



Strategies for Ecology Education, Development and Sustainability

SEEDS Field Trip Report

**Jasper Ridge Biological Preserve – Stanford University
June 22-28, 2003**

Field Trip Overview

Student field trips, one component of the Strategies for Ecology Education, Development and Sustainability (SEEDS) Program, aim to foster greater student identification with ecology through field experiences. From June 22-28, 2003 SEEDS supported a student field trip to Northern California highlighting Stanford University's Jasper Ridge Biological Preserve and other local ecological sites including the Hopkins Marine Station of Stanford University, the Marine Science Institute, the Monterey Bay Aquarium, and the Plant Gene Expression Center of the University of California and the United States Department of Agriculture (USDA). Attendees included seventeen students from ten schools, three SEEDS faculty, three staff from the Ecological Society of America (ESA), and one participant from the All Nations Louis Stokes Alliance for Minority Participation (ANLSAMP). See Appendix A for a list of attendees. A list of presenters can be found in Appendix B. The primary goals of the field trip were to provide students with an overview of several interesting and ecologically important field sites; expose students to the practical application of ecology at field stations, research laboratories and other locations; and to build student awareness of various ecological internship, degree, and career options.

The first two days of the field trip were spent at the Jasper Ridge Biological Preserve where participants hiked through several of the ecosystems in the Preserve, conducted a biotic creek survey, and learned about some of the research being done in the Preserve. The third day participants visited the UC Berkeley/USDA Plant Gene Expression Center where students learned about some of the Center's research. The visit to the Center was followed by some free time around the UC Berkeley campus and San Francisco. The last two days of the field trip offered an opportunity to learn more about marine ecosystems. On Thursday, participants visited the Hopkins Marine Station and the neighboring Monterey Bay Aquarium. The last day of the field trip, participants visited the Marine Science Institute. During the field trip, participants stayed in the Muwekma-Tah-Ruk house on the Stanford University campus. A full itinerary of the field trip can be found in Appendix B.

Monday, June 23, 2003

Participants began their field trip experience with two full days at the Jasper Ridge Biological Preserve. Jasper Ridge is located near Stanford University's campus in the eastern foothills of the Santa Cruz Mountains. An undeveloped jewel set amidst a rapidly urbanizing area, the Preserve provides refuge to native plants and animals, rich educational experiences to students and docent-led visitors, and a rare natural laboratory for researchers from all over the world. The

Preserve encompasses remarkable geologic, topographic, and biotic diversity within its 481 hectares (1,189 acres), including one of the few formally preserved serpentine grasslands in the world and the only freshwater lake in California managed primarily for research and instruction. These unique features, along with the Preserve's chaparral slopes, mixed evergreen forests, oak woodlands, and freshwater wetlands, provide researchers, students and visitors with a rare opportunity to experience many of the ecosystems that were once extensive in this part of California. For more information about Jasper Ridge visit <http://jasper1.stanford.edu/>

Monday morning participants arrived to Jasper Ridge and were welcomed by the Preserve's Administrative Director, Dr. Phillippe Cohen. Dr. Cohen gave an overview of the purpose of the Preserve as well as the sustainable design and construction of the Leslie Shao-Ming Sun Field Station.

Cindy Wilber, Program Coordinator, Justin Holl, Program Assistant, and Bill Gomez, Docent, then led three groups of participants on a guided tour, highlighting some of the ecosystem diversity and wildlife in the Preserve.

During lunch, Dr. Tom Mudd, docent and researcher at Jasper Ridge, gave a presentation on bats and some of his research at the Preserve. In his presentation, he addressed some of the common misconceptions about bats, the diversity of bats among the two orders: Microptera and Megaoptera and a wide range of topics including: evolutionary path, flight, reproduction, birth and rearing, habitat, ecological role, and predators and threats. Dr. Mudd's research at the Preserve includes identifying bat species by recording echolocation pulses and trying to determine how season, weather, lunar phase, lake levels, insect populations, etc. affect the activity of bats.

In the afternoon, Dr. Alan Launer, Stanford University Campus Biologist, and his student assistant (aka creek monkey), Ramon Roullard, helped participants to set various traps for the biotic creek survey.

Tuesday, June 24, 2003

The second day at Jasper Ridge began with a welcome by Dr. Pamela Matson, Dean of the School of Earth Sciences and Professor in Environmental Studies at Stanford University and Past President of ESA. Dr. Matson gave an overview of the University's use of the Preserve for research and student coursework. She also briefly talked about her interdisciplinary research in Hawaii and Baja, Mexico.

