

2023 - 2024 Annual Report

UC Santa Cruz

Fort Ord Natural Reserve

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Summary



This report provides an overview of activity at UC Santa Cruz Fort Ord Natural Reserve (FONR), in Marina, California for the fiscal year 2023-2024. FONR is a 610-acre reserve that protects maritime chaparral, coastal scrub, grassland, and oak woodland on part of the former Fort Ord army base. Reserve staff and interns monitor and maintain habitat for multiple protected species throughout the reserve. As part of the University of California Natural Reserve System, FONR provides a living laboratory and outdoor classroom for researchers, K-12 students, university students and faculty, and the greater Monterey Bay community.

The Fort Ord Natural Reserve consists of maritime chaparral habitat that is home to many rare and endemic species, as well as grasslands, coastal scrub, and oak woodland habitat. For much of the 20th century the land



was occupied by the Fort Ord US Army Base. FONR staff now uses the reserve to serve the community; helping to achieve regional conservation and education goals by supporting research, education, and outreach. The site was chosen as a UC Reserve due to the unique vegetation communities and the numerous sensitive and listed plant and animal species that occur throughout the reserve (including the federally endangered, state threatened Monterey gilia, state endangered seaside bird's beak, and the federally threatened Monterey spineflower).

In 2023-2024 Reserve Director Joe Miller was assisted by student employees, as well as multiple UC and CSU interns and volunteers. Instructors from UCSC, CSU Monterey Bay, Cabrillo College, and other California institutions continued use reserve resources. New partner institutions visited in 2023-2024, including new K-12 groups and university classes. Represented disciplines included environmental science, ecological assessment, biology, ecology, and environmental studies, scientific illustration, and others. This year we offered internship opportunities, continued flora and fauna monitoring, and experiential learning opportunities in the form multiple staff-led 3–4-day workshops.



Graduate students from UC Santa Cruz and CSU Monterey Bay embarked on research work about plant and animal interactions, rattlesnake activity, horned lizard ecology, and more. Students and Faculty from San José State University studied fence lizards and visited with ecology students. Years-long data collection was continued by FONR affiliated students and visiting classes. These and more about ongoing research on UCSC FONR is included in the research section of this report.





FONR staff improved facilities, including small updates and maintenance of our fencing, workshop, and outdoor classroom area. Staff also continued to assist Army contractors with continued environmental cleanup onsite. FONR staff engages with federal contractors during this work to ensure protection of habitats and natural resources on the reserve. New partnerships were formed with local nonprofit organizations, university internship agencies, and educational institutions. UCSC FONR stayed actively engaged in efforts to facilitate research on adjacent protected lands, as well as on reserve property.

In service to greater University of California goals in the Southern Monterey Bay area, FONR staff, student employees, and interns assisted University of California Monterey Bay Education, Science and Technology



Center (UCMBEST Center) with stewardship on an additional 400 acres of open space adjacent to the natural reserve in Marina, CA. This work included trespass abatement and invasive plant monitoring. FONR staff led restoration efforts of state and federally protected rare plant species, as part of a mitigation related to MBEST lands that have potential for future university led development. As with most reserve activities, FONR staff included many UCSC, CSU Monterey Bay, and community College students in these activities to create hands on learning opportunities for those entering the natural science and land management fields.



Reserve visitation numbers hold steady, with individual users and user-days on par with the previous year. In total the reserve hosted 1596 Individual users, on 2657 user days. Research use was slightly lower this fiscal year, while class use was higher.



Gratitude for Professor Laurel Fox



We would like to recognize the career of UCSC Professor Laurel Fox in her retirement from UC Santa Cruz Ecology and Evolutionary Biology department and as the Faculty Advisor of Fort Ford Natural Reserve. Laurel has been, and continues to be, an advocate for the Natural Reserves and teacher to many students, staff, and faculty.

She was integral in the preservation of the former Fort Ord lands that are now known as UCSC Fort Ord Natural Reserve, as well as their inclusion in the University of California Natural Reserve System. Fort Ord Natural Reserve would not exist today if it weren't for Laurel's hard work and dedication to establishing and maintaining the reserve. Her research has focused on understanding the abiotic and biotic factors that shape the community structure of maritime chaparral. Her work has inspired many a student and has been an important resource for land managers throughout the region working to protect and conserve this rare habitat. Truly serving as inspiration for the next generation of land managers and ecologists. While Laurel is entering retirement, we know she is not done with her work on the reserve or continuing to dedicate time to helping with the Natural Reserves.



Thank you, Laurel! Your generosity, mentorship, knowledge, and ecology research are an inextricable part of the Fort Ord Natural Reserve story.



Education

Class Use



In fiscal year 2023/2024 FONR staff supported a variety of class use that spanned multiple disciplines. Most existing classes that visit the reserve each year were maintained, and several new courses added reserve visits. Hundreds of undergraduate students gain important first impressions of the conserved natural spaces at FONR through direct engagement with the Reserve Director onsite. Reserve hikes that detail habitats and unique flora and fauna, CDFW permitted animal handling demonstrations, conversations with staff and interns about professional development, and other direct experiences are all part of the services that FONR staff strives to provide each year. Reserve staff also meets regularly for one-on-one mentorship with students who are working on individual projects for their UC Santa Cruz and CSU Monterey Bay classes. We were pleased to host Cabrillo College Extension Field Illustration classes for the first time. We were also fortunate to add special Spring field trips for all 4th grade classes from La Gloria Elementary School in Gonzales, CA, which was funded by a grant from the Monterey County fish and Game Commission. These trips are detailed below in the Public



Service section of this report. In addition to reserve field trips, FONR staff and students made several in-class visits to preschool through 4th grade classes. In 2023/24 we were also able to continue an ongoing class program with a local charter high school, Learning for Life, where students visit FONR multiple times each semester to learn about local natural history and career pathways in natural science and conservation. We added botanical studies and more interaction with university undergraduate researchers to this program.

FONR is roughly 45 minutes from the UCSC campus, minutes away from CSU Monterey Bay, and within about an hour of several other higher education institutions in the greater Bay Area. The site is a favorite location for classes due to ease of access to a field student site, as well as no cost overnight accommodations for classes at the reserve's outdoor classroom and campsite. Represented classes included a wide variety of disciplines including biology, ecology, environmental studies, earth sciences, agriculture, digital media and art from multiple institutions (Table 1).



