

Coachella Valley Conservation Commission
Coachella Valley Multiple Species Habitat Conservation Plan
Reserve Management Oversight Committee
AGENDA
April 26, 2023



2:00 p.m.

CVAG Conference Room, 73-710 Fred Waring Dr., Suite 119, Palm Desert, CA 92260

1. **Introductions and Announcements**
2. **Member Agency Reports**
3. **Update on Land Acquisition / Reserve Assembly**
4. **Monitoring Program Status**
 - a. Aeolian Sand Community
 - b. Vegetation Surveys
 - c. Desert Tortoise
 - d. Yellow Bat
5. **Annual Work Plan - Priorities for Monitoring and Management Tasks – Fiscal Year 23/24**
6. **Reserve Management Issues**
 - a. Fencing, Cleanups, and Signage
 - b. Palm Hills /Rimrock Trails Maintenance and Improvement Project
 - c. Peninsular Bighorn Sheep Fence and Drinker
 - d. Invasive Species Projects - Low Desert Weed Management Area
7. **Funding Opportunities**
 - a. Local Assistance Implementation and Planning Grants
 - b. Trails Proposal
8. **Next Meeting:** October 25, 2023, at 2:00 p.m. at CVAG Conference Room, 73-710 Fred Waring Dr., Suite 119 in Palm Desert, 92260
9. **Adjournment**

2023-2024 Annual Work Plan

CVMSHCP Biological Monitoring Program

BACKGROUND

The Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) covers 27 species and 27 natural communities. Implementing monitoring for species in an effective and efficient manner depends largely on prioritization of tasks that narrows and focuses budgets on monitoring needs. The CVMSHCP's Biological Working Group and Reserve Management Unit Committee meet regularly to share expert knowledge, data and experience; together they bring a consensus to the monitoring priorities planned annually. Species in arid environments typically experience population fluctuations driven by rainfall or other independent shifts in resource availability. Those drivers are often so strong that they can mask the early stages of the effects of a stressor unless the monitoring is designed to partition drivers from stressors and identify finer scale demographic shifts. Monitoring habitats to identify and manage those stressors is a tenet of the framework explicit in the CVMSHCP. Periodically assessing only occupancy or abundance of a species without tying those data to shifting resource/stressor levels is at best a blunt monitoring metric, and arguably will not provide land managers or regulators the knowledge and direction necessary to ensure the persistence of those species. Such an approach could easily result in monitoring species to extinction. For those species in which the stressors are acute, conceptual models have defined the questions and hypotheses that need to be addressed to evaluate the need and effectiveness of adaptive management. With hypotheses in hand, MSHCPs can both enlist the help of colleges and universities or use staff and consultants to design and implement monitoring that then informs and directs measures needed to ensure the persistence of those species.

In 2014, UC Riverside's Center for Conservation Biology outlined priorities for monitoring by developing a vulnerability assessment like ones developed for the US Department of Interior National Park system which utilizes a numerical risk ranking system. The ranking systems of the vulnerability assessment were introduced and discussed in depth at Biological Working Group meetings. The categories were adapted to those issues outlined as important for species in the CVMSHCP and ranked on variables from four main categories: what are the known risk factors present with population and/or habitat declines, had baseline surveys that had been completed, were the species endemic to the MSHCP, or migrants, and vulnerability to climate change. Within

each category, species were given a negative, positive or neutral score to quantify their expected response to each variable based on available information. For those species most at risk, our goal is to monitor population and ecological drivers at more frequent intervals, between 1-3 years for most species. For the less-at-risk group, periodic monitoring identifies the presence of stressors, such as weeds, inappropriate recreation, or altered ecosystem processes such as fire, flooding or dune sand accumulation that are temporally outside of expected parameters. Prioritizing monitoring in this way can be a far more informative and cost-effective approach to ensuring persistence of species and their habitats.

