UCSC
FORT ORD
NATURAL RESERVE

2019-2020 Annual Report

Joe Miller
Field Manager

CONTENTS

EXECUTIVE SUMMARY

This report provides an overview of activity at UC Santa Cruz Fort Ord Natural Reserve (FONR), in Marina, California for the fiscal year 2019-2020. FONR is a 600 acre reserve that protects maritime chaparral, 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. Research, teaching, and public service goals continued to increase this year. In FY2019-2020 Reserve Field Manager Joe Miller was assisted by Restoration Steward Brett Bell; along with Restoration Assistants Annie Allenbaugh, Cammy Chabre, Kyra Petrilli, and Jazmin Rios. Multiple UC, CSU, and community college interns contributed to work on the reserve as well.

Figure 1. A young bobcat is captured on wildlife cameras near the main entrance to the reserve.

Building upon consistent growth in user numbers for the previous three years, seasonal visitation increased for Fall of 2019 into Winter 2020. Instructors from UCSC, CSU Monterey Bay, and Cabrillo College continued to bring field classes to the reserve. These classes represented environmental science, ecological assessment, biology, ecology, and environmental studies; as well as art and photography.

As was the case for much of the nation's educational infrastructure, use at FONR was curtailed by the closures related to the COVID-19 pandemic, which started after the Winter quarter ended in March 2020. FONR staff continued to facilitate limited ongoing graduate and undergraduate research once approvals were acquired from university staff. After the closures, staff also adjusted their role to create multiple presentations to assist in virtual outreach and instruction. These included a video virtual field trip, instructional clips for biology courses, numerous articles and presentations, and an instructional video to assist with UCSC Younger Lagoon Reserve restoration internships. Despite these nonstandard protocols related to the pandemic, in FY2019-2020 more interns studied at FONR than ever before, with 46 students learning and working on the reserve. In FY2019-2020 over 600 users were able to access the resources at UCSC Fort Ord Natural Reserve, on nearly 1500 user-days.

Figure 2. Restoration and ecology interns learn to identify new plants in the Fort Ord Natural Reserve office at the UC MBEST center.

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 600-acre 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 sand gilia, state-endangered seaside bird's beak, and the federally threatened Monterey spineflower).

Figure 3. Seaside Bird's Beak is a hemiparasitic plant that is listed as endangered by the State of California, and also occurs at UCSC FONR.

This past year we offered internship opportunities, continued animal monitoring, and monitored long-term vegetation monitoring plots with faculty and undergraduate intern assistance. UC Santa Cruz undergraduate researchers continued a long-term population study of Coast Horned Lizard, Phrynosoma blainvillii, a species of special concern. This work has expanded to include an important habitat evaluation for the species, which was led by undergraduate research Danielle Davis. UCSC Ecology and Evolutionary Biology undergraduate Nick Bergeron completed a research project related to the ecology of Fear in small mammals at FONR. Reserve staff has helped to organize and manage field crews to assist UCSC graduate research on reserve wide vegetation plots, where Environmental Studies PhD Candidate Jon Detka works to understand the relationships between maritime chaparral plants and native fungal pathogens. These and many class-based research projects were assisted by the Field Manager in FY2019-2020.

Figure 4. Dr. Sean Reilly describes the Southern alligator lizard to his BIOE 82, Introduction to Field Research, class.

Staff also continued to assist Army contractors with continued environmental cleanup onsite. New partnerships were formed with local non-profit 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. The following report highlights these and additional efforts.

In additional service to greater University of California goals in the Southern Monterey Bay area, FONR staff 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 mitigation for MBEST lands that are being offered for 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.

EDUCATION

Instructional use at FONR has reached its highest level for the Fall and Winter quarter in FY2019 -2020, supporting classes that span multiple disciplines. While reserve class use essentially stopped in late March 2020, staff were able to support a few activities remotely. Reserve staff met regularly with classes to help support and develop teaching activities, interpret and identify flora and fauna, and help with student research projects. FONR is roughly one hour from the UCSC campus, minutes away from CSU Monterey Bay, and within an hour of several other higher education institutions in the greater Bay Area. Classes included a wide variety of disciplines including biology, ecology, environmental studies, earth sciences, and art from multiple institutions (Table 1).