Table 1. Fort Ord Natural Reserve Class Use FY 2023/2024

California Community College		
BIOE 209C Coastal Field Studies	Cuesta College	Laurie McConnico
BIO 11C Ecology	Cabrillo College	Allison Gong
Field Illustration	Cabrillo College Extension	Megan Painter
California State University		
AGPS 372 Agricultural Entomology	CSU Monterey Bay	Kelly Barr
BIO 196 Biology Introductory Research Practicum	CSU Monterey Bay	Gerick Bergsma
SICP 509 Botanical Illustration	CSU Monterey Bay	Andrea Dingledein
ENVS 240 Environmental Biology	CSU Monterey Bay	Kelly Barr
ENV 350 42892 42502 Quantitative Field Methods	CSU Monterey Bay	Robert Burton
ENV 44203 Environmental Impact Analysis	CSU Monterey Bay	Robert Burton
BIO 364 Mammalogy	CSU Monterey Bay	Jennifer Duggan
BIO 360 Natural History of California Wildlife	CSU Monterey Bay	Jennifer Duggan
ENVS 464 Wildlife Management and Conservation	CSU Monterey Bay	Jennifer Duggan
BIO 3795 CSUMB Service Learning	CSU Monterey Bay	Joe Miller (Agency Supervisor)
ENVS 189 Coastal Field Studies	San José State University	Rachel Lazzeri-Aerts
University of California		
Coastal Media Project	UC Santa Barbara	Summer Gray
BIOE 20f Field Biology in Practice	UC Santa Cruz	Abraham Borker
BIOE 114I Herpetological Research	UC Santa Cruz	Sean Reilly
BIOE 82 Introduction to Field Research	UC Santa Cruz	Kristen Heady, Allison Gong, Sean Reilly, Gage Dayton
UC California Naturalist Program	UC Santa Cruz	Linda Anderson

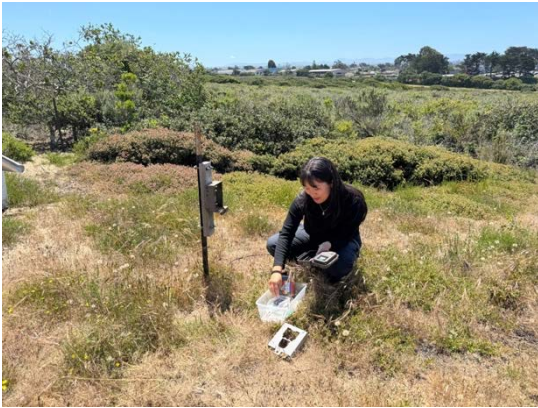
ENVS 83 183 Environmental Studies Internship	UC Santa Cruz	Joe Miller (Agency Sponsor)
ENVS 18 Scientific Illustration	UC Santa Cruz	Brett Bell
BIOE 117 Systematic Botany	UC Santa Cruz	Kathleen Kay
BIOE 281 Ecology lab	UC Santa Cruz	Ari Martínez
ENVS 160 Restoration Ecology	UC Santa Cruz	Karen Holl
K-12 Schools		
Pre K – 1 st Grade classes	Marina Vista Elementary, Marina CA	Staff
Pre K – 1 st Grade classes	Ione Olsen Elementary, Marina CA	Staff
Pre K – 1 st Grade classes	J.C. Crumpton Elementary, Marina CA	Staff
4 th Grade classes	La Gloria Elementary, Gonzales CA	Staff
Natural History (Life Science)	Learning For Life Charter School	Staff
Preschool and Pre-K Classes	Holy Cross School, Santa Cruz CA	Staff

Undergraduate Research and Independent Projects



Multiple undergraduate research and monitoring projects were supported by UCSC FONR staff in 2023-2024. Students from UCSC and CSUMB worked on independent projects including but not limited to herpetology, mammalogy, plant disease ecology, community ecology research, scientific illustration and entomology. These projects involve many hours of individual mentorship by FONR staff and create great collaboration opportunities between reserve staff and faculty of supporting institutions. See “Current Research” below for listing of individual projects.

Internship and Volunteer Program



In 2023-2024 FONR staff hosted over 50 volunteer and internship positions that served participants from UCSC, CSU Monterey Bay and other local schools. Interns were involved in a wide variety of stewardship, ecology, public service, research installations, rare plant restoration, and outdoor education. Agencies that provide class credit for these internships include the UC Santa Cruz Environmental Studies Internship Program, CSUMB Science Internship Program, CSUMB Habitat Stewardship Project, and the CSUMB Service-Learning Institute. FONR interns gain valuable experience while they assist staff in facilitating research, education, and public outreach. Interns

are involved in a wide variety of activities including field data collection, repair and maintenance of reserve facilities, land stewardship, rare plant surveys, invasive species control, assisting with classes, reptile and amphibian monitoring, small mammal trapping, avian point counts, working with k-12 and public outreach efforts, and faculty research projects. Interns make connections and learn from the larger conservation community through a variety of projects. We engage with professionals from the Bureau of Land Management, California Department of Fish and Wildlife, US Fish and Wildlife Service, Elkhorn Slough Foundation, California State Parks, California Native Plant Society, and local universities. Undergraduates who participate in internships at FONR gain research and practical skills, connect with faculty and other students, and get real world experience that cannot be acquired in a traditional classroom.



Public Service Highlights

La Gloria Elementary 4th Grade Field Trips



In April of 2024 very fortunate to host all 4th grade classes from La Gloria Elementary School on a “Nature Detectives” field trip. Learning with them about ecology and local flora and fauna was the best! Students from UC Santa Cruz and CSU Monterey Bay were on hand to lead hikes, host learning programs, and help show these awesome 4th Graders what it’s like to study natural science at a university.

A week before the visit, FONR Director and students visited the school to talk to the 4th grade classes about the upcoming trip, what to expect, and what subjects they might be

interested in learning more about. On the reserve, we covered the topics of herpetology, mammalogy, botany, entomology, ornithology, and ecology in small group presentations and field demonstrations.

This trip was funded through a grant from the Monterey County Fish and Game commission, and we are grateful for the opportunity to bring these awesome kids from Gonzales, CA out to learn more about our natural reserve. We are also thankful for the amazing assistance from CSUMB Habitat Stewardship Project Monterey Bay, who help host many K-12 field trips with our UCSC interns and student employees.



Fort Ord Natural Reserve Micro-Grant Program



Undergraduate student researchers often have limited funding for their work, and traditional grant timelines historically move slower than the pace of the urgent need to gain research experience in the last 1-2 years of a university education. Sometimes grant applications do not fit the need, as most undergraduate projects require smaller funding amounts due to scope and duration. Undergraduate transfer students have even less time to make connections and are sometimes left out of the loop due to lack of knowledge of resources to support their independent projects. In previous years, UCSC Natural Reserves directors have filled in these gaps with small

purchases of research equipment and supplies, provided reserve vehicles and fuel to facilitate undergraduate projects, and have facilitated much important foundational work through sharing their time and experience-based knowledge. Fort Ord Natural Reserve has formalized at least part of this work in fiscal year 2023-2024 by announcing the Fort Ord Natural Reserve Micro-Grant Program. These micro-grants are small, one-time-only, awards given to undergraduates from local universities and community colleges who would not have other funding opportunities for their research. Funding is based on availability and student need and is specifically used to purchase supplies for research. The student research is generally required to take place onsite, under the agency sponsorship of Fort Ord Natural Reserve staff. This program is donor funded. Interested students should communicate with reserve staff for more information about how to apply.