Based on the prioritizations, a schedule for annual monitoring was developed (Figure 1). Like the vulnerability assessments themselves, this schedule should be considered fluid and be able to respond to new information or changing site conditions (such as ample precipitation or the lack thereof). During spring 2015, focused workshops were held by the Coachella Valley Conservation Commission (CVCC) to determine monitoring strategies for desert tortoise and burrowing owl, and monitoring objectives were made in response to recommendations from those working groups. 2016 marked the fifth year of a severe drought, which finally began its reprieve in 2015-2016. Precipitation was normal through the spring of 2015-2016 due to an El Niño system which allowed for annual plant growth, and some relief from the extended drought, and then dropped off to below normal drought conditions in 2017-2018. 2017-2018 was the year following a wet winter/spring, and so the schedule was adapted to take advantage of monitoring for those species which could expand their territory or populations that year. The autumn and spring of 2018-2019 were exceptional rainfall years and resulted in a record-breaking wildflower bloom year in the spring of 2019. 2020 was close to average with heavier rains in the early spring, while a dry spell starting in 2021 continues into the spring of 2022. The winter/spring of 2023 saw an unusually high amount of precipitation in the western area and higher elevations of the Coachella Valley causing a massive bloom of wildflowers and invasive plant species. Areas further east such as mid-Valley and east Valley received low to average rainfall.

The species covered under the MSHCP are threatened not only by the threats laid out within the NCCP, however; planning has not historically considered the vulnerability of species due to climate change, which have become measurable and visible on the landscape. To protect the species for which these plans were designed, we must understand how species may shift on the landscape to track their biological niche; movements that are likely to transcend boundaries. These predictions can help inform supplemental management actions and approaches such as strategic lands acquisition, and the targeted management of the known threats to species (fire and off-highway recreation) within retained future habitat. Over the next several years, an initiative

which was supposed to begin in 2022 with Local Assistance Grant funding, was shifted to 2023 funding and will evaluate the climate change vulnerability of Plan-listed species, using the most recent and best available science to understand potential changes in the context of overall vulnerability rankings and the framework of the CVMSHCP.

Figure 1. 2014-2024 Monitoring Schedule

Species	2014 - 2015	2015- 2016	2016 - 2017	2017- 2018	2018- 2019	2019- 2020	2020- 2021	2021- 2022	2022 - 2023	2023- 2024
Plants										
CV Milkvetch	X	X	X	X	X	X	X	X	X	X
Little SB Mountains Linanthus	X	X	X		X		X	X		
Mecca Aster	X				X				X	
Mesquite Monitoring				X	X	X	X			X
Orocopia Sage	X				X				X	
Triple-ribbed Milkvetch			X	X	X	X	X			
Invertebrates										
CV Giant Sand-Treader Cricket			X	X	X	X	X	X	X	X
CV Jerusalem Cricket	X			X	X				X	
Fish										
Desert Pupfish	X	X	X	X	X	X	X	X	X	X
Reptiles										
Desert Tortoise		X	X	X	X		X	X	X	X
CV Fringe-toed Lizard	X	X	X	X	X	X	X	X	X	X
Flat-tailed Horned Lizard	X	X	X	X	X	X	X	X	X	X
Birds										
Burrowing Owl	X	X	X	X	X	X				
California Black Rail	X	X	X	X	X	X	X	X		
Crissal Thrasher	X	X			X	X				
Gray Vireo				X						
Least Bell's Vireo			X							
Le Conte's Thrasher	X	X			X	X			X	

SPECIFIC MONITORING DESCRIPTIONS AND QUESTIONS PROPOSED

CLIMATE RESILIENCE FOR PLAN SPECIES:

Desert species are adapted to aridity, but like all organisms, they still grow and thrive in specific conditions of temperature, moisture and other environmental and ecological conditions (e.g. specific soils, food plants or pollinators) that are subject to disruption as climate changes. In the CVMSHCP/NCCP area, deeper droughts and increased aridity associated with climate change (Hopkins 2018) are already affecting the distribution of desert species (Kelly & Goulden 2008; Barrows et al. 2020). Although the original plan for conservation area boundaries was designed to best protect the Plan-covered species and their habitats, these areas most suitable for these species is likely to shift and require a new vision for strategic conservation and acquisition. We propose to evaluate vulnerable species over two years for climate resiliency, with a goal of informing management to ensure that the stewards of the Plan do not lose the species it is charged to protect. The project is designed to evaluate climate resiliency and address the following questions:

- To what degree do the existing Plan conserved lands boundaries encompass the future habitat of covered species?
- Is there an existing buffer to allow for species movement/migration already built into the existing design; how should the boundaries be changed or broadened?
- What resources and funding would be needed to address and support climate resiliency for these biological resources?