Dr. Matson's welcome was followed by an overview of the Jasper Ridge Global Change Experiment. The Jasper Ridge Global Change Project examines the response of California grassland to four components of global change: elevated atmospheric carbon dioxide, elevated temperature, altered precipitation, and increased nitrogen deposition. To incorporate climate warming and study all treatments in field plots, the experiments use a new technology (FACE, or free-air CO₂ enrichment) in which the level of CO₂ is increased by emitting concentrated CO₂ from vertical pipes encircling the two-meter diameter study plots. Temperature is raised with infrared heaters, precipitation is augmented by drip irrigation, and nitrogen is added by slow release from encapsulated ammonium nitrate. For each of the four variables, there are two levels

of treatment: ambient (unaltered) and elevated. The experimental design includes 8 replicate quarter-circle plots for all possible combinations of the four treatments (128 total) and an additional 8 sampling sites that control for the effects of project infrastructure. Studies focus on four integrated components of ecosystem response to the treatments: plant primary production, soil carbon storage, soil nutrient availability, and species or functional-group composition. To learn more, visit <http://globalecology.stanford.edu/DGE/Dukes/JRGCE/home.html>.

At the site, Dr. Nona Chiariello, a staff person with the Experiment and Jasper Ridge Science Coordinator, demonstrated the equipment used to monitor root growth. Roots are monitored with a small video camera inserted into transparent observation tubes that extend under each quadrant. Root growth and turnover is determined from a time series of video images of roots growing outside the tube. The images show roots, root hairs, and even fungi on those hairs. Soil samples also monitor whether there is an increase or decrease in production. From soil core samples the experiment has shown less root growth under elevated carbon dioxide conditions, but it's yet unknown if this is from slower growth or root death.

Dr. Chris Field, co-principal investigator, demonstrated the spectrometer which measures light at different wavelengths. It allows for a generalized measurement of how much aboveground biomass is in a plot as well as the kinds of plant matter. It can also be used to help develop equations for satellites to look at the world.

Dr. Jeff Dukes, a post-doctoral researcher, demonstrated the use of a light sensor which measures how much shade there is at different levels of the canopy. This is determined by how many of the sensors on the wand are above or below the threshold. The threshold was set at fifty-percent of the sensors in shade and fifty-percent of the sensors in light.

In the afternoon, participants collected the traps set the previous day. Dr. Launer also shocked several areas of the creek to demonstrate another method used to sample fish diversity. Dr. Charles Carter, Stanford University Planner/Architect and avid fisherman, helped participants cast lines from the top of the dam. Species collected included Crayfish, Roach Minnows, Rainbow Trout, Steelhead, Sunfish, Suckers, and Large Mouth Bass.

The day ended with a lovely barbecue dinner at the home of Dr. Pam Matson.

Wednesday, June 25, 2003

Wednesday began with a visit to the Plant Gene Expression Center which is a unique collaboration of the Agricultural Research Service of the USDA and the Plant and Microbial Biology Department of the University of California. To learn more about the center visit <http://www.pgec.usda.gov>.

Dr. Jim Tepperman, a specialist in the lab of Dr. Peter Quail, gave an overview of the purpose of the Center which is to conduct fundamental research in plant molecular biology and to participate in an international effort to sequence plant genomes. Sequencing the complete genomes of model organisms has greatly facilitated the identification of genes that are important for both basic biological and disease-related processes. The lab determined the complete sequence of chromosome 1 of *Arabidopsis thaliana* (mustard weed) in December of 2000.

Dr. Vijay Sharma, a post-doctoral researcher in the lab of Dr. Jennifer Fletcher, gave an overview of the *Arabidopsis thaliana* genome. He talked about how the Center looks at normal and mutant strains to try and determine the components of the signal transduction pathways responsible for the perception of environmental and cellular cues.

At the Center, Dr. Michele Engel, a post-doctoral fellow in the lab of Dr. Sheila McCormick, talked about her work with the pollen development and interactions at fertilization in corn and mustard weed including functional analysis of gamete gene expression. After receiving her undergraduate and doctoral degrees from the University of California, Dr. Engel started her post-doctoral research under a USDA seed grant and now works under a genomics grant from the National Science Foundation. In advice to participants, she stressed the importance of good writing and publishing. She also recommended not choosing a “hot topic” for research because more advanced researchers will get faster results and publish first.

Dr. Katie Krolkowski, a post-doctoral researcher in the lab of Dr. Sarah Hake, showed participants various areas of the greenhouse where mustard weed, rice, and corn are grown and where she conducts her research. She demonstrated the self-fertilization technique that is used for corn. In her advice to participants, she recommended that students really think about what pace of research and results they need to stay motivated. She also stressed the importance of cultural diversity in science and the recognition that change happens slowly.