Ecological Restoration at UCSC FONR



For over 7 years we have been restoring degraded habitats on UCSC Fort Ord Natural Reserve with the help of student volunteer interns and student employees. This work is focused on maintaining habitat for, and creating new populations of, rare seaside bird's beak and Monterey gilia plants. Both have protected status by state and federal regulation, and the work is part of an effort to mitigate for habitat loss during the planned development on the adjacent UCSC MBEST (Monterey Bay Education, Science, and Technology Center). FONR staff use this unique opportunity to enhance the natural resources on the UCSC reserve parcels, while training the next generation of land stewards and restoration ecologists with hands on experiences. Staff and students collect seed, participate in greenhouse propagation with the generous assistance of the UCSC Greenhouses staff in Santa Cruz, and plant out thousands of individual plants on the reserve each Winter and Spring. In 2023/2024 approximately 25,000 Monterey gilia were propagated on UCSC Campus and planted in Marina, and nearly 1 acre of habitat was seeded directly to grow seaside bird's beak plants.





In 2023/2024 the Reserve Director started an initiative to convert acres of non-native grassland back into more biologically diverse native plant habitat, using intensive mowing and targeted invasive plant treatments across grassy areas of the North parcel of the reserve. Initial results were promising, and the treatment is planned to continue and expand for subsequent years. Monitoring shows greatly increased presence of native annual plants, and the removal of thatch will permit sensitive state and federally listed species to repopulate the area from existing seed banks and adjacent populations.

Illustrating Fort Ord – Art Exhibition at UCSC MBEST Center

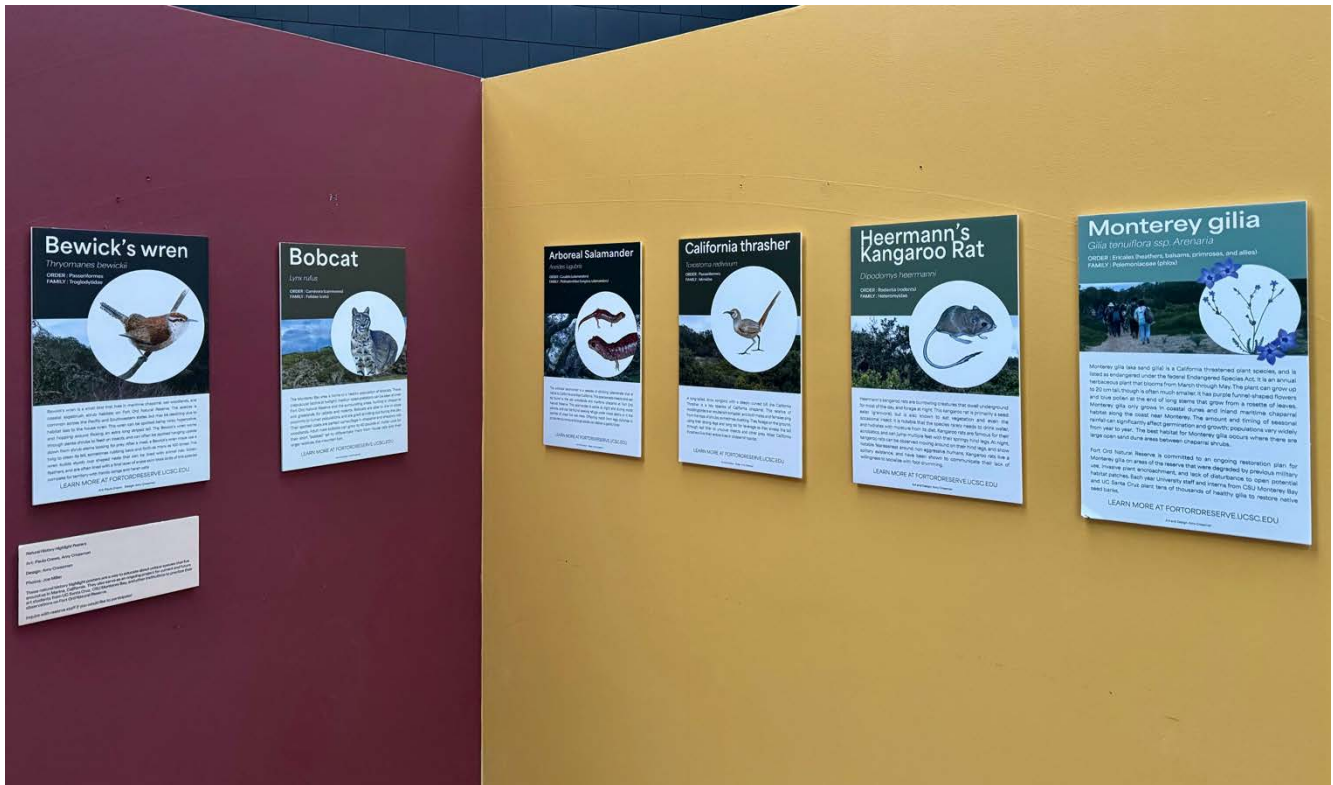
In June of 2024 we had a great time setting up our first small art show, “Illustrating Fort Ord Natural Reserve!” The show features work from the CSUMB Science Illustration program, UCSC Art student Amy Crossman, “friend of FONR” and local naturalist Brett Bell, photographs by the reserve director. The show will be in place through at least December 2024 in the UCSC MBEST Center in Marina, Ca during regular business hours Monday through Friday at 3180 Imjin Rd. Marina, CA.



Amy Crossman’s work is the result of a collaboration between the UCSC art student and FONR director. Over 2 UCSC quarters Amy worked on a series of paintings that represent the phenological changes from Winter through Spring in the special open dune habitats on the reserve. Amy also works to organize and begin an ongoing series of natural history highlight posters that will serve to educate visitors to UCSC properties in Marina, CA.



Amy Crossman's artwork was supported in part by a grant from the Norris Center for Natural History, and the show was put in place by FONR staff and student volunteers.



A'ai

Film Screening and Discussion with Ohlone/Costanoan-Esselen Nation Chairwoman Louise Miranda Ramirez, Kalie Granier, and Alexandria Casares



On March 21, 2024 at UCSC MBEST center in Marina, Ca Fort Ord Natural Reserve hosted a special screening and conversation with artist Kalie Granier and members of the Ohlone/Costanoan-Esselen Nation, Chairwoman Louise J. Miranda Ramirez and Alexandria Casares. The speakers discussed the short film, A'ai, which imagines the perspective of a pelican lamenting the recent kelp forest decline along the central California coast, warning of the consequences for the ecosystem at large. Chairwoman Ramirez and Alexandria Casares collaboratively translated the film script into Ex'celen language and the film features Casares as its narrator and performer. Louise J. Miranda Ramirez is Tribal Chairwoman of the Ohlone Costanoan Esselen Nation (OCEN). Presently OCEN

represents over 600 enrolled tribal members of Esselen, Carmeleno, Monterey Band, Rumsen, Chalon, Soledad Mission, San Carlos Mission (Carmel) and/or Costanoan Mission Indians descended from at least 19 villages within a contiguous region surrounding Monterey Bay.

Kalie Granier is a French interdisciplinary artist currently based in California. Her artistic practice delves beneath the surface, exploring the profound interdependence that exists between humans and non-human entities. Her work serves to illuminate imbalances both social and ecological while also envisioning alternative narratives that might lead to a more equitable future. In addition to her artistic endeavors, Kalie is a co-founder of Loud Spring, a European-American Art Tank/Collective that operates as a 501(c)(3) organization. Kalie holds a Master of Arts (MA) degree from the ESAG, Penninghen School of Visual Art in Paris. Her work has been exhibited in various galleries and museums across the United States, Europe and Argentina. She is a frequent guest speaker at UCSC, Cabrillo College, and Santa Clara University.



