



# Carrizo Plain National Monument

– 2024  
Scientific  
Research



# Carrizo Plain National Monument

One of California's highest diversity of state/federal threatened and endangered species/subspecies

- ▶ Vernal Pool Fairy Shrimp (FT)
- ▶ Longhorn Fairy Shrimp (FE)
- ▶ Kern Primrose Sphinx Moth (FT)
- ▶ Crotch's Bumble Bee (SC)
- ▶ Blunt-nosed Leopard Lizard (FE)
- ▶ Western Spadefoot (FPT)
- ▶ California Condor (FE)
- ▶ Swainson's Hawk (ST)
- ▶ Tricolored Blackbird (ST)
- ▶ California Jewelflower (FE)
- ▶ San Joaquin Woollythreads (FE)
- ▶ Kern Mallow (FE)
- ▶ Giant Kangaroo Rat (FE)
- ▶ San Joaquin Antelope Squirrel (ST)
- ▶ San Joaquin Kit Fox (FE)
- ▶ Mountain Lion (SC)

# Carrizo Plain National Monument

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- ▶ **Blunt-nosed Leopard Lizard (FE)**
- ▶ **Giant Kangaroo Rat (FE)**
- ▶ **California Jewelflower (FE)**
- ▶ **San Joaquin Kit Fox (FE)**

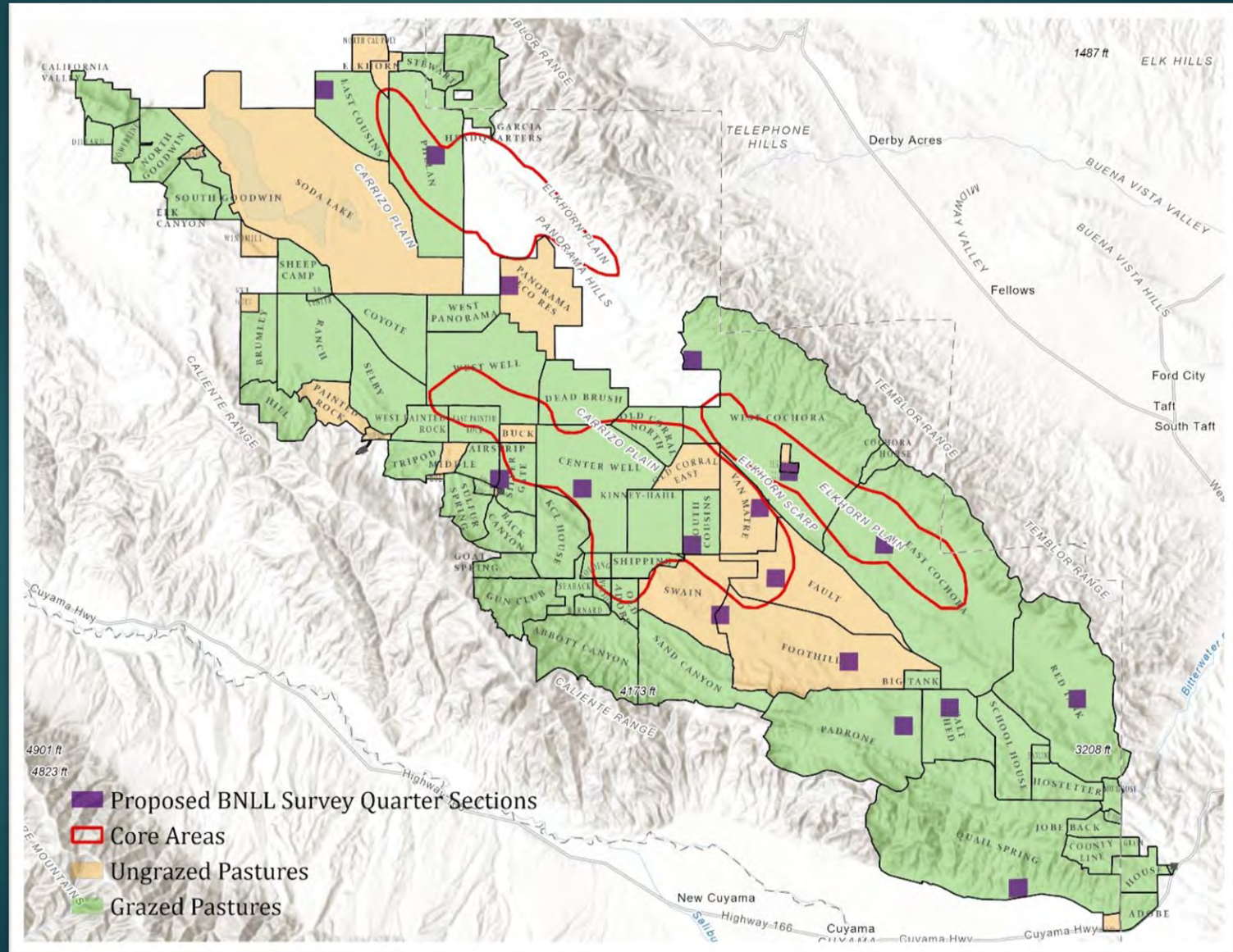
# Blunt-nosed Leopard Lizard (*Gambelia sila*)



