

**FY 2015-16 NRS Annual Report
NEW RESEARCH PROJECTS**

Campus: UC Riverside
Reserve: Sweeney Granite Mountains Desert Research Center
Prepared by: Tasha La Doux

New Projects (14):

- Project Title:** Differences in the vocalizations of the various subspecies of Western Scrub-Jay (*Aphelocoma californica*) complex
- Researcher(s):** Kurt Leuschner
- Affiliation(s):** College of the Desert
- Funding:** none
- Description:** Faculty Research. Dr. Kurt Leuschner studies Scrub-Jays throughout North America and is focused on recording the various species resulting from a recent taxonomic split in the western Scrub-Jay complex. The populations of Scrub-Jays found in the Granite Mountains and surrounding Mojave National Preserve are now considered Woodhouse's Scrub-Jay (*Aphelocoma woodhouseii*), but the California Scrub-Jay (*Aphelocoma californica*), which is limited to the coastal regions of Washington, Oregon, California, and Baja California, can be found as close by as the Little San Bernardino Mountains in Joshua Tree National Park. Kurt is particularly interested in areas where the ranges of these two taxa meet or overlap.
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- Project Title:** Responses of Desert Endotherms to Rapid Recent Climate Change
- Researcher(s):** Blair Wolf, Brittney Coe, Richard Ramirez
- Affiliation(s):** University of New Mexico
- Funding:** National Science Foundation (NSF), \$199,813
- Description:** Faculty Research/Ph.D. Dissertation. This research team is part of a larger collaborative effort between Steve Beissinger, Jim Patton, Rory Bowie (all from UC Berkeley), Lori Hargrove (San Diego Natural History Museum), Barry Sinervo (UC Santa Cruz), and the National Park Service to address how climate change will affect plant and animal communities in the future. Dr. Blair Wolf and his colleagues at the University of New Mexico are specifically interested in developing models that project habitat suitability and range-wide species' distributions based on physiological data collected under controlled experiments. This research aims to advance our understanding of whether the effects of climate change will be expressed primarily through constraints on animal physiological performance, or cause catastrophic declines of species due to changes in food availability or other ecological factors. Their experimental design includes measuring the thermoregulatory response of the animal when exposed to a range of air temperatures that reflect those found in the local environment. These data will further our understanding of animal responses to climate change by measuring the body temperature, resting metabolic rate, and evaporative water loss on a variety of small mammals representing different latitudes (north vs south), habitats (hot versus cool), and body sizes.
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- Project Title:** Mojave National Preserve Soil Survey
- Researcher(s):** Matthew McClintock, Matthew Ballmer
- Affiliation(s):** USDA-NRCS
- Funding:** NPS I&M program

Description: Government Research. Standard descriptions of soil profiles and plant communities for the Mojave National Preserve (Preserve) are being developed as one of 12 major inventory efforts supported by the National Park Service Inventory and Monitoring Program. In addition to the written descriptions and reports, NRCS will provide a geospatial map of soil types for the entire Preserve.

Project Title: Geographic variation in *Uta stansburiana*

Researcher(s): Kinsey Brock, Danielle Edwards

Affiliation(s): UC Merced

Funding: Society for the Study of Evolution, Rosemary Grant Award: \$2500

Description: Ph.D. Dissertation. Kinsey Brock is interested in genetic, behavioral, and ecological mechanisms underlying adaptive evolution in lizards. Her most recent research considers the ecological landscape as a driver of geographic variation in morph types of *Uta stansburiana*, a wide-ranging lizard with well-documented polymorphisms. By combining molecular genetics, demography, phylogenetics, and ecology, she hopes to learn more about the role of geographic and environmental variation in morphic speciation.

Project Title: Land Conservation in the Eastern Mojave Desert

Researcher(s): Julia Sizek

Affiliation(s): UC Berkeley

Funding: none

Description: Ph.D. Dissertation. This research project seeks to understand contemporary land conservation in the eastern Mojave Desert of southeastern California, focusing specifically on the regions of the Mojave and Colorado Deserts that can be roughly circumscribed as north of I-10 and south of I-15. Julia hopes to understand several aspects of land conservation and conflict over public lands management, including conflicts over ranching, resource use, biological resources, and cultural and historic resources. In addition to her interest in conflicts over the appropriate use for desert lands, she is also interested in processes effecting education about the desert, for example how public outreach and educational programs for undergraduate and early-term graduate students are presently administered. This qualitative research will be conducted through interviews, archival research, and participant-observation with local landowners, non-profit conservation organizations, and government agencies.