Research and Monitoring

Fort Ord Natural Reserve was established to preserve educational and research access to unique and rare flora and fauna that occur throughout the reserve. Faculty, graduate students, undergraduate students, and researchers from multiple institutions use the reserve for research. Below we provide a short overview of some of the ongoing research projects on the reserve during the past year.

FY 2023/2024 Research and Monitoring Projects

IMPACTS OF MATERNAL STRESS ON OFFSPRING LIZARDS - DAVID ENSMINGER

Project Members: Amber Singh, Sydney Cortez, Tony Vo, Daniel Hoops, Tess McIntyre, Tanushri Rana, Joseph Nguyen, Harshmeet Singh, Huda Kose, Sandra Khalaf, Mohamed Ali Wone, Cassandra Hak

Affiliations: San José State University, Macquarie University

As the environment changes due to things such as human activities and climate change, animals experience more challenges and stressors. However, we know very little about how these challenges can affect future generations and thus our ability to inform conservation or wildlife decisions and understand the underlying physiology of these changes is severely limited.



The purpose of the proposed study is to understand the impact of maternal stress on offspring in wild lizards and the physiological mechanisms of these effects. These objectives will allow us to better understand the mechanisms that allow lizards to respond to stressors such as invasive species, habitat change, and anthropogenic activities and extrapolate to future stressors they and similar species will face. All three objectives are designed to improve our understanding of how lizards respond to stressors, with a focus on understanding the physiological impacts that could drive population dynamics in a time of increased anthropogenic interactions and environmental change. For objective 1, we will assess the impact of maternal stress on offspring oxidative damage, immune function, DNA methylation, gut microbiota, and behavior. Objective 1 broadens our understanding of oxidative balance and immune function beyond typical mammal studies and is vital as recent research has shown that species can have drastically different

responses to stress depending on their life history stages and activities. As these oxidative balance and immune function can drive individual fitness, it is important to understand for conservation management and ecological modeling. Additionally, we do not know how maternal stress effects temperature preference, which could have profound effects on antipredator behavior, basking behavior, and food acquisition. We do know that overall activity can shift, but we do not know the thermal consequences of this shift. This research would help identify this impact and highlight future routes of exploration for the impacts of maternal stress on offspring fitness.

The second objective is to understand offspring stress hormone dynamics. Objective 2 seeks to highlight and broaden the complexity of the vertebrate stress response and the importance of examine the whole stress response axis as changes in hormones could have their impact strengthened or weakened depending on the status of hormone receptors. As the offspring will experience the mothers elevated stress hormones during development, the likelihood of changes in receptor density is high, but unknown due to lack of prior research on this subject in reptiles. Finally, objective 3 will allow the development of a cellular model for research on lizards, which will ultimately allow us to examine further cellular impacts of stress without having to interact with wild lizards. As the oxidative response to glucocorticoids is often tissue specific, examination of muscle cells will allow us to examine the cellular response of tissue to stress separate from the rest of the organism. Additionally, as lizards can regrow their tails, insight on how they heal damage to muscle cells would allow insight into health avenues for other species as well as humans.

Overall, this project will provide valuable information on how a native species is affected by environmental stressors as these results can be applied across different stressors and help us understand how stress alters reptile's interactions with their environment. While environmental stressors such as increased anthropogenic interactions, invasive species, and habitat alterations are occurring at increasing rates, we are unsure how this will impact many species. As maternal stress can alter the physiology and behavior of organisms, it is vital to understand maternal stress as it impacts species interactions as well as health. The techniques developed here will allow future research to identify the stress status of populations before populations collapse, providing biomarkers for identifying if a species is stressed. The results of these studies will help inform management plans for species that are at risk where similar studies would not be possible.

EXPLORING COAST HORNED LIZARD (*PHRYNOSOMA BLAINVILLII*) PREY PREFERENCE AMIDST ARGENTINE ANT INVASION IN MARINA, CALIFORNIA – ANABELLE CARTER

Affiliation: University of California, Santa Cruz

Invasive species are destroying ecosystems in many parts of the world, threatening biodiversity and causing harm to natural environments. As invasive species enter at-risk habitats they compete with local species and plunder available resources, resulting in major declines in native species populations. The coast horned lizard (*Phrynosoma blainvilli*) is one such native species, endemic to California, that is experiencing rapid population decline due to their highly specialized diets, dwindling geographical ranges, and loss of their primary food source, the harvester ant (*Pogonomyrmex*). The harvester ant is being outcompeted by the invasive Argentine ant (*Linepithema humile*), leaving coast horned lizards with a diminished food source, threatening their survival. To detect trends in horned lizard prey composition, we collected ant species data about coast horned lizard range at the Fort Ord Natural Reserve.

Dissecting coast horned lizard scat allowed us to analyze diet preferences. We hypothesize that coast horned lizard feeding preferences will be strongly in favor of harvester ants, with a clear avoidance of Argentine ants. Determining the prey preferences of the Coast Horned lizard in the context of the Argentine ant invasion will provide crucial knowledge for the conservation of both harvester ants and coast horned lizards, as well as bottom-up ecological relationships as a whole.



ALERT AND FLIGHT INITIATION DISTANCES FOR NORTHERN PACIFIC RATTLESNAKES (*CROTALUS OREGONUS SSP. OREGONUS*) - KATHERINE MOLINARI AND JENNIFER DUGGAN

Project Members: Katherine Molinari, Jennifer Duggan

Affiliation: California State University Monterey Bay

This project will quantify the alert distance (AD) (i.e., rattling, coiling) and flight initiation distance (FID) of the venomous Northern Pacific rattlesnakes at the UC Fort Ord Natural Reserve and assess whether these distances change with repeated human exposure. The results will allow accurate assessment of risk to both humans and snakes under conditions where human-wildlife interactions are increasingly common.



RESPONSES TO DEFOLIATION IN QUERCUS AGRIFOLIA – REMINGTON PLISCHKE

Project Members: Remington Plischke, Laurel Fox

Affiliation: University of California, Santa Cruz



Physiological responses to environmental stress determine plant survival and productivity. Plants respond to stressors such as high temperature and herbivory by altering allocation and uptake of water and nutrients. In 2022, oak moth caterpillars heavily defoliated some Coast Live Oak (*Quercus agrifolia*) trees at the Fort Ord Natural Reserve near the central California coast; others were less affected. This gradient allowed me to examine physiological responses of oaks to herbivory. My observations of 12 trees in 2023 showed that herbivory correlated with decreased canopy cover and increased stomatal conductance—a physiological measurement representing the rate at which water evaporates from stomata and CO₂ enters. My current project will (1) test whether herbivory increases stomatal conductance, (2) explore mechanisms that could create this response, and (3) assess long-term physiological recovery after herbivory

XERCES PROJECT: IDENTIFY THE CLOSEST ECOLOGICAL REPLACEMENT FOR THE EXTINCT XERCES BLUE BUTTERFLY – CALIFORNIA ACADEMY OF SCIENCES

Project Members: Durrell Kapan, Christopher Schwind, Stuart Weiss, Dean Meiman

Affiliations: California Academy of Sciences, Creekside Science, UCSC Fort Ord Natural Reserve, University of California Santa Cruz

The extinct Xerces Blue, one of the first documented invertebrates to go extinct due to human-caused habitat destruction, now only exists in museum collections. To identify a suitable ecological replacement for Xerces we have extracted DNA & sequenced the genomes of 80-to-100-year-old museum specimens of Xerces and its close relative, the Silvery Blue (*Glaucopsyche lygdamus*). Bringing back a 'stand-in' for the Xerces Blue is

intended to not only help restore lost connections in San Francisco's newly restored Presidio dunes but spark our collective imagination & show how we can work together to regenerate the natural world.