CLASS VISITS

Fall and Winter quarters in FY 2019-2020 FONR saw much repeat use by classes from UCSC and CSUMB instructors. Disciplines included ecology, biology, earth science, botany, art, and many introductory field method classes. Introductory field methods classes such as UCSC BIO 82 (Introduction to Field Methods), UCSC ENVS 104 (Introduction to Environmental Field Methods), and CSUMB ENV 350 (Quantitative Field Methods) make extensive use of reserve resources and staff. These classes represent some of the best use of UCSC FONR, due to uniquely accessible location and habitats.

Figure 5: UC Santa Cruz BIOE 82 students work on field notes in maritime chaparral habitat at FONR

TABLE 1. FORT ORD NATURAL RESERVE CLASS USE - FISCAL YEAR 2019/2020

Course Number/Name	Institution	Instructor
University of California Santa Cruz		
BIOE 117: Systematic Botany	University of California Santa Cruz	Kathleen Kay
BIOE 82: Introduction to Field Research and Conservation	University of California Santa Cruz	Abe Borker, Kristen Heady, Gage Dayton, and Gina Contolini
ENVS 104: Introduction to Environmental Field Methods	University of California Santa Cruz	Josephine Lesage
BIOE 137: Molecular Ecology	University of California Santa Cruz	Rachel Meyer
ENVS 182/183: Environmental Studies Internship	University of California Santa Cruz	Joe Miller

California State University Monterey Bay		
SICP 500-519: Scientific Illustration Program	California State University Monterey Bay	Anne Caudle, Jennifer Keller, Andrea Dingledein
BIO 195: Special Topics in Wildlife Research	California State University Monterey Bay	Gerick Bergsma
ENV 350: Quantitative Field Methods	California State University Monterey Bay	Robert Burton
ENVS 483: Environmental Impact Analysis	California State University Monterey Bay	Robert Burton
ART 31999: Field Sketching	California State University Monterey Bay	Andrea Dingledein
BIO 360: Natural History of CA Wildlife	California State University Monterey Bay	Jenny Duggan
BIO 342: Plant Communities of California	California State University Monterey Bay	Rose Ashbach, Scott Blanco
ENVS 446: Landscape Ecology	California State University Monterey Bay	Jenny Duggan
SL 95-500: CSUMB Service Learning	California State University Monterey Bay	Joe Miller
California Community College		
BIO 11C: Ecology	Cabrillo Community College Aptos, CA	Allison Gong
K-12 Education		
Green Careers Program - Watsonville Wetlands Watch	Pajaro Valley High School Watsonville, CA	FONR Staff
Wetland Stewards Program – Watsonville Wetlands Watch	Pajaro Valley High School Watsonville, CA	FONR Staff

INDEPENDENT UNDERGRADUATE RESEARCH AND SERVICE LEARNING

Multiple undergraduate research projects were supported by UCSC FONR staff in FY2019-2020. Students from UCSC and CSUMB worked on research including but not limited to coast horned lizards, wildlife travel corridors, and small mammal personality and fear. CSUMB Service learning internships and UCSC Environmental Studies internships covered topics related to experiential learning for k-12 students. 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 FY 2019-2020 FONR staff facilitated over 46 internship and volunteer positions for students from UCSC and CSU Monterey Bay. Participants were involved in a wide variety of stewardship, ecology, public service, research installations, restoration, and course facilitation internships. Agencies that provided class credit for these internships include the UC Santa Cruz Environmental Studies Internship Program, CSUMB Undergraduate Research Opportunities Center, CSUMB Science Internship Program, 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, vertebrate monitoring, small mammal trapping, working with k-12 and public outreach efforts, and faculty research projects. Interns were also able to make connections and learn from the larger conservation community through a variety of community projects. All of the 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.