Project Title: ISEECI Collaborative Research: Ecophysiological Instruments for Measuring Biotic Climate Impacts Across Western Field Stations

Researcher(s): Barry Sinervo, Amy Whipple, Susan Mazer, Paul Fikkema, Anthony Ambrose

Affiliation(s): UC Santa Cruz, UC Berkeley, UC Santa Barbara, Northern Arizona University

Funding: Collaborative Proposal: Ecophysiological Instruments for Measuring Biotic Climate Impacts Across Western Field Stations (grant# 1522558), NSF, \$444,961.00

Description: Faculty Research. The UC-wide Institute for the Study of Ecological and Evolutionary Climate Impacts (ISEECI) offers a platform for synthesizing past, current and future environmental change research, and for understanding and potentially mitigating future climate impacts. ISEECI leverages the UC Natural Reserve System as a biologically and geographically diverse laboratory to study the effects of climate change on California ecosystems. ISEECI was created with the support of one of the first UC Research Initiatives President's Research Catalyst Awards, \$1.9 million over four years. Using this funding, ISEECI will facilitate research for faculty, postdoctoral fellows and

graduate students from a variety of institutions. The overall goal is to test the feasibility of novel approaches for discovering ecosystem-wide responses to climate change. Here at the Sweeney Granite Mountains Desert Research Center, a team of scientists has deployed temperature sensors and phenocams to test their viability as a means to monitor seasonal changes in plants and animals.

Project Title: Toward a conservation physiology of Californian flora: assessing drought vulnerability and its variation with plant size across species and ecosystems
Researcher(s): Camila Medeiros, Lawren Sack
Affiliation(s): University of California, Los Angeles
Funding: Ecological Society of America, Forrest Shreve Award
Description: Ph.D. Dissertation. The goal of this research project is to quantify the vulnerability of common species to drought in key ecosystems of California. Specifically, Camila's dissertation will focus on quantifying physiological traits, such as leaf hydraulic conductance (Kleaf), osmotic potential at full turgor and turgor loss point (ft and tlp), gas exchange and leaf water potential, as well as structural and compositional analyses, including anatomy, leaf venation, nutrient concentrations and carbon isotopes, which provide important indices of drought response. She hopes to develop new predictive tools for California species and increase mechanistic understanding of drought responses, which will then improve our understanding of how climate change may impact species distributions and vulnerabilities. While visiting the Sweeney Granite Mountains Desert Research Center they collected stem cuttings from 28 species of common desert shrubs, then transported them back to UCLA where they collected physiological data and preserved leaf material for anatomical analyses.

Project Title: Erosion of lizard diversity by climate change and altered thermal niches
Researcher(s): Rafael Resendiz, Barry Sinervo, Barbara Larrain
Affiliation(s): UC Santa Cruz, Universidad Nacional Autónoma de México
Funding: National Science Foundation
Description: Post-doctoral research. The objective of this research is to assess extinction risk of a variety of lizard species throughout North America, but mostly focused in the southwestern U.S. and Mexico. Dr. Sinervo has been using the Granite Mountains for this project for a number of years and for a variety of lizard species, but Rafael Resendiz is especially interested in the Gila Monster. The researchers have been using polyvinylchloride (PVC) pipe models with data-loggers to record operative temperatures in three types of microsites: one at sunny sites, one in shade, and one in a sun/shade mosaic. Operative temperatures represent the equilibrium of an inanimate object with its habitat and thus allow exploration of the thermal environment at the spatial scale experienced by the lizards. The PVC models are made to be similar in size and shape to the lizard species being tested, as well as painted with reflective spray paint to approximate the reflectivity of their skin. Temperature is recorded every 30 min from 07:30 to 21:30 h to estimate the distribution of operative temperature throughout the potential activity period of the lizard. These models are being deployed across the historic and current geographic range of where the lizards are found, as well as in areas thought to represent future refugia.

Project Title: Fire on the Mojave: Stories from the Deserts and Mountains of Inland Southern California
Researcher(s): Ruth Nolan

