where?
5. What recommendations would you make to stakeholders and resource managers for adaptation? Do your recommendations for adaptive practices differ between protected areas and the “human-dominated landscape”?

Using these questions to guide their research, students will draw from peer-reviewed publications as well as “grey” literature. Students may contact non-governmental organizations, agencies (e.g., United States Forest Service), managers of protected areas (e.g., University of California Reserve System, National Park Service, California State Parks), or researchers pursuing new projects to collect relevant supporting information.

Course Units and Grading: This course is offered for 2 units with a required 1-day field trip to a nearby State Park. Students will be expected to complete an assignment from the field trip and any conflicts with the date should be discussed with the Instructor in advance. Students may select letter grade or credit/no credit. Grades given will reflect students’ knowledge of the lecture and reading material, the final project, short written quizzes, and class participation.

Grades will be calculated as follows:

- 1) Homework (3 written assignments) (45%)
- 2) Final Project (40%)
- 3) Quizzes (10%)
- 3) Class Participation (5%)

Prerequisites: Course assumes prior education in environmental science or biology. AP Environmental Science or Biology accepted. Please discuss other relevant experience or background with the Instructor.