This project addresses critical planning initiatives highlighted in the California State Integrated Climate Adaptation and Resiliency Program by modeling vulnerable species and habitat to better plan for resiliency in the Coachella Valley. The objective is to model current and future habitat suitability for several Plan species within the region encompassing the Plan area and determine to what degree the future suitable habitat of these species is and can be protected. This information may inform what type of resources and funding would be necessary to create a climate-resilient habitat management plan for these species.

To accomplish predictive models about current and future habitat suitability, data about species localities, historic to current will be collated and verified, together with climate and other environmental data layers for the species distribution model. Resultant habitat maps will be field

verified as representative of current suitable habitat, and then used to project future habitat areas for the near-term (2040-2070) and longer-term (2070-2099) within the Coachella Valley and environs. Climate-resilience summaries will be created for two to three lower-elevation species (e.g. Orocopia sage and Mecca aster) in Year 1 and for two to three mid-elevation alluvial fan associated species (e.g. Le Conte's Thrasher and the Little San Bernardino Mountains Linanthus). This project will also test this approach for providing concrete, actionable information and recommendations for use with other species.

Future climate information for various climate scenarios, gridded for use in species distribution modeling (habitat modeling), is now available at relatively fine spatial scales of 270 m per pixel or less, and an additional trove of information is available concerning remote sensing of land cover types, phenological characteristics, topography, soils and other factors. Newer datasets are also fine-scale temporally, with predictions for roughly 30-year periods for 1950 until the end of century. This type of information is critical to understand the speed and likely trajectory of changes geographically, in the near-term (2040-2070) and longer-term (2070-2099); changes which are likely within the lifetime of humans living within the CVMSHCP/NCCP Area today.

The following is a continuation of this project, begun in 2022-2023:

Expected Tasks for 2023-2024:

- **Project Management**
- **Finalize species and environmental datasets for modeling.**
- **Perform species distribution modeling.**
- **Summarize in a written report the final modeling methodology, species distribution modeling results, and management recommendations for informing plan area climate resiliency. Archive GIS data.**

PLANTS

Vegetation mapping

Fine-scale vegetation maps are used to understand the terrestrial landscape. These are used by the California Department of Fish and Wildlife (CDFW) and other state, federal and local agencies for conservation planning and other purposes. The Survey of California Vegetation (SCV) is the CDFW's standard for classifying and mapping California's vegetation, set forth by the Vegetation Classification and Mapping Program

(VegCAMP). The SCV starts with collection of plant data in the field that are analyzed to develop a classification of vegetation types, which is then used to create fine-scale digital vegetation maps. The objective of the SCV is to develop a state-wide digital vegetation layer that is uniform in resolution and supported by field data, using a repeatable methodology.

The CDFW is working to finalize complete vegetation maps for the state of California. As part of this effort, for the years 2023-2025, CDFW has provided funding directly to UCR to map areas within the Coachella Valley that were not previously mapped, and those that CDFW would like to update, comprised of 1,266,969 acres within Riverside County. UCR will be also re-attributing the Mecca Hills and Orocochia Mountains using an updated data frame and associated disturbance attributes from CDFW, an area of 112,830 acres in Riverside County. Activities will involve coordination between UCR, CVCC, and other CVHMSCP partners, and provide information on disturbance, CVMHSCP species, and other information.