Figure 6: CSUMB Undergraduate Research Opportunities Center (UROC) Interns work on monitoring wildlife corridors at FONR.

RESEARCH AND MONITORING

Research and Monitoring FONR was established because of the unique and rare flora and fauna that occur throughout the 600 acres. Faculty and graduate students 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.

Figure 7. FONR staff frequently captures drone imagery to assist in research projects. This photo was taken during a mapping flight related to Jon Detka's plant disease research.

CURRENT RESEARCH – FISCAL YEAR 2019-2020

PRELIMINARY SURVEYS OF ABIOTIC FACTORS INFLUENCING ABOVEGROUND FUNGAL INFECTIONS ON CENTRAL CALIFORNIA MARITIME CHAPARRAL MANZANITAS

UCSC Environmental Studies Gilbert Lab student Jon Detka's research is focused on exploring the influence of reduced summer marine fog exposure and drought-stress on aboveground fungal disease dieback and mortality in maritime chaparral shrubs (*Arctostaphylos*: Ericaceae). A rapidly changing global climate is likely to increase the prevalence of drought conditions and reduce the duration and geographic extent of summer maritime fog conditions along the Central California Coast. *Arctostaphylos* spp. are the most diverse group of endemic species in California maritime chaparral and increased drought stress coupled with reduced wetting associated with summer maritime fog conditions could increase the susceptibility of *Arctostaphylos* spp. to necrotrophic foliar fungal diseases and decrease the prevalence of biotrophic foliar fungal diseases. Increased disease mortality associated with necrotrophic foliar fungi among *Arctostaphylos* spp. has several potentially important conservation implications as efforts shift to conserving communities with high species endemism. Conservationists and restorationists will be better equipped to accommodate changes in range dynamics of these species given increased understanding of their reliance on fog and its relation to changes in foliar disease prevalence.

Figure 8. FONR Field Manager Joe Miller assists Jon Detka in installation of a small scale weather station at a research plot.

LONG-TERM RESEARCH EXAMINING THE ECOLOGY OF FLORA AND FAUNA IN MARITIME CHAPARRAL

UC Santa Cruz faculty member Dr. Laurel Fox has been working on the ecology and conservation of maritime chaparral for nearly three decades. Her work has resulted in a variety of important publications that are providing insight into life history of rare species and factors that influence the abundance and distribution of species throughout the region. This past year she supported several undergraduate researchers who are assisting with a variety of projects examining plant demographics and the impact herbivores have on structuring communities. UCSC FONR interns assist Dr. Laurel Fox in field data collection.

TAXONOMY AND HABITAT ASSOCIATIONS OF THE MONTEREY ORNATE SHREW

The Monterey ornate shrew (Sorex ornatus salarius) is listed as a California species of special concern. However, recent capture data at the University of California's Fort Ord Natural Reserve and the Fort Ord Natural Monument suggests that the shrew may occur in a greater variety of habitats, and in larger numbers, than previously thought. While surveys for S. o. salarius are necessary to improve understanding of its taxonomy, habitat preferences, and population densities, shrews are typically cryptic animals that can be difficult to detect and/or capture. Determining an effective method for sampling these cryptic animals will be a crucial first step in designing cost-effective and informative studies that minimize harm. The project uses genetic analyses to assess if shrews found across multiple habitat types (i.e., riparian and dry upland habitat) in Santa Cruz and Monterey counties belong to one wide ranging subspecies (i.e., S. o. salarius). Surveys conducted to collect tissue samples (i.e., tail clips) will also allow an assessment of the habitat associations of S. o. salarius. This information may be useful in determining if the state listing status of this rarely studied subspecies is currently warranted. Surveys collect presence/absence data for S. ornatus over an area much more extensive than that sampled using livetrapping methods. These presence/absence data would be combined with site-specific (e.g., vegetation, soil, topography) and survey-specific (e.g., temperature, precipitation) data to construct a predictive habitat model for S. o. salarius using occupancy estimation methods. In addition, presence-absence data, as well as any site-specific abundance data collected during livetrapping, would be used to establish a baseline dataset on which future monitoring of S. o. salarius could build.