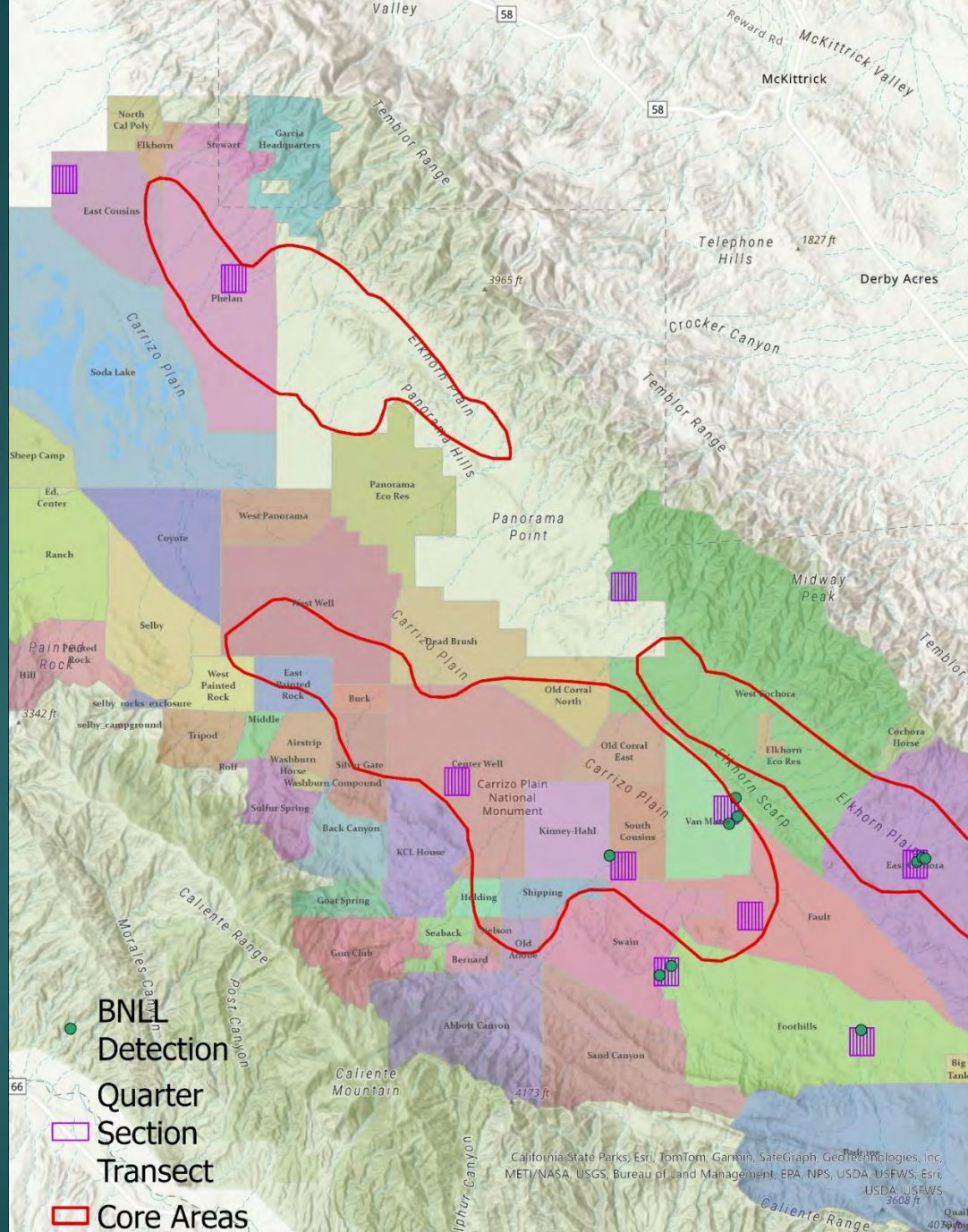
- ▶ Walking Survey Transects (1/4 section)
- ▶ Road Surveys
- ▶ Scat Dogs (Working Dogs 4 Conservation)
- ▶ PhD Candidate Emme Nix – BNLL time to detection
- ▶ Dr. Dave Germano & retired BLM Biologist Larry Saslaw – BNLL x LNLL hybrid zone in Cuyama
- ▶ Hurricane Fire – BNLL recolonization of burned area (M. Westphal, C. Lortie, E. Nix, E. Tennet et al)
- ▶ Incidental iNaturalist sightings ➡ CNDDB ([California Natural Diversity Database](#))