Expected Tasks for 2023-2024:

- **Coordination between UCR, CDFW and CVCC and other partners for field sampling and mapping.**

Mesquite Working Group Development

Southern California's desert populations of honey mesquite (*Prosopis glandulosa* Torr. var. *torreyana* (L. D. Benson) M. C. Johnst.) are an important component of desert biodiversity as key structural components of endemic food webs and appear to be in decline in several areas. These stands occur within diverse biotic associations including desert riparian communities as peripheral to species such as willows, cottonwoods and palms, within and surrounding dry lakebeds, and as isolated sand dune hummocks (Barbour and Major 1977). While honey mesquite are protected both in dune and riparian habitats as components of natural communities under the NCCP portion of the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP), honey mesquite here also provide critical habitat for several CVMSHCP covered species. Species occurring on mesquite sand dunes include the federally-endangered Coachella Valley fringe-toed lizards (*Uma inornata*) and Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae*) as well as Palm Springs pocket mice (*Perognathus longimembris bangsii*), round-tailed ground squirrels (*Spermophilus tereticaudus*), Coachella Valley giant sand treader crickets (*Macrobaenetes valgum*) and LeConte's thrashers,

(*Toxostoma lecontei*). In riparian habitats, Bell's vireos (*Vireo bellii pusillus*) and Crissal thrashers (*T. crissale*) utilize honey mesquite. Managing and sustaining honey mesquite is an important objective of the CVMSHCP.

Understanding the drivers of any declines in the health of a natural community is paramount when developing a restoration plan. Studies investigating the spatial and temporal scale of the problem and the factors involved (abiotic, biotic and anthropogenic) are the basis for a scheme that either directly or indirectly addresses those drivers to prevent further decline and restore the area to the desired state. With the apparent decline of this protected community as a pressing issue, here we suggest convening to review the existing datasets, goals, and stakeholders within the Plan area.

Mesquite stands along the Banning Branch of the San Andreas fault were studied for the contributing factors associated with their decline in 2014 (Barrows et. Al 2014). Stands were analyzed using available historic aerial and satellite imagery. In 2022, CVCC acquired a drone which captures high-resolution pictures which can be used to create orthomosaic images. These new capabilities allow for a renewed study of mesquite success surveys. Hummocks included in the 2014 study will be resurveyed by CVCC staff and compared with the latest images available in the report. Areas of live honey mesquite will be digitized using standard heads-up digitizing procedures tracing the outer boundary of each contiguous clump of live mesquite within each site. New images will be converted to pan-chromatic (black and white) to create a common format with the historic black and white images and those included in the 2014 study. This information will be used to direct management actions necessary for the restoration of the honey mesquite hummocks along the San Andreas fault line.

Expected Tasks for 2023-2024:

- **Coordination between partners for reviewing status, goals and available data for conservation.**
- **Create orthomosaic images of mesquite hummocks surveys along the Banning Branch of the San Andreas fault.**

INSECTS/ARTHROPODS

Coachella Valley Giant Sand-Treader Cricket

The Coachella Valley Giant Sand-Treader Cricket (*Macrobaenetes valgum*, hereafter CVGST) is a large, wingless camel cricket of the family Rhaphidophoridae. It is protected under the CVMSHCP due to its habitat restriction to areas with large amounts of fine, active sand which have drastically declined in area because of development and blocking/alteration of sand movement from sand sources. However, within remaining healthy dune habitats, such as the CVNWR, these crickets can be exceptionally abundant. Little is known of their biology, but their lifecycles appear to be closely linked to winter rains (Tinkham 1962, Barrows 2012). Nymphs (juveniles) are present in large numbers in the autumn months but are too small to be easily detectable. However, the crickets grow rapidly throughout winter, and by late winter or early spring the surviving CVGST are large enough to detect. CVGST are important nocturnal generalist detritivores that likely feed opportunistically on plant and animal matter (Polis 1991). They are sensitive to high heat, so each morning, before the heat of the day arrives, they excavate a new burrow into the sand, presumably to a depth where conditions are comfortably cool and moist (Tinkham 1962). Their method of excavation leaves behind a characteristic triangle-shaped pile of sand tailings at the mouth of each burrow. By July or August, when summer temperatures are at their maximum, adult CVGST have mostly disappeared, and the population is carried on by dormant offspring.