Figure 9. Shrews may be encountered in pitfall trap arrays at FONR

HABITAT USE, ACTIVITY PATTERNS, AND THERMAL PREFERENCE OF *PHRYNOSOMA BLAINVILLII* (COAST HORNED LIZARD)

UCSC Environmental Studies/Ecology and Evolutionary Biology major Danielle Davis is working on the following senior research project: Phrynosoma blainvillii are listed as a species of special concern in California with a known population on Fort Ord Natural Reserve land. This species ranges from the southern end of the Baja California peninsula to northern central California, west of the deserts and the Sierra Nevada. As an ectotherm, a certain range of environmental temperatures are important for allowing movement; the location of FONR is of P. blainvillii's most northern coastal range, allowing for cooler temperatures, making the species presence here of interest. This study focuses on observing the

Figure 10. UCSC Undergraduate Researcher Danielle Davis shares her Coast Horned Lizard research methodology with a student from Castroville's North Monterey County High School.

daily and seasonal activity patterns, habitat use, and thermal preference of horned lizards at FONR. Observations will be taken along a determined transect incorporating the various habitats present using ArcGIS to spatially locate each observation.

With little ecological data collected on *P. blainvillii*, this study will help fill a gap in our knowledge about this species' behavior relate to habitat and weather conditions. FONR can also use the results of this study as a foundation for further student research.

EPIPHYTIC LICHENS AND BIRD COMMUNITIES IN OAK WOODLANDS

Figure 11. CSUMB Undergraduate researchers gather arthropod population data in the Coast live oak woodland of FONR

Dr. Gerick Bergsma (CSUMB) is studying how oaks function as a foundation species for 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, they 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. Dr. Bergsma's study is examining the relationship between lichen cover and avian abundance, biodiversity, and foraging behavior. His results will help our understanding of how epiphytic lichens affect arthropod and bird communities.

OAK WOODLAND ECOLOGICAL COMMUNITY ANALYSIS

Kat Patrice and Cristina Vance (CSUMB) are working with Dr. Gerick Bergsma. Their project is focuses on how arthropod communities in Coast Live Oak trees differ with varying amounts of epiphyte cover. Trees were chosen based on the amount of lichen present; eight of the oak trees had a significant amount of lichen present, while the other eight did not. Arthropods were sampled using the beat method, sweep nets, pitfall traps, brushings, and lichen clippings. Arthropod samples were then analyzed in the lab to identify organisms to family. When comparing results from different areas on and around a tree (e.g. the brush within the drip line of the trees, the lichen, and the tree itself) they found few differences between arthropod communities with high and low lichen cover. Although these results indicate lichens do not appear to have an impact on arthropod abundance, future sampling across seasons and over a greater spatial scale are needed.