The visit to the Center was followed by some time to walk around the campus of the University of California, Berkeley and the famous Telegraph Avenue. Participants then went to Chinatown in San Francisco for some free time and a group dinner. The day ended with a stop at Justin Holl’s house across from the beach.

Thursday, June 26, 2003

Joanna Nelson and Caren Braby welcomed the field trip participants to the Hopkins Marine Station. Joanna Nelson is an interdisciplinary science educator in the laboratory of Dr. Mark Denny. Caren Braby, a Ph.D. candidate in the lab of Dr. George Somero, researches *Mytilus* as a model for understanding the interaction between physiological adaptation and species invasions.

Hopkins Marine Station is a marine biology research and educational facility that operates as a branch of Stanford University's Department of Biological Sciences. Founded in 1892, Hopkins was the first marine laboratory to be established on the American Pacific coast. Since that time, many notable scientists, as well as a continuous population of undergraduate and graduate students have come to the Station to study and work towards a better understanding of the marine world. The Station is located in Pacific Grove, on the Monterey Peninsula, which forms the Southern shore of Monterey Bay. It lies in a region of scenic beauty and historic interest, 90 miles south of Stanford's main campus in Palo Alto. For more information about the Station, visit <http://www-marine.stanford.edu/>.

The visit began with Catherine Munsch, a research assistant, giving an overview of the research of Dr. Stephen Palumbi’s lab which works with population genetics and sequencing of West Coast mussels. They study the ecology of marine organisms along the shoreline and how far

down the coast certain species are and how this might affect fishing. Dr. Palumbi then introduced a video of a group of his that went to Chinatown, San Francisco to buy shark fins in order to sequence the DNA to determine the species. Joanna and Caren led two groups on a tour of the Station, featuring Cannery Row, the Tuna Research Conservation Center, and the library with highlights of the history of the Station.

Dr. George Somero, Director of the Hopkins Marine Station, talked about how his lab looks at biochemistry, molecular biology, physiology, etc. to determine how organisms have adapted to their marine environment. They try to determine what lethal levels for salinity, temperature, etc. are and study species that high both wide and narrow tolerances. One project has studied heat shock response and repair proteins. Caren also spoke about her work with invasive mussels and determining the physiological differences between native and nonnative mussels, including heart rate changes in response to temperature changes.

While at the Hopkins Marine Station, Susie Rodrigues of the Muwekma Ohlone tribe spoke to the participants about the history of the tribe and her work in the archeological digs. Dr. Laura Jones, Stanford University Campus Archeologist, talked about the three sites on the Station's land: one Chinese fishing village and two prehistoric Native American sites. In their excavation, they look at "kitchen trash" including stoves, food remains, etc. There is uncertainty why the people were where they were considering it was a cold, windy and exposed location and they hope to determine if they lived there or if there was trade resource exploitation. Dr. Julia Hammett, a paleoethnobiologist from Truckee Meadows Community College, studies charred shells on the sites.

Participants walked to the neighboring Monterey Bay Aquarium and toured the impressive facility. The exhibits show the hidden world of Monterey Bay, a spectacular ocean realm at the heart of the nation's largest marine sanctuary. The exhibits re-create the bay's habitats, from shallow tide pools to the open ocean and deep sea. For more information on the aquarium, visit <http://www.mbayaq.org/>.

Melissa Jurgensen-Armstrong, SEEDS Regional Coordinator, joined the field trip participants at the Aquarium and participated in the activities for Thursday and Friday.

Thursday ended with dinner at Phil's Fish Market.

Friday, June 27, 2003

Friday featured a visit to the Marine Science Institute, a nonprofit science and environmental education organization offering hands-on programs that excite students of all ages about science. For more information on the Marine Science Institute, visit <http://www.sfbaymsi.org/>.

Dennis Rogers, Land Program Coordinator, began the visit by giving an overview of the San Francisco Bay. Water for the Bay comes from precipitation and both the San Joaquin and Sacramento Rivers and because the depth of the Bay is only 8-12 feet, organisms are adapted to little wave action. The Bay is quite young; seventy percent of the biomass of invertebrates was not there in 1850. The Bay is one of the most predominant places for marine invasive species.

Participants used a mud catcher to bring up a mud sample from the Bay. Several species of invertebrates were identified. Participants rotated to the marine mammal station where samples of baleen and toothed whales were on display. Finally, participants finished with a fish seine. An ichthyology overview was given highlighting fish fins and the differences between top, middle, and bottom-dwelling fish. The day concluded with fish identification. Species identified included the Staghorn Sculpin, the Stony Surf Perch, the Starry Flounder, and the Diamond Turbit.