Research within the CVMHSCP has shown that winter precipitation is sometimes statistically correlated to CVGST abundance, which is intuitive with what we know about this insect's life history. However, there is also considerable variability in CVGST population trends that does not appear explainable by precipitation patterns alone. We are continuing to determine the influence of other factors such as the lagging impact of long-term drought, sand stability and other threats to the species. Surveys of CVGST take place in late winter to early spring, when the crickets are large enough and as near to peak abundance as possible for detection. Surveys are conducted across all the long-term 0.1 ha aeolian community plot, generally annually.

Expected Tasks for 2023-2024:

- **Conduct population and reproductive success surveys throughout their CV range in the spring 2024.**
- **Assess levels of invasive species and their impacts on covered aeolian species' food resources – spring 2023.**

- **Continue to revisit the sites where loose sand may be declining and no CVGST were found in 2022 in populations at Stebbins Dune.**

REPTILES

Coachella Valley fringe-toed lizard, and flat-tailed horned lizard

Aeolian sand suite of species monitoring protocol includes monitoring for CV Milkvetch, Palm Springs pocket mouse and round-tailed ground squirrel. These species are lumped together as they co-occur in many of the same natural communities (aeolian sand fields, dunes, and mesquite hummocks) and so are monitored simultaneously. All have shown substantial reductions in habitat and populations in recent times; no other species' habitats within the CVMSHCP have had nearly the same levels of fragmentation, impacts from invasive species and overall loss (>95%). The most severe losses have occurred with flat-tailed horned lizards; causes for those declines have varied between species and have included human enhanced predation pressure, habitat fragmentation, and ant declines due to Sahara mustard. Drought and climate change may also be stressors; however, a full understanding of how stressors and drivers interact with regard to flat-tails has been elusive because the last known remaining population in the Coachella Valley occur on few sites (Thousand Palms Preserve, Dos Palmas ACEC) and so there is insufficient variation in climate and habitat conditions to partition the relative influences of potential stressors.

In recent years, USGS and UCR have partnered to collect genetic data for CV fringe-toed lizards. These data revealed a recent shift and emergence of a unique genetic structure for each of the core areas designated to protect this species. These findings present questions regarding the trajectory of these genetic changes, and whether they are adaptive or random (genetic drift) and whether a loss in genetic heterogeneity might be leading to reduced fitness (reproductive recruitment and population sustainability) at some locations. Other questions related to habitat fragmentation include whether it is possible to re-establish connectivity that appears now to be severed, or if physically moving lizards between core areas could be useful, of negligible value, or counterproductive.

Another overriding question is the impact of climate change on these species. Unlike species without edaphic restrictions in the suitable habitat, sand dune species do not have the options to move up-slope or northward to stay within a preferred climatic envelope as anthropogenic climate change progresses. Models aimed at predicting climate change's impact on CV fringe-toed lizards have indicated substantial loss of suitable habitat.

In 2016-2018, UCR and USGS also collected morphological data that may be used to address whether population genetic differences are adaptive to localized habitats. In 2023-24, monitoring will continue across the aeolian sand habitats focusing on the impacts of Sahara mustard, fragmentation and climate. The Aeolian Sand Protocol will continue to be used to document plant, arthropod, and vertebrate occurrences and habitat status. Included in the monitoring is an ongoing assessment of invasive species and their impacts on covered aeolian species' food resources.

The proposed survey would provide resource managers critical information with which to assess whether the MSHCP/ NCCP is currently meeting its aeolian sand species conservation goals and objectives, including conservation of essential habitat and habitat quality. This study will fulfill required objectives listed under *Species Conservation Goals and Objectives* in Section 9.6.2.1 through 9.6.2.3 for the CVFTL, and objectives in Section 9.6.3.1 and 9.6.3.2 for the FTHL.

Questions to be addressed:

- Can the covered aeolian sand species sustain populations in areas where Sahara mustard has invaded?
- How is climate change impacting sustainability for this species?
- Are control methods for the invasive species effective at reversing the downward trajectory for this species group?
- Is the documented increased genetic structure now static or does it represent a trajectory that might include reduced genetic heterogeneity and fitness?