THE ECOLOGY OF FEAR IN NOCTURNAL RODENTS

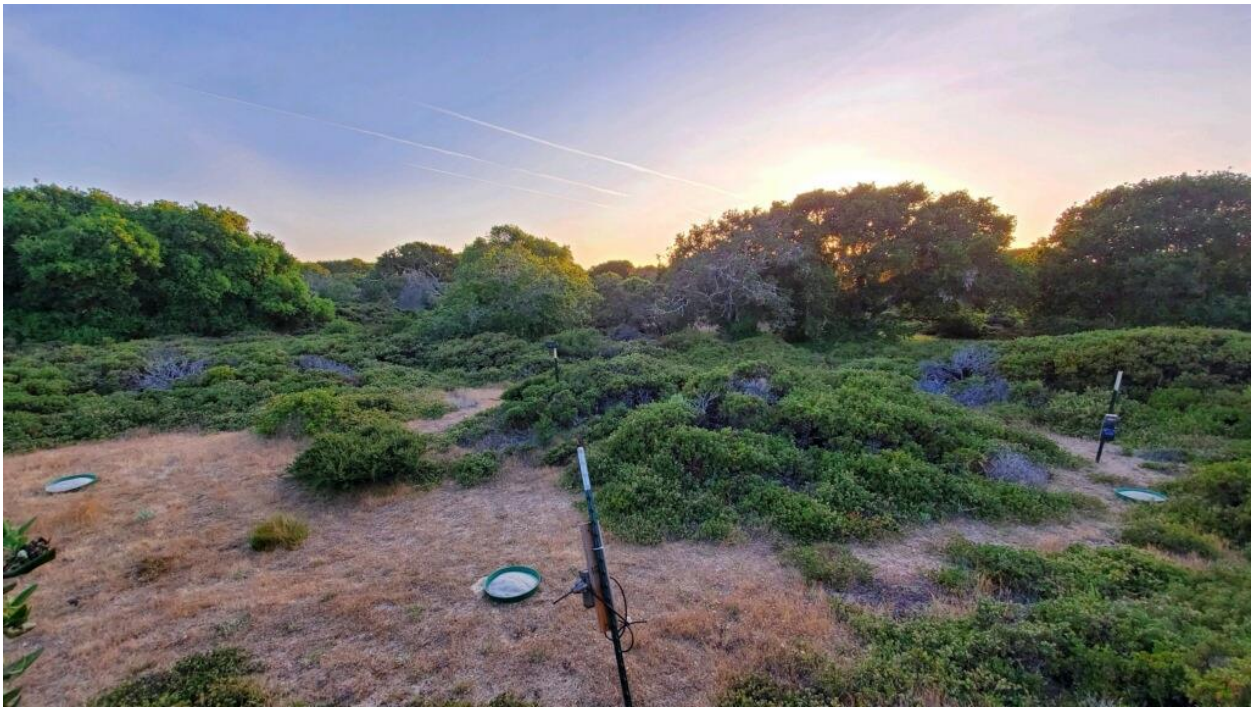


Figure 12. Seed Trays and monitoring cameras set out for "Giving up densities" study in rodents among sandmat manzanita

Nicholas Bergeron is a Norris Center for Natural History Grant recipient, working on senior research for the Ecology and Evolutionary Biology undergraduate program at UCSC. Nicholas is using a "Giving Up Densities" technique to study animal foraging behavior. The overall goal of the research is to examine how food intake and foraging behaviors in nocturnal rodents are influenced by direct (owl vocalizations) and indirect (distance from cover) cues. Specifically, the study uses field cameras and artificial foraging patches to study how specific foraging behaviors, such as vigilance, are affected by indirect and direct cues and what impact they have on food intake.

POPULATION SURVEYS OF COAST HORNED LIZARD, PHRYNOSOMA BLAINVILII

Danielle Davis, UCSC Environmental Studies/Biology undergraduate student, is working on a project that is establishing a long-term mark-recapture survey to monitor *Phrynosoma blanivillii*. She is collecting life history and habitat use information on this rare species as well as establishing a long-term monitoring program for the reserve. This research involves the PIT (passive integrated transponder) tagging of horned lizards which reside along a study transect will be monitored long term.

THERMAL MELANISM IN ANNIELLA PULCHRA

Alexander Krohn is a staff member at the Norris Center for Natural History, and is working on the following project with the UCSC Sinervo Lab. Anniella pulchra, the California Legless Lizard, occurs in three color phases: normal (tan), intermediate (silver), and black (melanistic). The tan morph is found throughout the entire California range of the species, but the melanistic form only occurs in two coastal areas: the Monterey Bay and Morro Bay.

For years scientists have hypothesized that these melanistic forms convey a thermal advantage in the foggier, cooler coastal bays. However, the hypothesis remains untested. Moreover, the thermal advantage could only be realized if the lizards were above ground and basking. For a fossorial species, this seems highly unlikely. We aim to test the thermal benefits of melanism in Anniella pulchra by comparing the thermal preferences and heating rates of the tan and melanistic individuals.

