

Introduction to Environmental Field Methods

This course introduces you to the start-to-finish process of field science. We will cover a range of field skills and methods in ecology, but the emphasis is on how they fit into the larger process of conducting investigations to guide conservation, restoration, management, and basic scientific understanding. At the end of this course you will be familiar with the scientific method; development of strong research questions; study design; data collection, exploration, analysis; and the interpretation and communication of findings. You will know some natural history and have the tools to learn and record more. You will have the basic tools to evaluate other research efforts in detail.

This is a hard course. You will need a willingness to work energetically during field outings as well as in and after class, a working knowledge of basic statistics and stats software, time to read, and the ability to work in groups with your peers on several assignments. Because this is a five-unit course packed into five weeks, it will be intensive. And with only 10 class periods, you MUST consistently attend class periods, as the class will move quickly and there's a risk that you could get left behind.

This is also a fun and rewarding course. You will get to know each other well, get dirty, spend time outside, and learn a lot if you put in the effort.

Instructor

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Texts

- 1) Ambrose, HW, III, KP Ambrose, DJ Emlen, and KL Bright. 2007. *A Handbook of Biological Investigation* (7th ed.). Hunter Textbooks, Knoxville, TN, 198 pp.
- 2) Elzinga, CL, DW Salzer, JW Willoughby, and JP Gibbs. 2001. *Monitoring Plant and Animal Populations*. Blackwell Science, Malden, MA, 360 pp.

Both books are required and available at the campus bookstore and on reserve at the Science Library.

Additional papers and readings will be made available through eCommons.

Additional required resource: a field notebook. Please see below and the additional handout.

Field Journals

For this course, you will use a combination field notebook and field journal to build your observation, note taking, and natural history skills, and to build a durable record of your field activities and observations this summer (and beyond!). There should be an entry in your journal for every trip you make into the field, whether it is a part of this course or not.

Your journal should be turned in at the end of class on Mon, August 25 so that we can return them to you before the end of the quarter. Because maintenance of your journal is a daily responsibility, late journals will not be accepted. We will grade your journal on accuracy, format, clarity, completeness, neatness, and attention to detail.

Field Trips

First and foremost this class will emphasize hands-on research and reporting. Most weeks, we will spend part of the time in the classroom and the remaining hours in the field at sites including the upper campus, Younger Lagoon, and other coastal sites between Sunset Beach and Franklin Point. We will meet and leave on time at our designated meeting points. **If you are late, we can't wait for you.** You cannot generally make up field exercises.

It's a privilege to do research in the UCSC reserves, as well as in state parks and beaches. At times we will be working in areas that are closed to the public. This means we have a few rules:

- The reserve managers have the ultimate authority. You must listen to them. Please let me know if there are any problems.
- Except for data, you may not collect ANYTHING inside the Reserves or State Parks (no shells, etc.) or anywhere else you do field work with the class or as part of your final projects.
- Being a student in this class does NOT give you permission to be in the park or reserve restricted areas without the class unless previously arranged.

Preparing for the Field

A key to being able to assimilate information outdoors is comfort. Study in the field often requires that you be still for long periods of time, either quietly viewing the subject at hand, or quietly waiting for your subject to come into closer view.

- Eat well before and during field trips. Don't hesitate to carry snacks with you. Nuts, raisins, fresh or dried fruit, or chocolate (non-melty!) are good choices. A quart/liter-sized container of **water is essential**.
- Dress in layers, so garments can be added or subtracted to maintain body temperature in cold, windy weather, or if the temperature gets very warm. A shirt and outer sweater (preferably wool or fleece), along with a vest and/or windbreaker, make a good combination. You don't have to wear them all at once! Wear sturdy pants (shorts are often a disaster in the field) and closed shoes with socks and some traction, such as tennis shoes. Carry both a warm hat and a sun hat (e.g. baseball cap or a wide-brimmed hat). Light long-sleeved shirts are a very good option for hot, sunny conditions. Long pants and sturdy shoes are often best, even if it's hot.
- Consider lip protection, sunscreen, and sunglasses (especially UV blocking models).
- Our labs happen rain or shine. During the summer, rain is highly unlikely, but if there's any question, bring rain gear – a rain jacket and pants (Gore-Tex, rubberized plastic, etc.), and a wide-brimmed or baseball cap to keep the rain out of your eyes. Pack your field notebook and other non-waterproof items in Ziploc bags inside your pack. For rainy days, pencil is often easier to manage than pen, and if the wind isn't blowing an umbrella can help keep data recording dry.
- For bird study, gloves, not mittens, are a better choice, since it's easier to adjust the focus of your binoculars while wearing gloves.