Expected Tasks for 2023-2024:

- **Conduct population and reproductive success surveys throughout their CV range in the fall of 2023 and spring 2024.**
- **Assess levels of invasive species and their impacts on covered aeolian species' food resources – spring 2024**
- **Continue to revisit translocation sites to determine the sustainability of CVFTL populations at Stebbins Dune.**

Desert Tortoise

Agassiz's desert tortoises that live in the mountains surrounding the Coachella Valley are protected under the ESA as threatened. However, despite being covered under the Coachella Valley Multiple Species Habitat Conservation Plan they are not the recipients of any active recovery efforts since they exist mostly outside the boundaries of designated critical habitat for the recovery of the species. Scattered populations are known to exist in the Whitewater Hills

(Mesa study site), Painted Hills, and Santa Rosa Mountains. The Mesa tortoises are well-studied by virtue of research on the effects of wind energy operation on wildlife by the U.S. Geological Survey. However, earlier research suggests that the Mesa population declined from 1997-2013. Despite high primary productivity of tortoise food plants and high reproductive output, the population shows little evidence of recruitment for reasons that are currently unknown. The Mesa population is the largest in the region but has not been sampled since 2013. Current data on population size and survivorship are needed to determine if the decline continues and identify causative factors.

In addition to that study site, preliminary surveys have located several adult and neonate tortoises between the mouth of Deep Canyon and the Highway 74 area in the Santa Rosa Mountains. Little is known about the ecology of tortoises in the low elevation areas of the Santa Rosa Mountains. To live in such low elevation habitats (<300 m) suggests that Santa Rosa tortoises may have the ability to endure exceptionally hot and dry habitats, compared to other tortoise populations. Understanding how tortoises are behaviorally adapted to live in these hot, low, southerly locations may help to understand how they will fare under future warming temperature scenarios predicted to cause declines in and around nearby Joshua Tree National Park.

Additional evidence suggests that other populations survive in the Coachella Valley uplands, including the southern foothills of the Little San Bernardino Mountains (LSBMs). More information is also needed on the genetic affinities of tortoises in the uplands surrounding the Coachella Valley. Research was funded by the Coachella Valley Conservation Commission from 2015-2018 to collect DNA samples from tortoise populations separated by the Coachella Valley, including Mesa, Cottonwood Canyon (Joshua Tree National Park), and the Orocopia Mountains area. Analyses show little genetic differentiation between Mesa and the other two sites, suggesting that the boundary of the Eastern Colorado Genetic Unit needs to be extended to the west to include Mesa. It is hypothesized that genetic connectivity between Mesa and populations east of the Coachella Valley occurs through the southern foothills of the LSBMs, but DNA samples are needed to test that hypothesis. DNA samples were needed from the Santa Rosa tortoises for comparison with newly available samples from Anza Borrego Desert State Park to the south. So, surveys in the Santa Rosa and LSBM were conducted through 2021 and 2022. USGS actively monitored areas where signs of tortoise presence and burrows were found to locate individuals which were then measured, marked, and blood samples were drawn if possible. Due to the lack of precipitation, tortoises were found dehydrated and blood samples could not be drawn. Leveraging funding from BLM as well as CVCC, USGS also monitored the population at Mesa

site. This is the largest population of tortoises in the area. Over 70 mostly adult tortoises were marked at the site between 1997 and 2022. Mean annual egg production and mean annual clutch frequency at this site were the highest ever reported for this species. However, data on population size from 1997-2013 suggest a declining population with limited recruitment despite high reproductive output. There are two reasons why population size should be monitored again. First, monitoring to determine current population size is lacking since demographic surveys have not been conducted for a decade (last surveyed in 2013). Second, the site is undergoing a “repowering” operation to replace 460 small lattice-style turbines with 8 very large monopole turbines. This is a major surface-disturbing process that has the potential to kill tortoises not detected by biomonitors, especially small tortoises. To obtain a comparable estimate of population size USGS will repeat surveys in the spring/summer of 2023 and 2024 using the same techniques as from 1997-2013 to find out how many tortoises survived. A before-after-impact study of wind energy repowering has never been done for tortoises and this presents a unique opportunity given that extensive data on tortoise demography are available before repowering.

