NRS BIOL/ENVS 188 California Ecology and Conservation
Course Description & Syllabus
Fall 2015

Instructors:
1. Prof. Don Croll, Long Marine Lab, Center for Ocean Health, 100 Shaffer Road. Office: 831 459 3610; dcroll@ucsc.edu
   Lab website: http://bio.research.ucsc.edu/people/croll/
2. Dr. Gage Dayton, Administrative Director, UCSC Natural Reserves. Nat Sci Li Rm 467, Office: (831) 459-4867; Cell: (831) 227-5887; ghdayton@ucsc.edu.
   UCSC NRS website: http://ucsantacruz.ucnrs.org/
3. To be determined

Course Goals:
- Become familiar with the fauna and flora of California
- Appreciate the ecological complexity of California ecosystems
- Appreciate the geology, geography, climatology, and history that relates to the distribution and abundance of organisms
- Understand fundamental global conservation challenges
- Examine the effects of human activities on the ecosystems of California
- Understand the structure and art of ecological and conservation field research
- Practice skills in experimental design
- Obtain experience in making measurements related to population ecology, community ecology, and behavioral ecology
- Practice skills in data analysis
- Practice skills in oral presentation
- Hone scientific writing skills
- Appreciate the importance of functioning as a team while conducting biological fieldwork
- Effectively conduct field research projects from start to written report
- Have fun in the field in amazing places!

Evaluations & Grading
Project #1 Proposal 2%
Project #1 Poster 8%
Rapid Research A 2%
Stats Quiz 3%
Peer Review 5%
Project #2 Write-up 10%
Stats Quiz 3%
Rapid Research B 4%
Project #3 Write-up 18%
Dichotomous Key 2%
Habitat Brief #1 3%
Habitat Brief #2 3%
Final Field Project Proposal Oral Presentation 3%
Final Field Project Oral Presentation 6%
**General Course Description:**

*California Ecology and Conservation* will comprise the academic content of what is generally considered four on-campus lecture and laboratory courses (quarter). Lectures will include an introduction to field-based ecological research, basic principles in ecology and conservation, field experimental design, field research techniques and methods, statistics, use of the scientific literature, and scientific writing. In addition to lectures, a series of in-field workshops (pre- and post field research) will provide individualized tutoring and guidance in the design, execution, analysis, and presentation of ecological field research. The field-based portion of the study will be comprised of student-based inquiry studies. At each field location, students will be provided a collection of broad and specific papers (generally ~10 papers/location) from the scientific literature that serve to frame the habitat, theoretical questions, and past research conducted at, or relevant to, the NRS reserve.

In addition, using a workshop format, the instructors and students will develop a broad set of potential ecological/conservation studies appropriate for the location (based upon the literature, past research, and practical considerations). Students – either as individuals or in small groups – will develop specific, theoretically grounded field-based studies that can be conducted at the UC reserve within time, geographic, and practical realities. Lectures and workshops will occur throughout the course – presented in the field at individual reserves.

**General Course Structure**

Students will be in the field at University of California Natural Reserves (http://nrs.ucop.edu) for the entire duration of the course. The class will visit a total of 5 reserves. At the first 4 reserves, students will attend a series of field-focused lectures, workshops, and readings as well as execute a series of individual, small group (4 students), and entire class (28 students) field research projects aimed at providing the tools to independently conduct their own field research. These early lectures, workshops, readings, and projects will, using the framework of student-directed field projects, develop competence in conducting ecological and conservation research with emphasis on the following key topics:

- **Literature review**
  - Development of general conceptual framework for field study (theoretical context, context of specific study within current thinking, “big picture”)
  - Previous research – both review and experimental related to the study topic, including key papers
  - Specific background – studies using similar methodologies and approaches, studies conducted in similar ecological contexts, locations, etc.