POISON OAK: You can do a few things to minimize this problem: (1) be able to identify it in all of its insidious forms; (2) wear long pants and a long sleeve shirt if you are sensitive; and (3) get it off yourself as soon as possible. Your first line of defense is to rinse with COLD water as soon as possible, e.g., in a creek or the ocean. When you get home, use Tecnu as per the instructions. (4) After field trips, wash your field clothes – separately if you can – to get the oil out of your clothing. THERE IS POISON OAK AT YOUNGER LAGOON. Be respectful of others – even if you aren't sensitive to it, many others are. If you touch poison oak with shared equipment, someone else will be exposed to it. The oil in poison oak (urushiol) that people react to can last a very long time, so it won't wear off on its own. Make sure shared equipment is clean.

TICKS: Ticks give you the chance to experience parasitism as well as practice the mutual grooming techniques you have seen other primates do in documentaries. The best prevention is to check for them periodically and especially in the shower post-field. Besides the obvious (e.g. arms and legs), check nooks and crannies: hairline, behind ears, neck/waist/bra/sock lines, groin, armpits. If you find a tick that has not burrowed into your skin, remove it and dispose of it somewhere that it won't find someone else to burrow into. If you have an "attached" tick, do not just pull on it – you are likely to remove the body while leaving the head in your skin – you must gently twist and pull with tweezers to get the whole tick out and avoid infection risk. Ask for help.

Things to Bring

- Field notebook with pens and pencils
- Watch: weatherproof and digital. Stopwatch function is also useful
- Binoculars, if you can get your hands on some: used for LOTS of things
- Field guides, if you have them – plants, birds, and intertidal natural history are especially useful
- Food and drink
- Daypack

Research Equipment

We will be using a wide range of research equipment – from transect tapes to binoculars to computers. This only works if we all take responsibility for caring for it, and making sure it gets put back so that others can use it. Be conscientious. Also, it is common that equipment breaks or needs maintenance. We won't yell at you or charge you extra for breaking stuff (unless it's been gross negligence!). Don't put away a damaged or non-functional piece of equipment. Let someone know so that we can fix it or replace it.

Computers and Data Analysis

Scientists and resource managers use computers. Hopefully you have (or have access to) a laptop that is not too ancient. For this class you will need:

- Word
- Excel
- Powerpoint
- JMP (free download for students at its.ucsc.edu)
- E-mail that you check on a regular basis; crucial to class and group communication.

If you have data analysis questions, it is crucial that you come prepared – with data entered and opened in JMP to confirm that the format is correct. When required for class, make sure presentations are prepped and ready to load onto a presentation computer.

Cell phones, iPods, etc.

Please turn off and put away cell phones, iPods, etc. during class time, including while doing fieldwork with the class. You will survive and chances are you will get to know the environment and your classmates better without them. I also ask you to NOT use your cell phones on field trips except for emergency or logistical coordination reasons. Also, be aware that in some field locations, cell phone coverage won't be available.

Grading

Field skills	12%
Field Journal	90
Dichotomous key	30
Other science skills	3%
Journal article discussion	30
Field write-ups	22%
Terrace vegetation sampling lab	40
Dune vegetation sampling lab	60
Intertidal sampling lab	60
Wetlands activity write-up/discussion	30

Final project	32%
Final project proposal	30
Final project paper	120
Final paper peer review	40
Final project poster	70
Final project oral presentation	60
Exams	21%
Exam 1	70
Exam 2	70
Exam 3	70
Participation	10%
Class participation	95
Online course evaluation	5
Other	3%
TBD	30
TOTAL	1000

Summer Session Students with Disabilities

If you qualify for classroom accommodations because of a disability, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me as soon as possible, preferably within the first week of the Summer Session. Contact DRC by phone at [831-459-2089](tel:831-459-2089) or by email at drc@ucsc.edu for more information.