USGS will also study the genetic relationship of tortoises isolated in the Santa Rosa Mountains to other populations around the valley. Desert tortoises are widely distributed throughout much of the Mojave and Sonoran deserts of California. The Salton Trough (including the Coachella Valley) forms a major low elevation barrier to tortoises at the southern edge of their range. Despite this barrier, there are scattered populations of tortoises on the southwest side of the Coachella Valley in the Santa Rosa Mountains. The genetic relationships of these tortoises to others on the northeastern side of the Coachella Valley are unknown. Obtaining blood samples to extract DNA and run genetic analyses are required to determine if these isolated tortoises are unique or related to other populations. This will be done in collaboration with Dr. Bryan Jennings (UCR).

Finally, USGS will also continue to study the demography and ecology of tortoises in Deep Canyon to understand adaptations to climate change. The largest known breeding population of tortoises isolated in the Santa Rosa Mountains is in Deep Canyon where we have marked over a dozen tortoises, four of which are currently outfitted with radio transmitters. In collaboration with the University of California, Riverside (Boyd Deep Canyon Desert Research Center) and the California State University Fullerton, USGS is monitoring tortoise behavior and potential predators with up to 8 passively activated trail cameras placed on tortoise burrows. USGS will also continue to use radiotelemetry to study seasonal and annual movements.

Expected tasks:

- **Conduct census of tortoises on conservation lands adjacent to BLM sites to determine current population size using previously published techniques**
- **Conduct surveys on tortoises in the Santa Rosa Mountains and Little San Bernardino Mountains in areas known to have tortoises (e.g., Mission Creek, Whitewater, Deep Canyon, Randall-Henderson Trail).**
- **Search for any populations in the Little San Bernardino Mountains through Morongo Canyon, Long Canyon, Deception Canyon, Fargo Canyon.**
- **Tortoises will be marked, measured and a small sample will be outfitted with radio transmitters). Females will be X-rayed during the egg-laying season.**
- **Take small blood samples of tortoises in the Santa Rosa and LSBMs for DNA analyses.**

FISH

Desert Pupfish

This species has been monitored annually by the California Department of Fish and Wildlife and monitoring will continue in 2023-2024 throughout the Dos Palmas and Coachella Valley Stormwater Channel and Delta Conservation Area, as well as within the multiple drain systems that flow into the stormwater channel and the Salton Sea with the same protocols employed to date. Additionally, this year, the Center for Natural Lands Management will be creating and implementing a biological monitoring protocol for a revived population of pupfish at the Thousand Palms Preserve. This species is potentially at risk due to abundant and multiple invasive species, as well as water diversions, increasing salinities in the Salton Sea and loss of water in creeks and drains, and how climate change might interact with those stressors.

MAMMALS

Peninsular bighorn sheep

This species has a significant portion of its range within the CVMSHCP; the Santa Rosa/San Jacinto Mountains Conservation Area contains 187,457 acres of USFWS designated essential habitat for Peninsular bighorn sheep. Data to help understand the effects of environmental variability, including drought and climate change will assist researchers and managers in understanding any shift in potential habitat. CVCC is working with multiple agencies to implement bighorn sheep monitoring that supports the evaluation of population data and associated environmental drivers. CDFW manages and implements interagency monitoring of PBS adhering to the actions outlined in the federal PBS Recovery Plan under the Endangered Species Act. Monitoring of PBS metapopulations occurs range-wide across 9 recovery regions

via ground and aerial surveys of radio collared bighorn sheep. The objectives of year-round population monitoring include quantifying lamb survival and recruitment, determining cause-specific mortality and annual survival of marked individuals, and calculating biennial population estimates. In 2014 and 2015, biologists radio-collared sheep within the central Santa Rosa Mountains. Data collected from collaring and monitoring efforts support spatiotemporal population models that investigate and identify limiting factors in support of recovery efforts.