CALIFORNIA INSECT BARCODING PROJECT – CALIFORNIA ACADEMY OF SCIENCES



Project Members: Christopher Grinter, Diana Phan, Julia Betz, Elise Vasquez

Affiliations: California Academy of Sciences, UCSC Fort Ord Natural Reserve, California State University Monterey Bay, California Institute for Biodiversity

As part of an ongoing collaborative project to survey and study the insects in California, this project will serve to enhance our understanding of California's insect biodiversity by employing long term insect sampling to create barcoding data for all insect species captured on site for one year.

SURVEYING SILVERY BLUE BUTTERFLIES AT FORT ORD NATURAL RESERVE FOR REINTRODUCTION – DEAN MEIMAN

Project Members: Dean Meiman, Durrell Kapan

Affiliations: California Academy of Sciences, UCSC Fort Ord Natural Reserve

In preparation for the conservation project that is introducing silvery blue butterflies to the restored

San Francisco Presidio, researchers identified Fort Ord Natural Reserve in Marina, California as a potential source population to capture butterflies for relocation. Observing habitat characteristics and butterfly behavior at this potential source population, UCSC Undergraduate Dean Meiman conducted surveys of the Silvery Blue butterfly at Fort Ord under supervision of Dr. Durrell Kapan of the California Academy of Sciences. Survey data encapsulated the butterfly's entire flight season for the year. To contribute to this conservation project, Meiman examined the distribution of Silvery Blue butterflies at Fort Ord Natural Reserve to better understand their habitat preferences.

AVIAN MIXED SPECIES FLOCKS IN CENTRAL CALIFORNIA – ARI MARTINEZ

Project Members: Ari Martinez, Vincent Weber, Noah Arthur, Allene Henderson, Chelsey Hunts

Affiliation: University of California, Santa Cruz

This proposal seeks to address a significant gap in our understanding of avian mixed-species flocking behaviors, a widespread phenomenon observed across taxa globally. Notably, in the Nearctic region, this behavior remains largely understudied in birds. Our objective is to enhance our comprehension of the evolutionary stable strategies driving species to exhibit this behavior by developing and evaluating survey protocols. Despite the ecological significance of these avian communities, their understudied nature hinders the development of

effective conservation strategies. The primary aim is to rectify this knowledge deficit by exploring avian mixed-species flocks through the implementation of an environmental gradient design. This approach enables a systematic examination of how avian populations and communities vary across diverse landscapes, providing essential insights for informed conservation decisions and contributing to the promotion of biodiversity protection in the Nearctic region.

EPIPHYTIC LICHENS AND BIRD COMMUNITIES IN OAK WOODLANDS – GERICK BERGSMA

Project Members: Rose Tibet

Affiliations: California State University Monterey Bay

Oaks are the foundation for important woodland ecosystems throughout Central California. The epiphytic lichen, *Ramalina menziesii*, commonly grows on oaks, and can form dense filamentous masses that hang up to 2m from the tree branches. Because of their size and morphology, the lichens create considerable physical structure, which may create foraging and habitat structure for insectivorous birds. Furthermore, the lichens are known to capture moisture and dust-borne nutrients from the air, thereby enriching soil moisture and nutrient levels underneath the tree. This may also affect the understory habitat and foraging opportunities for ground feeding birds. Our study aims to measure the relationship between lichen cover and avian abundance, biodiversity, and foraging behavior, and links to a larger study investigating how epiphytic lichens create habitat cascades that affect arthropod and bird communities.



SAN LUIS OBISPO, MONTEREY, AND SAN BENITO COUNTIES; VEGETATION INVENTORY, MAPPING, AND WILDFIRE RISK ASSESSMENT – CALIFORNIA NATIVE PLANT SOCIETY

Project Members: Mark Bibbo, Paul Excoffier, Alexis LaFever, Annie Zell, Kelsey Guest, Abra Schlotz

Vegetation sampling to support a fine-scale vegetation mapping project for SLO, Monterey, and San Benito Counties. The ultimate purpose is to produce a vegetation map that will be used for multiple, broad purposes such as regional fire and fuels management planning, game management and wildlife habitat identification, water conservation and management, and watershed assessments.



PLANT PHENOLOGY IN OPEN DUNE HABITATS SCIENTIFIC ILLUSTRATION STUDY – AMY CROSSMAN

Affiliation: University of California, Santa Cruz

Characterized by its sandy dunes, dense shrubbery, and diverse ecology: Fort Ord Natural Reserve hosts vibrant maritime chaparral. Within each season, the landscape undergoes a metamorphosis. Plant and animal species emerge and go dormant in response to environmental changes, a series of processes that vastly alters the visual identity of the land. Within wind-blown sand dune habitats, a unique variety of native blooms appear as Winter fades into Spring. Their emergence is backdropped by sands, mosses, and grasses of ever-

changing color and texture. These gouache paintings are based on observations made across the sandy dune area over time and are not intended as direct reproductions of any one plot. Look closely for Monterey gilia, sky lupine, purple owl's clover, peak rush rose, phacelia, and more.

DEMOGRAPHY OF CALIFORNIA POPPY - ELSA CLELAND

Project Members: Jason Sexton, Elsa Cleland, Rachel K Brown

Affiliations: University of California San Diego, University of California Merced, University of California Santa Barbara

Predicting species responses to climate change requires understanding population-level processes across a species range. Here, we propose to monitor demography of *Eschscholzia californica* (California poppy) at UCNRS reserves across California and incorporate population-level vital rates into a new kind of species distribution model, a “demographic distribution model.”

LONG TERM RESEARCH ON PLANT AND ANIMAL INTERACTIONS AT FORT ORD - LAUREL FOX

Affiliation: University of California, Santa Cruz

Long term research at UCSC FONR emphasizes the effects of interactions on community structure and dynamics, especially plant-herbivore and three- trophic-level interactions. Research focuses on resource use, plant defenses and the role of nutrients. Enclosures (3m x 3m) that exclude deer and both deer and rabbits are measured each year, and seed production is monitored. Collections of live *Ceanothus*, dead *Ceanothus*, and live stems of *Arctostaphylos* sp. are used to determine shrub/stem age and important environmental factors affecting germination.