Wk	Class dates		Where to meet	Class activities (L=lecture, D=discussion, A=activity)	Tests	Assignments	Due dates	Reading DUE	
<i>Note that class activities & assignments may be subject to change, so pay attention to such announcements during class!</i>								Ambrose et al.	Elzinga et al.
1	28-Jul	M	Nat Sci Annex 102	D: Overview of class L: Intro to env. research methods D: Keeping a field notebook & journal A: Observations & questions; dichotomous keys L/D: Sampling units & terrace vegetation exercise		Get a field notebook by next class, 7/30 Make a dichotomous key; due beginning of next class, 7/30			
	30-Jul	W	LML Whale	D: Younger Lagoon Natural Reserve A: Habitat mapping A: Coastal terrace plant ID & vegetation sampling (Beth Howard and Tim Brown).		Send terrace vegetation data by end of day JMP tutorial, by next class, 8/4 Terrace vegetation sampling write-up, due next W, 8/6	Dichotomous key and specimens	Ch. 1-6	
	31-Jul	Th @ 6pm	Nat Sci Annex	A: Small mammal trap deployment (Gage Dayton)					
	1-Aug	Fr @ 7am	Nat Sci Annex	A: Small mammal trap sampling (Gage Dayton)					
2	4-Aug	M	Sunset Beach	A: Coastal dune vegetation sampling A: JMP stats tune-up	Exam 1	Identify unknowns and enter data in spreadsheet		Ch. 7-8	Ch. 1- 6 & pp. 75-88, 101-134, 205-224
	6-Aug	W	Franklin Point	A: Coastal dune vegetation sampling D: Coastal dune vegetation hypotheses D: Reading and writing scientific papers		Send dune vegetation data by end of the day Dune vegetation sampling write-up, due next W, 8/13 Journal articles for discussion (groups A & B)	Terrace vegetation sampling write-up	Ch. 9-13	Appendix II and pp. 149-172,

Other dates:

ADD deadline: W 7/30

3	11-Aug	M @ 6am	De Anza Santa Cruz	A: Intertidal sampling (guest naturalist: Pete Raimondi) L & demo: Using statistics	Exam 2	Enter intertidal data			pp. 231-245
	13-Aug	W @ 6:30 am	Davenport Landing	A: Intertidal sampling (guest naturalist: Laura Anderson) D: Journal article (A & B) discussions D: Scientific presentations and posters		Send intertidal data by end of the day Develop draft proposal for final project, due COB Th, 8/14 Intertidal sampling write-up, due next W, 8/20 Journal articles for discussion (groups C & D)	Dune vegetation sampling write-up Journal article disc. (teams A & B)	Ch. 14	
4	18-Aug	M	LML	L: Water quality and coastal ecosystems (Kim Null) A: Younger Lagoon sampling D: Journal article (C) discussion	Exam 3	Revise proposal for final project, due end of T, 8/19	Journal article disc. (team C)		
	20-Aug	W	Nat Sci Annex 102	L: Wetland rapid ecological assessment: CRAM (Ross Clark & Kevin O'Connor) A: Wetland assessment D: Journal article (D) discussion		Draft final project report, due at the beginning of class, M 8/25 Journal article for discussion (group E)	Intertidal sampling write-up Journal article disc. (team D)		
5	25-Aug	M	Nat Sci Annex 102	D: Jobs and grad school D: How to do peer review A: Peer review exercise for final papers A: TBD		Peer review of draft final project reports in class TBD	Draft final project report at beginning of class Field journals at end of class		
	27-Aug	W	Nat Sci Annex 102	D: Journal article (E) discussion A: Final presentations			Journal article disc. (team E) Final project poster presentations Final project reports due COB, F 8/29		