

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 also have basic skills to evaluate other research efforts.

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, get dirty, spend time outside, and learn a lot if you put in the effort.

Instructor

Dan Brumbaugh
Institute of Marine Sciences
Long Marine Laboratory, COH Tr 9, Rm 103
office hours: TBD & by appointment

(831) 332-6933 cell (*business hrs)
dbrumbaugh@ucsc.edu

TA

Josie Lesage
Environmental Studies
office hours: T 12:45-1:45pm @ Kelly's
W 3:30-4:30pm @ Lulu Carpenter's
(downtown, Pacific Ave.)
& by appointment

(714) 833-4945 cell (*business hrs)
jclesage@ucsc.edu

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 S&E Library.

Additional 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 both a field notebook and a field journal to build your observation, note taking, and natural history skills, and to create 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 during the course, and ideally, additional entries from other forays outside of class sessions.

Your journal should be turned in at the beginning of class on Tues, July 21 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. See the “Field Notebook and Journal” handout for more details on how to use your notebook and journal, suggested types to buy, what to include in each, and in what formats.

Field Trips

This class will emphasize hands-on, experiential 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 Younger Lagoon Research Reserve, and other coastal sites between Sunset Beach (Watsonville) and Franklin Point (towards Pescadero). 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 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, or other fresh or dried fruit 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 **sunscreen**, sunglasses (especially UV blocking models), and lip protection.
- **Be prepared** – 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.
- Because you'll have to work with your hands (to write in a notebook, use a transect tape, adjust binoculars, etc.), if it's cold enough, gloves are generally a better choice than mittens.

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 AND OTHER SITES we will visit. 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 easily wear off on its own. Make sure shared equipment stays clean.

TICKS: The best prevention is to wear long sleeves and long pants, with the latter tucked into your socks, to create as much clothing barrier as possible between you and the ticks. Then, check for them periodically clinging on your clothes, 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, and arm pits. 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 and journal, with pens and pencils.
- Watch: weatherproof and digital. Stopwatch function is also useful.
- Binoculars, if you have some, can be used for LOTS of things. If you don't have but need access to binocs, it may be possible to check out a pair from the university.
- Camera: stand-alone digital model or on your phone, for visual records organisms (e.g., to be identified later), habitats, or field methods (e.g., for presentations). Note that phone cameras are pretty good for close-ups, but generally poor for zooming in on more-distant subjects.
- Field guides, if you have them – coastal plants and intertidal natural history are especially useful.
- Food and drink
- Daypack

Course Equipment

We will be using a wide range of research equipment – from clipboards, field guides, transect tapes, quadrats, magnifiers, etc. 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 there was 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, as well as e-Commons, that you check regularly; 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 do not use cell phones for making non-class, non-emergency related calls, texting, or doing social media during class time, either in the classroom or the field. Note that cell phone coverage won't be available in some field locations. Also, please refrain from using iPods, iPads, or other such devices to listen to music, play games, etc. When we're in the class and the field together, our job is to communicate with and learn from one another, and to observe and hear what nature has to offer.

Grading

Field & other skills	15%
Field Journal	100
Dichotomous key	20
Journal article discussion leading	30
Field write-ups	19%
Coastal Terrace lab	40
Rocky Intertidal lab	60
Coastal Dune lab	60
Wetlands activity write-up/discussion	30
Final Project	27%
Final project proposal	20
Final project write-up, draft	60
Peer review of draft write-up	40
Final project poster	60
Final project poster presentation	50
Final project write-up, final	40

Exams & Quizzes	25%
Exam 1	70
Exam 2	70
Exam 3	70
Quiz 1	10
Quiz 2	10
Quiz 3	10
Quiz 4	10
Participation	14%
Class participation	135
Online course evaluation	5
TOTAL	1000

Most assignments that are turned in late without prior arrangement will be docked 10% per day, up to one week after the original deadline; after one week, late work will receive a zero. Journals, posters, and final project write-ups will not be accepted late.