BIODIVERSITY OF LEPIDOPTERA – MAXIM KLEPIKOV

Affiliation: University of California, Santa Cruz

MAPPING GENETIC DIVERSITY AND RESPONSES TO SELECTION ACROSS CALIFORNIA IN TWO BUTTERFLY SPECIES – JAYME LEWTHWAITE

Project Members: Jayme Lewthwaite, Melissa Guzman, Vaughan Shirey

Affiliation: University of Southern California

Insects are important parts of our ecosystems and provide crucial services for human well-being including pollination and waste management. Insect populations are exposed to many kinds of anthropogenic threats throughout their range, from climate change to pesticide use, and land use change. The ability of these populations to withstand and adapt to these multiple threats depend on two factors. First, the combined exposure of these threats throughout their range. Second, the susceptibility of individuals and populations to those threats. Both of these can vary throughout a species range, and understanding how these two interact is crucial to mitigate potential declines and inform conservation efforts. In this project we aim to tackle both of these factors for two butterfly species in Western United States.

In order to evaluate the combined exposure threat, we model species observations using existing publicly available data. However, in order to evaluate the population's susceptibility, we will need to collect live individuals from across each species' range in order to genotype and to estimate genetic diversity across the species' ranges.

These specimens will also allow us to identify any putative anthropogenically-induced adaptation across each species' range as we will be conducting genome wide selection scans. The selection scans will allow us to identify loci or single nucleotide polymorphisms (SNPs) that are targets of adaptation in the population. We will be examining these patterns across a gradient of land use (the UC reserves represent the more "natural" end of the gradient and will be paired with specimens from less natural areas nearby) and degree of temperature change experienced over the past century (we are surveying across a large latitudinal gradient from Southern Oregon to Southern California) to identify candidate loci that are under strong selection from land use change and climate change.

As a final step, we will identify areas that are most important to protect to promote long term survival. Together, these sources of data will provide a comprehensive picture of risk and susceptibility of species across their range, needed to make decisions about their conservation.

UCSC FONR BAT MONITORING – BETHANY SCHULZE

Sponsor: UCSC Natural Reserves

Bethany Schulze is a CSU Monterey Bay graduate student working on bats along the central coast. At Fort Ord, she is conducting year-round monitoring efforts using bat acoustic data loggers. This information provides data

on bat use throughout the year and is providing insight into the temporal shift in bat activity and species composition at the reserve.

UCSC FONR FLORA AND FAUNA SURVEYS

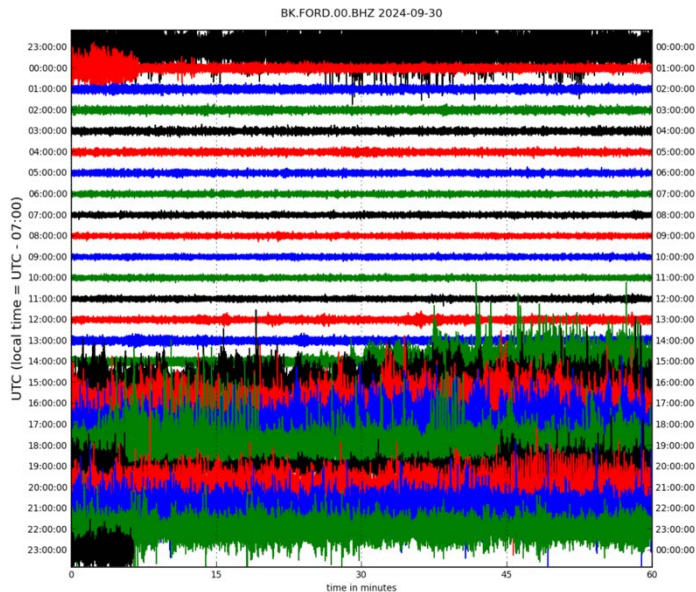
Sponsor: UCSC Natural Reserves

FONR staff and undergraduate interns from both UC Santa Cruz and CSU Monterey Bay monitor 600-acre UCSC Fort Ord Natural Reserve land. These efforts accomplish critical baseline monitoring of the reserve and, importantly, engage students in a wide range of research and stewardship techniques that teach them important skillsets. Activities include photo point surveys, rare plant surveys, herpetology cover board and pitfall array surveys, wildlife camera surveys, small mammal monitoring, UAV mapping, and mapping of long-term chaparral vegetation monitoring plots.



SEISMIC MONITORING AND SHAKE ALERT EARLY WARNING SYSTEM – UC BERKELEY SEISMOLOGY LAB

Today, the technology exists to detect earthquakes so quickly that an alert can reach millions of people before strong shaking arrives. The UC Berkeley and its partners operating California's seismic network, CISN, are developing and implementing the ShakeAlert earthquake early warning system to identify and characterize an earthquake within few seconds after it begins. We quickly calculate the expected intensity of ground shaking, and can send warnings to people and infrastructure in harms way. To reliably distribute warnings for all parts of the State with high earthquake hazard, it is important to have a robustly operating, dense network of seismic stations capable of providing data that can be used in ShakeAlert. The blue dots on the adjacent map



are the stations contributing to ShakeAlert now. Particularly in Northern California, more sites are needed (green triangles, yellow squares). UC Berkeley and CISN partners are looking for locations where we can install new earthquake monitoring stations. UCSC Fort Ord Natural Reserve's station went online in Summer 2019. In addition to contributing to ShakeAlert, the new stations will also support the mission of the CISN, to operate a reliable, modern, statewide system for producing earthquake information for the benefit of public safety, emergency response, and loss mitigation.

ARCTOSTAPHYLOS SEED BANKS AND ANIMAL FORAGING – TOM PARKER

Affiliation: San Francisco State University

Dr. Tom Parker is studying a variety of abiotic and biotic factors that influence the distribution of Manzanita throughout the state. His work at Fort Ord is focused on quantifying seed banks of *Arctostaphylos pumila* and *A. tomentosa* and how density of seeds in the soil influence foraging effort of small mammals.

Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord

COASTAL FOG MONITORING – DANIEL FERNANDEZ

Project Members: Olivia Equinoa, Joe Miller

Affiliations: California State University Monterey Bay, UC Santa Cruz Natural Reserves

As part of an ongoing project to measure fog water on the Pacific Coast of California. The goal will be to collect fog water samples to quantify the amount of fog deposition to a standard passive fog collector. The collection of water from fog offers a unique opportunity to engage with an environmental feature endemic to the Monterey area (fog). Worldwide, numerous countries capitalize upon the presence of fog to produce potable water in regions that receive little rainfall. In some cases, entire communities utilize fog water to meet their basic needs. Indeed, such deployments exist in Chile, Guatemala, Israel, Yemen, Eritrea, Morocco, Spain, and

many other countries throughout the world. A simple mesh mounted properly on a square frame provides a surface for the fog water to coalesce. Once the droplets reach a suitable size, their weight causes them to fall off and collect in a trough below. From a single square meter of vertically mounted mesh up to several gallons of water have been produced in a single day under foggy conditions with sufficient wind. Actual amounts collected are very location dependent and under foggy conditions are more typically about a liter. Besides potentially providing a means of capture of usable water, which can serve multiple purposes, this technique provides a much more quantitative in situ means of assessing the presence of fog. The fog collected is a function both density of water in the air as well as the wind speed and direction. When the wind directs fog into the mesh, maximal fog water accrues. As wind speed increases, typically so does the amount of fog water collected.