Figure 13. Melanistic California legless lizards are widespread at UCSC Fort Ord Natural Reserve, though they are usually taking refuge under the sand, and only come out to feed.

LONG TERM BAT MONITORING

Bethany Schulze is a CSUMB 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.

Figure 14. Bethany Schulze presents bat monitoring methods to a UC Santa Cruz ENVS 104 - Introduction To Field Methods class

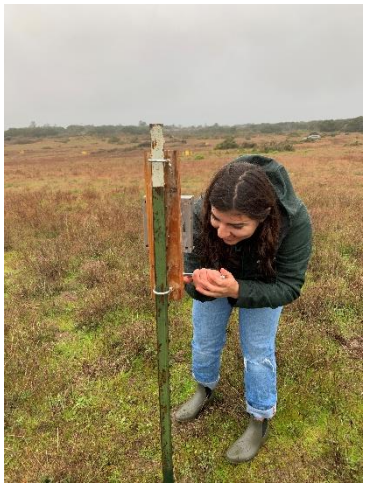
ENVIRONMENTAL DNA SAMPLING

The following work is being conducted by citizen scientists and is guided by the UC Genomics Consortium. Conservation International names California as one of the world's biodiversity hotspots. A biodiversity hotspot is a region with many species whose existence is threatened by human activity. California's wildlife is particularly at risk because many of its resident species are endemic (only found in California) and over 70% of natural habitat has

Figure 15. Researchers from UCSC Shapiro Lab tour the reserve with members of the public during an eDNA Bioblitz event

been lost due to development and land degradation. One of the main challenges facing Conservation Biologists is effective monitoring of species distribution and establishing reliable baselines of a region's biodiversity facilitating early detection of species declines. This project aims to address these problems. Firstly, the samples collected will be analyzed to establish a baseline of California's biodiversity. Secondly, the samples will be stored in an environmental DNA museum allowing future researchers to analyze change in biodiversity over time in relation to changing environmental conditions. Thirdly, we are creating a toolkit to make biodiversity monitoring easier and more effective by enhancing current methodological techniques.

FLORA AND FAUNA MONITORING



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, herpetology cover board surveys, wildlife camera surveys, pitfall trap surveys, endangered plant monitoring, and the establishment of long-term chaparral vegetation monitoring plots.

Figure 16. A UCSC Environmental Studies Intern installs a game camera on a rare rainy day at FONR

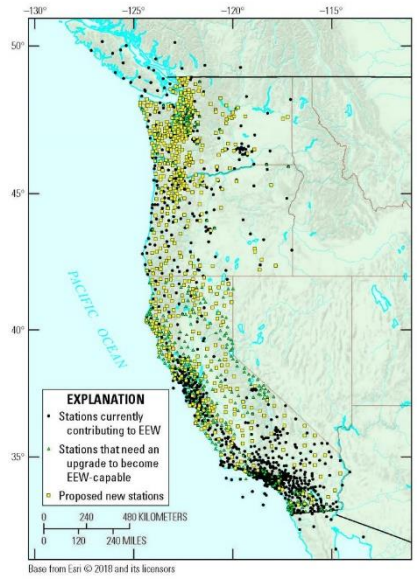
COASTAL FOG MONITORING

Dr. Daniel Fernandez (CSUMB) continues to conduct his long-term monitoring of coastal fog at stations on the reserve. Fog is a significant source of summer water for many of the plants that occur along the central coast. His work is providing important information on how fog patterns are changing from year to year. In 2019 with the assistance of numerous UCSC and CSUMB undergraduate and graduate students, UCSC FONR staff built an additional 8 collectors that are placed on a coast to inland gradient. The stations will be monitored long term to help inform research regarding climate patterns and efficiency of fog collection for use. The newest installation is currently being installed, which is a prototype large scale collector meant to assess the potential collection of fog for use. Staff expects this unit to be operational in Early Fall 2020.