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	23-Jun	T	Lg Disc 128	D: Overview of class L: Intro to the env. research process D: Keeping a field notebook & journal A: Observations & questions; dichotomous keys L/D: Sampling units & terrace plant exercise		Get a field notebook by next class, 6/30 Make a dichotomous key; due beginning of next class, 6/25			
	25-Jun	Th	Lg Disc 128 Younger Lagoon	D: Younger Lagoon Natural Reserve A: Field observations, questions, and habitat mapping (Beth Howard) L/D: Sampling units & terrace plant exercise (cont.)		Field journal entries JMP tutorial, by next class, T 6/30	Dichotomous key and specimens	Ch. 1-6	
2	30-Jun	T	Lg Disc 128 Coastal Terrace	A: Coastal terrace plant ID & surveying (Beth Howard) D/A: Excel spreadsheet & JMP stats tune-ups	Exam 1	Field journal entries Enter terrace data in spreadsheet and send by end of the day		Ch. 7-8	Ch. 1- 6 & pp. 75-88, 101-134, 205-224
	2-Jul	Th @ 6:30 am	Lg Disc 128 Davenport Landing	A: Intertidal surveying (guest naturalists: Melissa Redfield) L/D: Coastal dune plant assemblage hypotheses D: Reading and writing scientific papers		Field journal entries Send intertidal data by end of the day Intertidal write-up, due next Th, 7/9 Journal articles for discussion (groups A & B)	Terrace write-up	Ch. 9-13	Appendix II and pp. 149-172,

Other important dates:

ADD deadline: W 6/25

DROP deadline: Sun 6/29

WITHDRAW period: M 6/30 – F 7/10

3	7-Jul	T	Lg Disc 128 Sunset Beach	A: Coastal dune plant surveying D: Presenting science: Leading discussions, giving talks, and posters	Exam 2	Field journal entries Send dune data by end of the day Journal articles for discussion (group C)			pp. 231- 245
	9-Jul	Th	Lg Disc 128 Franklin Point	A: Coastal dune plant surveying D: Journal article (A & B) discussions	Quiz 1	Field journal entries Send dune data by end of the day Draft proposal for final project, due 5pm F, 7/10 Dune write-up, due Th, 7/16 Journal articles for discussion (group D)	Intertidal write-up Journal article disc. (teams A & B)	Ch. 14	
4	14-Jul	T	Lg Disc 128 San Lorenzo River	L: Wetland rapid ecological assessment: CRAM (Ross Clark & Kevin O'Connor) A: Wetland assessment D: Journal article (C) discussion	Exam 3	Revise proposal for final project, due 5pm W, 7/15 Journal article for discussion (group E)	Journal article disc. (team C)		
	16-Jul	Th	Lg Disc 128 Younger Lagoon	L: Water quality and coastal ecosystems (Kim Null) A: Younger Lagoon sampling (Beth Howard & Tim Brown) D: Journal article (D) discussion	Quiz 2	Draft final project report, due T 7/21 Journal article for discussion (group F)	Dune write-up Journal article disc. (team D)		
5	21-Jul	T	Lg Disc 128	D: How to do peer review A: Peer review exercise for final papers D: Journal article (E) discussion	Quiz 3	Peer review of draft final project reports in class	Draft final project report (2 copies!) at beginning of class Journal article disc. (team E) Field journals		
	23-Jul	Th	Lg Disc 128	D: Journal article (F) discussion A: Final presentations	Quiz 4		Journal article disc. (team F) Final project poster presentations Final project reports due COB, F 7/24		

Week	1		2		3		4		5	
Day	T, 6/23	Th, 6/25	T, 6/30	Th, 7/2	T, 7/7	Th, 7/9	T, 7/14	Th, 7/16	T, 7/21	Th, 7/23
Dichotomous Key	→									
Field Journal	→									
Coastal Terrace			→							
Rocky Intertidal				→						
Coastal Dunes					→					
Final Project					→					
wetland CRAM							█			
Younger BioBlitz & water quality								█		
Ambrose et al. readings	█					█				
Elzinga et al readings		█								
Journal article discussions					█					