- Affiliation(s):** College of the Desert
Funding: none
Description: Faculty Research. In addition to being a professor of English and Creative Writing at College of the Desert, Ruth Nolan is a poet, author, and editor of many literary achievements. Her current book project, “Fire on the Mojave: Stories from the Deserts and Inland Southern California Mountains” aims to capture the role and impact of wildfires in the arid regions of southern California. She will be incorporating both experiential narratives as well as scientific research from a variety of sources to foster a wider community awareness and discourse on fire science, fire ecology, and the impact of major wildfire events on the people and land of the Mojave Desert.
- Project Title:** Terrestrial Species Stressor Monitoring
Researcher(s): Griffin Capehart, Scott Newton
Affiliation(s): California Department of Fish and Wildlife
Funding: California Department of Fish and Wildlife
Description: Government Research. In response to an Executive Order by the Governor, the CDFW has been tasked with implementing a monitoring protocol at over 300 locations throughout the Great Valley and Mohave Desert ecoregions to preserve and protect the state's fish and wildlife resources in these regions. The monitoring data will be used to better understand the impacts of habitat conditions, including drought, on the distribution and abundance of wildlife species. This team of biologists focused their research at Snake Spring in the Granite Mountains, where they recorded presence and abundance of birds, reptiles, amphibians, bats, and other mammals. This data will help develop occupancy and abundance models for a number of species in the desert.
- Project Title:** California Upland Gamebird Proposal: Development of a Survey Protocol for Quail and Doves in Relation to Landscape Level Habitat Assessments
Researcher(s): Michael Casazza, Cory Overton, Angela Merritt
Affiliation(s): USGS Western Ecological Research Center
Funding: CA Dept. Fish & Wildlife, Pheasants Forever/Quail Forever
Description: Government Research. A team of wildlife biologists from USGS and US Fish & Wildlife Service utilized the Center while conducting monitoring surveys for Gambel’s Quail throughout Mojave National Preserve and the surrounding BLM lands. This was part of a larger effort to test monitoring protocols developed to assess population size, trends, and distribution of Quail and Dove species throughout the Mojave, Great Basin, and Sonoran Deserts. Ultimately, this monitoring program is meant to provide land management agencies with a means to characterize and catalog relevant environmental conditions over large spatial and temporal scales.
- Project Title:** Environmental factors that affect seed count and germination rates in invasive Mojave populations of Sahara mustard (*Brassica tournefortii*)
Researcher(s): Brian Alfaro, Diane L. Marshall
Affiliation(s): University of New Mexico
Funding: Joshua Tree National Park Association, \$4,000
Description: Ph.D. Dissertation. Brian is a Ph.D. student at the University of New Mexico, working with Dr. Diane Marshall. His interests include evolutionary and ecological processes that contribute to invasiveness in plants, as well as identifying advantageous traits that allow a plant to be invasive outside their native range. Brian’s dissertation will focus on

Brassica tournefortii, which is highly invasive in the Desert Southwest. Specifically, he aims to identify migration rates and patterns using population genetics.

Project Title: Germination timing as a driver of physiological evolution
Researcher(s): Joe Hereford, Johanna Schmitt, David Ackerly
Affiliation(s): UC Davis, UC Berkeley
Funding: NSF: Award #1447203 (\$316,713) and Award #1457400 (\$726,511).
Description: Post-doctoral Research. Joe Hereford, Ph. D., and his colleagues are interested in the microevolutionary processes driving the development of C4 photosynthesis in plants. Joe will be using a highly selfing and short-lived annual *Mollugo verticillata*, which occurs in a wide range of climatic habitats spanning the conditions that favor C3 and C4 plants. Interestingly, this species utilizes a type of C3-C4 intermediate photosynthesis called C2. In addition, at the Granite Mountains, Joe collected seeds and physiological measurements on the sister species, *Mollugo cerviana*, which uses C4 photosynthesis. By looking at the two species he will be able to make comparisons of their photosynthetic physiology. He will be conducting physiological experiments on plants he grows from seed to determine the extent of adaptation and phenotypic plasticity in these species.

Project Title: Impact of Concentrating Solar Power Plants on Bee Diversity in the Mojave Desert
Researcher(s): Shaun McCoshum, Monica Geber
Affiliation(s): Cornell University
Funding: Cornell's Atkinson Center for a Sustainable Future (ACSF)
Description: Post-doctoral Research. The Mojave Desert eco-region is one of the most undisturbed in North America and a region of very high diversity of plants and bee pollinators. At the same time, the Mojave has seen the recent installation of large renewable energy facilities, longer term development associated with golf courses, casinos, shopping malls, etc., and is earmarked to support 20,000 megawatts of renewable energy over the next 25 years. The impacts of these developments on invertebrate pollinators are largely unknown and will likely vary between facilities, most of which completely remove native vegetation from the site. This project aims to compare bee diversity in undisturbed areas of the Mojave Desert (e.g. Sweeney Granite Mountain Desert Research Center) to the bee diversity at large renewable energy facilities, such as the Ivanpah Solar Electric Generating System, as well as other developed areas nearby (e.g., Conventional Solar Electric Generating Facilities or the Primm Valley Golf Course and Casino). Bees will be collected and identified at the various locations; these data will be used to assess environmental impact of large-scale solar facilities, as well as develop an economic and environmental cost benefit analysis for this type of environmental disturbance.