Figure 17. Three 1-meter fog collectors arranged in a transect up a slope in rare maritime chaparral habitat at FONR.

ARCTOSTAPHYLOS SEED BANKS AND ANIMAL FORAGING

Dr. Tom Parker (SFSU) 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.



SEISMIC MONITORING AND SHAKEALERT EARTHQUAKE EARLY WARNING SYSTEM

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.

PUBLIC SERVICE

FONR continues to increase engagement in public service and community outreach. Public schools, universities, NGOs, conservation entities, and a variety of community organizations were able to work with staff and use reserve resources at an increased level. New partnerships emerged in FY2019-2020 including North Monterey County Parks and Recreation, Pacific Grove Museum of Natural History, UC Agriculture and Natural Resources, The Monterey Bay Drone, Automation, and Robotics Technology (DART), Scouts BSA, and Pine Hill School.

RESERVE USE

Before the closures related to COVID-19 precautions, FY2019-2020 was on track for another record use level for the reserve, with planning to support new instructional groups in higher numbers (Appendix 1). The largest user group was undergraduate students who used the reserve for coursework and independent research. University level classes were the next largest group. The decrease in K-12 was a direct result of multiple Spring cancellations, though we anticipate resuming targeted outreach to local schools and nonprofits. Approximately 28 different NGO, community, K-12, affiliated, and governmental entities used the reserve throughout the year (Table 2).

TABLE 2. NGO, GOVERNMENTAL, K-12, AND AFFILIATED USER GROUPS

Bureau of Land Management	UC Genomics Consortium	University of California Agriculture and Natural Resources

Fort Ord Reuse Authority	California Native Plant Society	Learning for Life Charter School
California Department of Fish and Wildlife	CSUMB SEEDS club	Los Arboles Middle School
North Monterey County Parks and Recreation	UCSC Office of Physical Education, Recreation, and Sports	Pine Hill School South Monterey
Ventana Wilderness Alliance	CSUMB Return of the Natives	Monterey County Workforce Development Board
UC Santa Cruz Arboretum	UCSC Kenneth Norris Center for Natural History	California Academy of Sciences
CSUMB Sciences Internship Program	CSUMB Service Learning Institute	UCSC Environmental Studies Internship Office
Pacific Grove Museum of Natural History	The Monterey Bay Drone, Automation, and Robotics Technology (DART)	UC Monterey Bay Education, Science and Technology Center (MBEST)
US Department of Fish and Wildlife	Monterey Bay Tracking Club	Scouts BSA
Second Start Learning	Gavilan College	Cabrillo College

APPENDICES

APPENDIX 1. USE DATA FOR FY 2019-2020

RESERVE USE DATA Fiscal year: 2019-2020

Campus: University of California, Santa Cruz
Reserve: Fort Ord Natural Reserve

	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	1	8	0	0	4	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	25
Research Scientist/Post Doc	1	19	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	20
Graduate Student	1	74	0	0	5	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	87
Undergraduate Student	8	79	0	0	5	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	14	175
Professional	0	0	2	6	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0	0	0	3	12
Other	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0	1	8	3	18
Volunteer	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	3	12
SUBTOTAL	13	189	3	7	14	125	0	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	4	16	36	349
UNIVERSITY - LEVEL INSTRUCTION (CLASS)																										
Faculty	5	11	0	0	5	22	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	34
Graduate Student	6	11	0	0	11	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	22
Undergraduate Student	183	452	0	0	343	448	19	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	545	928
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	4	8
SUBTOTAL	194	474	0	0	359	481	20	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	577	992
OTHER																										
Graduate Student	0	0	12	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	24
K-12 Instructor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	3	3
K-12 Student	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	62	0	0	22	62
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	34	3	34
Docent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1	3
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	5	15	6	18
SUBTOTAL	0	0	12	24	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0	0	25	65	8	49	47	144
HOUSING																										
TOTALS	207	663	15	31	373	606	20	29	0	0	0	0	0	0	0	0	4	18	0	0	25	65	16	73	660	1485

APPENDIX 2. PUBLICATIONS

JOURNALS

Beltran, R. S., E. Marnocha, A. Race, D. A. Croll, G. H. Dayton, and E. S. Zavaleta. 2020. Field courses narrow demographic achievement gaps in ecology and evolutionary biology. Ecology and Evolution.