EVALUATING SMALL RODENT ABUNDANCE AND BIODIVERSITY BETWEEN WET AND DRY SEASONS IN UC FORT ORD - HALIMIDA SUISO, JUSTIN IDE, JOCELYN AYALA

Affiliation: California State University Monterey Bay

This undergraduate research project evaluated long term small mammal datasets collected by UCSC Fort Ord Natural Reserve staff and volunteers since 2016.

Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord

Halimeda Suiso, Justin Ide, Jocelyn Ayala

Introduction

- The area of this study includes grassland and shrubland habitats of the chaparral biome in UC Fort Ord, a retired Army base that closed in 1994.
- A wide variety of native small rodents are present within UC Fort Ord and contribute to its extensive biodiversity (Figure 1).
- Small rodent abundances vary between the wet year specifically between the wet and dry seasons.²
- Previous studies revealed that biodiversity indices of small rodent populations have increased during rainy seasons.²
- Research question:** How does small rodent abundance and biodiversity differ between wet and dry seasons?
- Hypothesis:** There will be a greater abundance of small rodents during the wet season.

Methods

Field Methods

- There are four trapping sites at UC Fort Ord: North Grassland, North Transition, South Grassland, and South Transition with 49 trapping sites at each, utilizing humane Sherman traps (Figure 2).
- After trapping, each rodent is identified (down to the species) and given an ear tag. In addition, sex, life stage, body length, foot length, ear length are recorded.

Statistical Methods

- To compare abundances across different seasons, wet month and dry data from 2022 and 2023 were subtested.
- For 2022, June was selected as dry month, November was selected as the wet month.
- For 2023, April was selected as the dry month and December was the wet month.
- To estimate abundances, average count of rodents was calculated for each month.
- For each site the Shannon-Wiener diversity index was calculated for both 2022 and 2023.
- To test habitat association, a Chi squared test was conducted for each season.
- All analysis was conducted on RStudio and Excel.




Figure 1. Common Small Rodents found in UC Fort Ord: A) Harvest Mouse, B) Kangaroo Rat, C) Deer Mouse, D) Pocket Mouse

Results

- Average count of small rodents increased during months with greater average precipitation (Table 1).
- The Shannon-Wiener Diversity Index average values in wet seasons were higher than dry seasons (Table 2).
- Rodent abundance counts had a greater range during the wet season for both 2022 and 2023 (Figures 3 & 4).
- There was a significant association of rodents in their habitat by genus for November 2022 and both 2023 months. Meanwhile, June 2022 did not show a strong association by genus (highlighted in red) (Table 3).

Discussion

- Small rodent abundance increased for the wet season of both years as there may be more resources present, which has been demonstrated by previous studies (Figure 3 & 4).⁴
- Shannon-Wiener diversity index average calculations demonstrated an increase in biodiversity during the wet season of both years as shown by the larger H' value likely due to increased water, nutrients, and shelter produced by wet season (Table 2).
- Peromyscus genus is most abundant between wet and dry seasons and across habitats likely due to the fact that three species are included within the genus name. Other studies have also seen this pattern and hypothesized that Peromyscus are versatile habitat-wise.⁵
- Proposed hypothesis was supported as the prediction that small rodent abundance and biodiversity would be higher for the wet seasons was demonstrated by counts and Shannon-Wiener diversity index (Table 1 & 2).

Table 1. Small rodent average counts compared to average precipitation in Monterey for 2022 and 2023

Month, Year	Average Count	Average Precipitation (inches)
June, 2022	4.50	0.13
November, 2022	6.71	2.64
April, 2023	5.20	0.12
December, 2023	7.18	4.53

Table 2. Shannon-Wiener Diversity Index across site Grassland and Shrubland sites

	NG	NT	SG	ST	Average H'
June, 2022	0.993	0.831	0.000	0.936	0.699
November, 2022	0.673	0.997	1.120	0.830	0.905
April, 2023	1.277	0.690	0.586	0.611	0.791
December, 2023	1.040	0.752	1.259	1.062	1.028

Table 3. Chi-Squared p-values comparing monthly habitat association, with significance level of 0.05.

	Wet Month	Dry Month
2022	November 5.145e-04	June 0.5534
2023	December 2.404e-07	April 1.998e-03

Figure 2. UC Fort Ord National Reserve map showing North and South Reserves

Figure 3. 2022 small rodent counts for June (dry) & November (wet)

Figure 4. 2023 small rodent counts for April (dry) & December (wet)

Table 1. Small rodent average counts compared to average precipitation in Monterey for 2022 and 2023

Table 2. Shannon-Wiener Diversity Index across site Grassland and Shrubland sites

Table 3. Chi-Squared p-values comparing monthly habitat association, with significance level of 0.05.

References:

1. Halimeda Suiso, Justin Ide, and Jocelyn Ayala. Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord. Undergraduate research project, California State University Monterey Bay, 2023.
2. Halimeda Suiso, Justin Ide, and Jocelyn Ayala. Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord. Undergraduate research project, California State University Monterey Bay, 2023.
3. Halimeda Suiso, Justin Ide, and Jocelyn Ayala. Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord. Undergraduate research project, California State University Monterey Bay, 2023.
4. Halimeda Suiso, Justin Ide, and Jocelyn Ayala. Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord. Undergraduate research project, California State University Monterey Bay, 2023.
5. Halimeda Suiso, Justin Ide, and Jocelyn Ayala. Evaluating small rodent abundance and biodiversity between wet and dry seasons in UC Fort Ord. Undergraduate research project, California State University Monterey Bay, 2023.

Reserve Use

Table 2. NGO, Governmental, K-12, and Affiliated User Groups

JC Crumpton Elementary School	UC Monterey Bay Education, Science and Technology Center (UCMBEST)	University of California Agriculture and Natural Resources	CSUMB Monterey Bay Habitat Stewardship Project
CSUMB Undergraduate Research Opportunities Center (UROC)	UCSC Environmental Studies Internship Office	UCSC Kenneth Norris Center for Natural History	Department of Defense Base Realignment and Closure (BRAC)
Marina Vista Elementary School	The Western Section of The Wildlife Society	Monterey Peninsula Unified School District	Learning For Life Charter School
UC Santa Cruz Arboretum	California Native Plant Society	California Academy of Sciences	Vandenberg Space Force Base Girl Scouts
CSUMB Sciences Internship Program	CSUMB Service-Learning Institute	Elkhorn Slough Foundation	United States Naval Postgraduate School
Cabrillo College	Santa Cruz Museum of Natural History	Bureau of Land Management	Marina Police Department
UC Genomics Consortium	California Department of Fish and Wildlife	Monterey Bay Tracking Club	CSUMB Scientific Illustration Program
US Department of Fish and Wildlife	Marina Fire Department	US Army Reserve	City of Marina
Scouts BSA	Ione Olson Elementary School	Holy Cross School	North Monterey County Parks and Recreation
Pajaro Valley High School	University of California, San Diego	University of California, Santa Barbara	University of California, Santa Cruz
San Jose State University	California State University Monterey Bay	Questa College	University of Southern California
Monterey County Fish and Game Commission	Monterey Bay Economic Partnership	Tucci Learning	Watsonville Wetlands Watch