Additionally, an updated vegetation map was completed in spring 2017 to enhance our understanding of essential bighorn sheep habitat and identify management needs to ensure persistence of sheep populations within the Plan area. Since 2015, data on characteristics of the vegetation within PBS core or essential habitat has been gathered to complement concurrent monitoring studies on genetics, population ecology, health status, and threats/stressors.

In 2017, USGS was funded through a CDFW Local Assistance Grant and CVCC to refine a protocol to document recreational trail use along nine trails and compare those data to the spatial and temporal movements of the bighorn. In the fall of 2020, CVCC provided funding for CDFW to purchase and install 15 global positioning system (GPS) collars and data plans to facilitate monitoring of the Santa Rosa Mountains recovery unit, specifically, the ~50 individuals that will be affected by the construction of the bighorn sheep exclusion fence expected to begin in Autumn 2023.

Anthropogenic disturbance becomes a conservation concern when it negatively influences fitness and ultimately causes detectable negative changes in population size. In general, most human recreational activity can be considered a non-lethal type of disturbance for bighorn sheep. Assessments of the impact of disturbance due to recreation activities often focus on short-term behavioral responses of sheep. Employing techniques first used for desert bighorn sheep and other techniques piloted in the CVMSHCP area, the project examined existing data and new data collected from a limited number of GPS collars, infrared counters, and human volunteers (citizen scientists). Combined with a review of environmental data (temperature, rainfall, vegetation, elevation, slope, habitat type), the combined results will make preliminary correlations about spatial-temporal phenomena and determine the final sample size of PBS, infrared counters, and volunteers needed for the full implementation of our larger study (CVMSHCP wide monitoring and research). The preliminary study was completed in 2021 and is working to refine a protocol and final report.

In 2023-24, USGS and CVCC will continue to work with USFWS, CDFW and BLM to quantify the spatial, temporal, and behavioral use of habitat in the CVMSHCP by PBS and human recreational users. The initial work from this study has helped to identify many unforeseen

limitations to the proposed research design or additional research questions, which will refine or add to the types of techniques needed to properly evaluate shared use of habitat by humans and PBS. In addition to preparing for a larger round of work, the initial results can be used to help the wildlife agencies assess and improve their management of the species (at local, regional, statewide, and national levels). Through a CDFW Local Assistance Grant, NDVI data will be added to the models this coming year to help determine how availability of forage, determined by satellite green-up data, can influence the behavior of sheep near trails as well as help refine the models for the protocol. This funding was supposed to be available in the 2022-2023 year, but got shifted due to budget constraints, and tasks will roll over into the upcoming 2023-2024 fiscal year.

The CVMSHCP-wide study will provide resource managers with the information with which to assess whether the MSHCP/ NCCP is currently meeting its bighorn conservation goals and objectives, including conservation of essential habitat and habitat quality. This study will fulfill preliminary objectives listed under *Species Conservation Goals and Objectives* in Section 9.8.4.1, and 9.8.4.2.

Questions to be addressed:

- How do population dynamics relate to environmental variables such as topography, access to alluvial fans, water/forage availability, vegetation, fire history, predation, disease, and invasive species?
- What is the extent of the threats that affect sustainability of this species?
- How do recreational land uses impact the sustainability of this species?
- What are the effects of climate change (e.g. shifts in availability of forage and water, cover; increased disease during wetter periods)?
- What are the spatial and temporal variations in habitat use? What are the relationships of the habitat data to the modelled and actual occurrences?

Expected tasks:

- **Biomonitoring of PBS during fence installation**
- **Collaring of sheep in the fall of 2023 in La Quinta to better monitor before/after effects of the fence on sheep population/movement.**
- **Can NDVI data help determine temporal and spatial shifts of ewe group movement**
- **If possible, an expansion of study to La Quinta area**
- **Grad student /Post Doc to focus on in depth study of questions arising from the initial recreational study**