Huang, Y., G. R. Morrison, A. Brelsford, J. Franklin, D. D. Jolles, J. E. Keeley, V. T. Parker, N. Saavedra, A. C. Sanders, and T. R. Stoughton. 2020. Subspecies differentiation in an enigmatic chaparral shrub species. American Journal of Botany.

Lin, M., A. L. Simons, E. E. Curd, R. J. Harrigan, F. D. Schneider, D. V. Ruiz-Ramos, Z. Gold, M. G. Osborne, S. Shirazi, and T. M. Schweizer. 2020. A Biodiversity Composition Map of California Derived from Environmental DNA Metabarcoding and Earth Observation. bioRxiv.

Meyer, R. S., E. E. Curd, T. Schweizer, Z. Gold, D. R. Ramos, S. Shirazi, G. Kandlikar, W.-Y. Kwan, M. Lin, and A. Freise. 2019. The California environmental DNA "CALeDNA" program. bioRxiv:503383.

Meyer, R. S., E. E. Curd, T. Schweizer, Z. Gold, D. R. Ramos, S. Shirazi, G. Kandlikar, W.-Y. Kwan, M. Lin, and A. Freise. 2019. The California environmental DNA "CALeDNA" program. bioRxiv:503383. Riordan, E. C., and P. W. Rundel. 2019. Evaluating the Future Role of the University of California Natural Reserve System for Sensitive Plant Protection under Climate Change.

Parker, V. T. 2019. Chaparral of California. Encyclopedia of the World's Biomes, Elsevier Inc 2019:1–14.

UNDERGRADUATE RESEARCH

Feng, W. 2020. Small Scale Variability Within High-density Arrays of Fog Collectors - CSU Monterey Bay UROC 2020.

Lor, G. Z. 2019. Resource partitioning between Monterey dusky-footed woodrats (Neotoma fuscipes luciana) and brush rabbits (Sylvilagus bachmani) in maritime chaparral habitat. University of California, Santa Cruz.

Loshkareva, Y., C. Swann, and D. Fernandez. 2019. Variability of Fog Collection Between a High-Density of Fog Collectors Within a Localized Area. AGUFM 2019:A33N–2904.

Shin, Y., and J. M. Duggan. 2019. Comparing Efficiency of Different Survey Methods for Detecting Snakes at the UC Fort Ord Natural Reserve: Preliminary Observations. CSU Monterey Bay Research Symposium.

OTHER MEDIA

Miller, J. 2020a. UC Santa Cruz Fort Ord Natural Reserve - Spring 2020 Virtual Visit. https://youtu.be/n4tU-8T6eOA

Miller, J. 2020b. UCSC Fort Ord Natural Reserve Green Careers Video 2020. https://youtu.be/AqH73fStDiw

Pinck, S., and J. Miller. 2020. Citizen Science in Action at UC Santa Cruz Fort Ord Natural Reserve. A story about a scorpion, a scorpion specialist, and iNaturalist! (Comic Artwork). https://fortordreserve.ucsc.edu/community-outreach%20/scorpion_comic_2020

APPENDIX 3. UCSC NATURAL RESERVE COMMITTEE AND CHARGE

University of California Santa Cruz

2020-2021 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 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 Universitywide NRS Advisory Committee that advises on policy for all NRS reserves.

In addition to the chair (Faculty Director), the committee is comprised of faculty advisors to each reserve, one faculty representative at large, one non-senate academic appointment, one staff representative, two graduate student representatives, two undergraduate student representatives, 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.

DURATION OF APPOINTMENTS

Faculty Director: 5 years

Faculty Advisors: 3 years

Non-Senate Academic, Staff, and Student Representatives: 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

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