Appendices

Appendix 1. Use Data for Fiscal Year 2023/2024

	UC Home		UC Other		CSU System		CA Comm College		Other CA College		Out of State College		International University		Government		NGO/Non-Profit		Business Entity		K-12 School		Other		Total		
	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	
UNIVERSITY- LEVEL RESEARCH																											
Faculty	3	13	0	0	3	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	29
Research Scientist/Post Doc	1	5	0	0	0	0	0	0	2	4	0	0	1	1	0	0	3	26	0	0	0	0	0	0	0	7	36
Research Assistant (non-student/faculty/postdoc)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	21	0	0	0	0	0	0	0	0	7	21
Graduate Student	7	28	0	0	3	23	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	11	54
Undergraduate Student	33	143	2	2	21	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	216
Professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	3	3
Volunteer	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Reserve Staff	1	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12
SUBTOTAL	46	203	2	2	27	110	0	0	2	4	0	0	1	1	0	0	14	53	0	0	0	0	0	0	92	373	

	UC Home		UC Other		CSU System		CA Comm College		Other CA College		Out of State College		International University		Government		NGO/Non-Profit		Business Entity		K-12 School		Other		Total		
	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	
UNIVERSITY - LEVEL INSTRUCTION (CLASS)																											
Faculty	3	8	0	0	6	18	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	28
Graduate Student	19	37	0	0	31	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	68
Undergraduate Student	204	470	5	55	335	345	33	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	577	951
Professional	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2	12
Other	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	30	32	32
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	26	4	26
SUBTOTAL	229	525	5	55	372	394	34	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	60	675	1117

	UC Home		UC Other		CSU System		CA Comm College		Other CA College		Out of State College		International University		Government		NGO/Non-Profit		Business Entity		K-12 School		Other		Total		
	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	
OTHER																											
Research Scientist/Post Doc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0	3	3
Undergraduate Student	30	92	0	0	12	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	140
K-12 Instructor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	34	0	0	23	34	
K-12 Student	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	725	930	0	0	725	930	
Professional	1	2	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	1	1	1	2	0	0	0	4	11	
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	32	24	32	
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	0	0	0	4	8	
Reserve Staff	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	
SUBTOTAL	35	103	0	0	12	48	0	0	0	0	0	0	0	1	6	2	2	2	2	753	974	24	32	829	1167		

TOTALS	310	831	7	57	411	552	34	83	2	4	0	0	1	1	1	6	16	55	2	2	753	974	59	92	1596	2657
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Appendix 2. UCSC Natural Reserves Committee and Charge

University of California Santa Cruz

2023-2024 Natural Reserves Advisory Committee

Charge

The committee provides oversight of on- and off-campus natural reserves of instructional and research interest. It is responsible for developing program vision and policy for the management and use of the UCSC Campus Reserve, Santa Cruz Mountains Reserve, and of the four UC Natural Reserves System holdings: Año Nuevo Island Reserve, Landels-Hill Big Creek Reserve, Younger Lagoon Reserve and Fort Ord Reserve. The committee coordinates with the system wide NRS Advisory Committee that advises on policy for all NRS reserves.

In addition to the chair (Faculty Director), membership of the committee is comprised of faculty advisors to each reserve, one faculty representative at large, one non-senate academic appointment, one staff representative, one graduate student, two undergraduate students, and ad hoc faculty members as needs arise. The Faculty Director, in consultation with the Dean and the Administrative Director of the UCSC Natural Reserves, appoints the committee. Membership terms begin September 1 unless otherwise specified.

Curation of Appointments

Faculty Director: 5 years

Faculty Advisors: 3 years

Non-Senate Academic, Staff, and Students: 1 year

Members may be reappointed at the discretion of the Faculty Director in consultation with the Administrative Director.

Hours/Quarter: Chair/NRS Representative-20, Members-10

Reports to: Division of Physical & Biological Sciences Dean

2023-2024 NATURAL RESERVES ADVISORY COMMITTEE MEMBERSHIPS

Faculty Director of the Natural Reserve System	Don Croll	Professor of Ecology and Evolutionary Biology	Long Marine Lab, Center for Ocean Health	(831)459-3610 dcroll@ucsc.edu
Faculty Advisor Younger Lagoon Reserve	Karen Holl	Professor of Environmental Studies	Environmental Studies Department	(831) 459-3668 kholl@ucsc.edu
Faculty Advisor Año Nuevo Reserve	Daniel Costa	Professor of Ecology and Evolutionary Biology	Long Marine Lab, Center for Ocean Health	831) 459-2786 costa@ucsc.edu
Faculty Advisor UCSC Campus Natural Reserve	Gregory Gilbert	Professor of Environmental Studies	Environmental Studies Department	(831) 459-5002 ggilbert@ucsc.edu
Faculty Advisor Fort Ord Natural Reserve	Laurel Fox	Professor of Ecology and Evolutionary Biology	Ecology and Evolutionary Biology Department	(831) 459-2533 fox@ucsc.edu
Faculty Advisor Landels-Hill Big Creek Reserve	Peter Raimondi	Professor of Ecology and Evolutionary Biology	Long Marine Lab, Center for Ocean Health	831) 459-5674 raimondi@ucsc.edu
Faculty Advisor Santa Cruz Mountains Reserve	Chris Wilmers	Professor of Environmental Studies	Environmental Studies Department	(831) 459-2634 cwilmers@ucsc.edu
1 Non-Senate Academic	Chris Lay	Administrative Director and Lecturer	Environmental Studies Department, Kenneth S. Norris Center for Natural History	(831) 459-4763 cml@ucsc.edu
1 Staff	Sylvie Childress	Director UCSC Greenhouses	Greenhouses/MCD Biology	(831)502-8001 Sylviechildress@ucsc.edu
2 Graduate Students	Alexandra Race	Graduate Student	Department of Education	arace@ucsc.edu
	Jon Detka	Graduate Student	Environmental Studies Department	jdetka@ucsc.edu
2 Undergraduate Students	Anabelle Carter	Undergraduate Student	Ecology and Evolutionary Biology Department	apcarter@ucsc.edu
	unseated			
Ex-Officio	Bryan Gaensler	Dean of Physical and Biological Sciences	Division of Physical and Biological Sciences Dean's Office	(831)459-2131 dean.science@ucsc.edu

	Gage H. Dayton	Advisory Committee Convener and Administrative Director UCSC Natural Reserves	Natural Sciences II, Room 467	(831)459-4867 ghdayton@ucsc.edu
	Mark Readdie, Ph.D.	Resident Director Landels-Hill Big Creek Reserve	HC67 Box 1679 Big Creek Reserve Big Sur, CA 93920	(831)667-2543 readdie@ucsc.edu
	Randolph Skrovan	Facilities Manager Institute of Marine Science	Long Marine Lab, Center for Ocean Health	(831)459-4735 rskrovan@ucsc.edu
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	Beth Howard, MA	Director Younger Lagoon Reserve	Long Marine Lab Conservation Annex	(831)459-2455 eahoward@ucsc.edu
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	Chad Moura, MS	Director Santa Cruz Mountains Reserve	Natural Sciences II, Room 465	cwmoura@ucsc.edu
	Joe Miller	Director Fort Ord Natural Reserve	UC MBEST Center Suite 104	joemiller@ucsc.edu