The last field trip event was a barbecue dinner at the Muwekma house. Simha Reddy, an undergraduate student at Stanford, and Radika Bhaskar, a graduate student in the Biological Sciences Department at Stanford, joined the participants and shared some of their experience with the students.

Field Trip Evaluations Summary

Overall, the feedback on the evaluations was extremely positive. The field trip was described as “action-packed, one-in-million, educational, inspirational and the best experience ever had.” When asked what accomplishments were achieved, responses included: being pushed to new levels, making friendships and connections with other students interested in ecology, putting together career goals and aspirations, clarifying which fields to pursue, meeting people who are at the top of their fields, getting motivation for graduate school, learning about Pacific coastal ecosystems, setting a new goal of helping other minorities see the possibilities in ecology, learning about the wide variety of research areas in ecology, and defining research interests.

Suggestions for improvement included: more evening outings or activities; a better description of daily activities; more hands-on activities incorporated with the lectures; more information on internships, jobs, and graduate school; daily evaluations; more faculty-student interaction; more variety in the meals; inviting more graduate students to speak to the participants; better housing; and having participants keep a journal and notes of the field experience.

Appendix A Field Trip Attendees

Students		
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Appendix B Field Trip Itinerary

Sunday, June 22nd

Afternoon	participants arrive to San Jose airport and take shuttles to Stanford University Xanadu Residence Office for housing registration after registering, walk to the Muwekwa-Tah-Ruk house where we'll be staying
6:00 pm	dinner on campus
7:00-8:00 pm	icebreaker SEEDS field trip orientation
evening	free time

Monday, June 23rd

7:30 am	breakfast on campus, pick up box lunch
8:00 am	vans depart for Jasper Ridge Biological Preserve (JRBP)
8:30 am – 12 noon	welcome and overview of Sun Field Station: Philippe Cohen guided tour of Jasper Ridge: Cindy Wilber, Justin Holl, Bill Gomez
12 noon	box lunch at JRBP
12:30-2:00 pm	bat presentation: Tom Mudd
2:00 – 4:00 pm	set creek traps for biotic survey: Alan Launer, Ramon Roullard
5:00 pm	vans depart for Stanford University
6:00 pm	dinner on campus
evening	free time

Tuesday, June 24th

7:30 am	breakfast on campus, pick up box lunch
8:00 am	vans depart for JRBP
8:30 am – 12 noon	Earth systems overview: Pam Matson Global Climate Change Experiment: Nona Chiariello, Chris Field, Jeff Dukes
12 noon	box lunch at JRBP
12:30-3:30 pm	pull creek traps and identify organisms: Alan Launer, Ramon Roullard fishing from the dam: Charles Carter
3:30 pm	vans depart for Stanford University
6:00 pm	dinner on campus at the home of Pam Matson
evening	free time

Wednesday, June 25th

7:30 am	breakfast on campus, pick up box lunch
8:00 am	vans depart for University of California/USDA Plant Gene Expression Center
9:00 am -12 noon	participants learn about the Center and its research: Jim Tepperman, Vijay Sharma, Michele Engel, and Katie Krolikowski
12 noon	box lunch at the Center

afternoon/evening dinner and free time in San Francisco, followed by get together at Justin Holl's house in San Francisco (across the street from the beach)
8:00 pm vans depart for Stanford University
evening free time

Thursday, June 26th

7:30 am breakfast on campus, pick up box lunch
8:00 am vans depart for Hopkins Marine Station
9:30 am -12:30 pm tour of the Station and research highlights: Joanna Nelson, Caren Braby, Catherine Munsch, Steven Palumbi, George Somero
12:30 pm box lunch at Hopkins
Overview of the history of the Muwekma Ohlone tribe: Susie Rodrigues
Overview of the archeological dig at Hopkins: Laura Jones, Julia Hammett
afternoon A tour of the Monterey Bay Aquarium
5:00 pm vans depart for Stanford University, dinner en route at Phil's fish market
evening free time

Friday, June 27th

7:30 am breakfast on campus
8:00 am vans depart for Marine Science Institute
8:30 – 11:00 Shore-side program rotation at the Institute: Dennis Rogers
12 noon box lunch on the road
6:30 pm Barbecue dinner on campus: Vimha Reddy and Radika Bhaskar
evening free time

Saturday, June 28th

morning participants depart
shuttles to San Jose airports

Appendix C

Field Trip Presenters/Coordinators

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Barbecue at Muwekma

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