- **Natural history**
  - Identification of focal and interacting species important to the study. This will include early instruction in the use of dichotomous keys and taxonomic guides (e.g., Jepson manual, vertebrate and invertebrate field guides)

- **Statistical considerations in study design**
  - Basic concepts in inductive reasoning and important concepts in inferential statistics relevant to field study design (hypothesis testing, statistics, sample size)
Development of conceptual models for field research (hypothesized direct and indirect interactions)
Identification of factors and variables for field measurement
Statistical considerations for sampling
  ▪ Randomization, systematic, stratified sampling, bias (both general and for specific sampling methods)
  ▪ Types of data (continuous vs. interval, etc.)
  ▪ Sample size and power, using published literature and preliminary data

Field methods and practical considerations
Specific tools to measure field variables (e.g., quadrats, transects, distance sampling, line-intercept, point sampling, vertebrate and invertebrate trapping, mark-recapture, behavioral sampling)
Time, money and sample size tradeoffs
Allocation of resources (personnel and funding)
Computers and other electronic tools in the field

Execution of field research
Data collection in the field, adapting protocols and sampling design in the field
Data entry in the field
Pilot studies and rethinking field study design

Preliminary data analysis
Preliminary data summary and visualization, power analysis
Data-driven adjustment of field study design

Data analysis and visualization
Basic data summary and visualization using Excel and JMP
Statistical considerations – which tests to use
  ▪ General linear models
  ▪ Correlation and regression (linear and non-linear)
  ▪ Multivariate statistics (e.g., multiple regression, ordination, clustering, discriminant analysis)

Scientific writing
General framework and specific contents
Scientific writing: outlining, paragraph structure, grammar
Literature searches (e.g., Web of Knowledge, Google Scholar)
Bibliographies (use of on line bibliographic software, e.g., Mendeley, Zotero)
Critical review

At the final reserve, students will conduct (in groups) an independent field study where they will develop and execute the entire project independently. The results of the final project will be presented as a scientific paper, written in the style of journal articles published in Ecology or Conservation Biology, as well as a 20-minute oral presentation.

Required Course Textbooks
Additional References


Additional Natural Reserve Course Readings – to be assigned in advance of each reserve visit

The UC Natural Reserve System website supports a link to an updated bibliography for each NRS reserve, hosted through the Zotero portal. Students should familiarize themselves with this online bibliographic database to learn more about each reserve, research that has been conducted at the NRS reserves, and to inform each of you about potential research projects for this class. See http://nrs.ucop.edu/bibliography.htm
NRS BIOL/ENVS 189 Critical Conservation Issues in California
Course Description & Syllabus
Fall 2015

This is a 2.3 semester unit course that is a required supplement to the *California Ecology and Conservation* course for students from semester campuses. This concurrent additional course is comprised of a review of the biodiversity threats and approaches to conservation in California. Students will gain a foundational knowledge of the history, theory, and principles of conservation biology, applied to the state of California. The course will emphasize student-initiated topics, independent research, and communication.

Initially, students will work independently with instructor oversight to develop a broad list of the species, habitats, and processes that are at-risk in California due to anthropogenic activities. Using the peer-reviewed and gray literature, students will initially work together and subsequently as a group to develop a ranked list of biodiversity threats in the State. From this list, students will select individual areas of focus that they will explore through the remainder of the course to a systematic review paper.

**Systematic Review Paper**
During the first two weeks, students will work as a group to develop a set of potential topics. From this, students will develop a proposal for a specific systematic review. The major assignment for the course will be a 3-5 page systematic review paper. A systematic review is a review of the scientific literature that follows a strict protocol to summarize available evidence and objectively assess the impact of an action or effectiveness of an intervention. By writing a systematic review, students will gain an in-depth understanding of one area of conservation science, demonstrate their ability to synthesize the primary literature and communicate the results to a scientific audience, develop skills in peer review and revision, and (optional) make a contribution by submitting their paper for publication.

**Oral Presentation**
Students will present their research results in a 15-minute presentation during the penultimate week of the quarter.

**Grading**
- Proposal 20%
- Written Review Paper 60%
- Oral Presentation 20%