# BNLL Walking Survey Transects ( 1/4 sec)









# BNLL Road Surveys 2024





# Scat Dog detections 2024



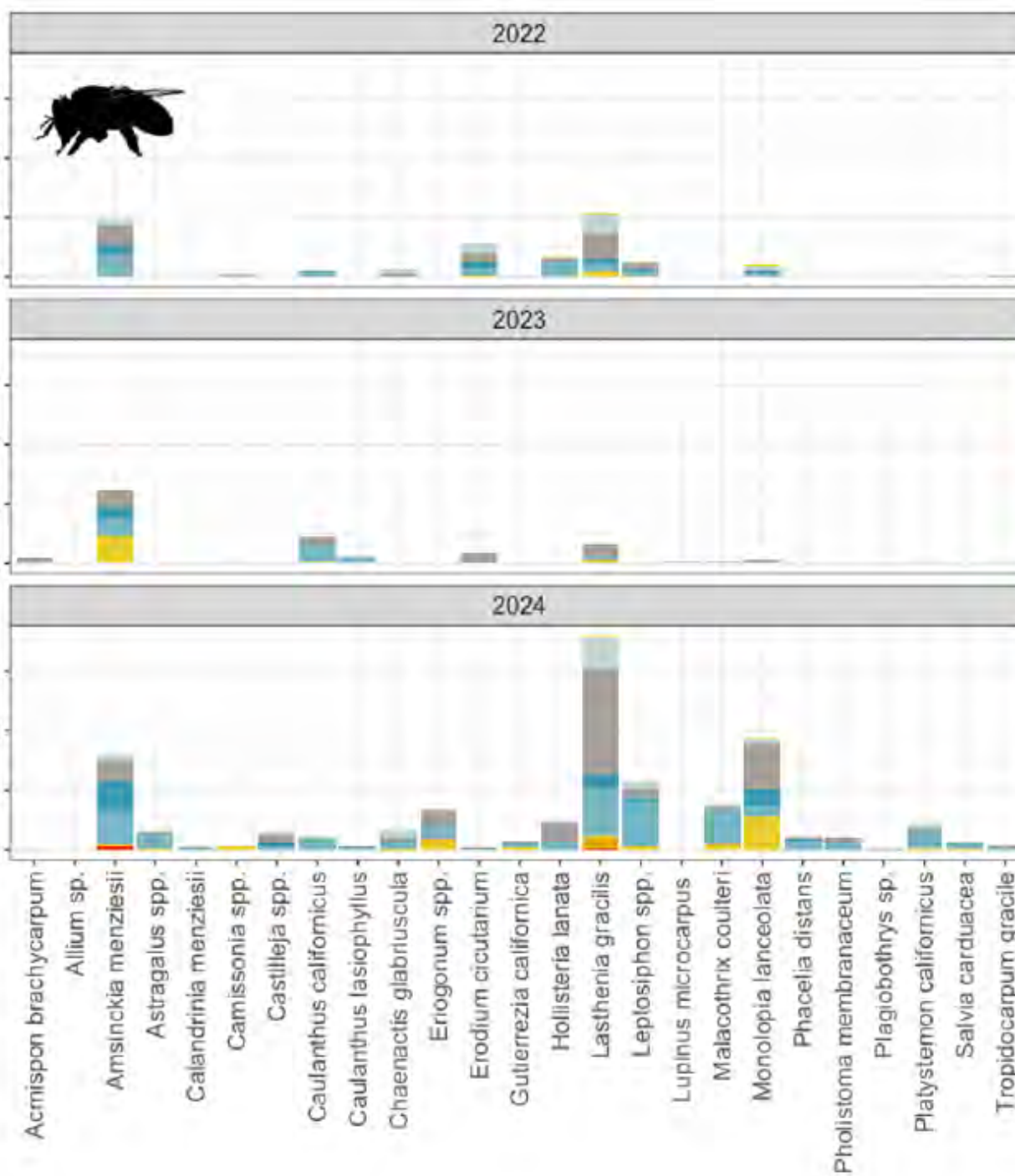


# California Jewelflower (*Caulanthus californicus*)

- ▶ Santa Barbara Botanical Garden
- ▶ In 2022, Santa Barbara Botanic Garden (SBBG) initiated a **three-year project** to monitor pollinator visitation to *C. californicus* and the surrounding plant community on Carrizo Plain National Monument. In an effort to aid the long-term conservation and restoration of this rare plant, native habitats, and plant-pollinator networks on BLM land in the Central California District, our project (L20AS00044) outlined two major objectives:
  - ▶ (1) Identify the **pollinator community of both the federally endangered *C. californicus*** and its associated plant species, and
  - ▶ (2) Use these plant-pollinator network data to **identify target native plant assemblages** for a habitat restoration experiment



Number of Pollinators



- Araneae
- Coleoptera
- Diptera
- Hemiptera
- Hymenoptera
- Lepidoptera
- Orthoptera
- Thysanoptera



# Order Hymenoptera (ants, bees, wasps, sawflies & others)


- ▶ “We observed at least 18 morphospecies of five orders visiting *C. californicus*: Hymenoptera, Diptera, Coleoptera, Lepidoptera, and Hemiptera. Pollinators in the order Hymenoptera were both the most abundant and diverse insect pollinators of *C. californicus*. Within the Hymenoptera, solitary mining bees in the family Andrenidae were the most abundant (N= 23 individuals, four morphospecies), followed by solitary digger bees in the family Apidae (N = 16, two morphospecies), sweat bees in Halictidae (N = 13, four morphospecies), and a single leaf-cutter bee in the family Megachilidae (N=1, one morphospecies). “



# California Jewelflower (*Caulanthus californicus*)

- ▶ California Native Plant Society
- ▶ The United States Bureau of Land Management (BLM), California Bakersfield Field Office contracted with the California Native Plant Society (CNPS) **Rare Plant Program (RPP)** to conduct focused botanical surveys on the Carrizo Plain National Monument (CPNM). In particular, surveys focused on three taxa that are listed as endangered under the federal Endangered Species Act (ESA) and are known to occur in CPNM: **San Joaquin woollythreads (*Monolopia congdonii*)**, **California jewelflower (*Caulanthus californicus*)**, and **Kern mallow (*Eremalche parryi* subsp. *kernensis* [= *E. kernensis*])**.
- ▶ This work has included three consecutive years of surveys for these target taxa, in **2022, 2023 and 2024**.

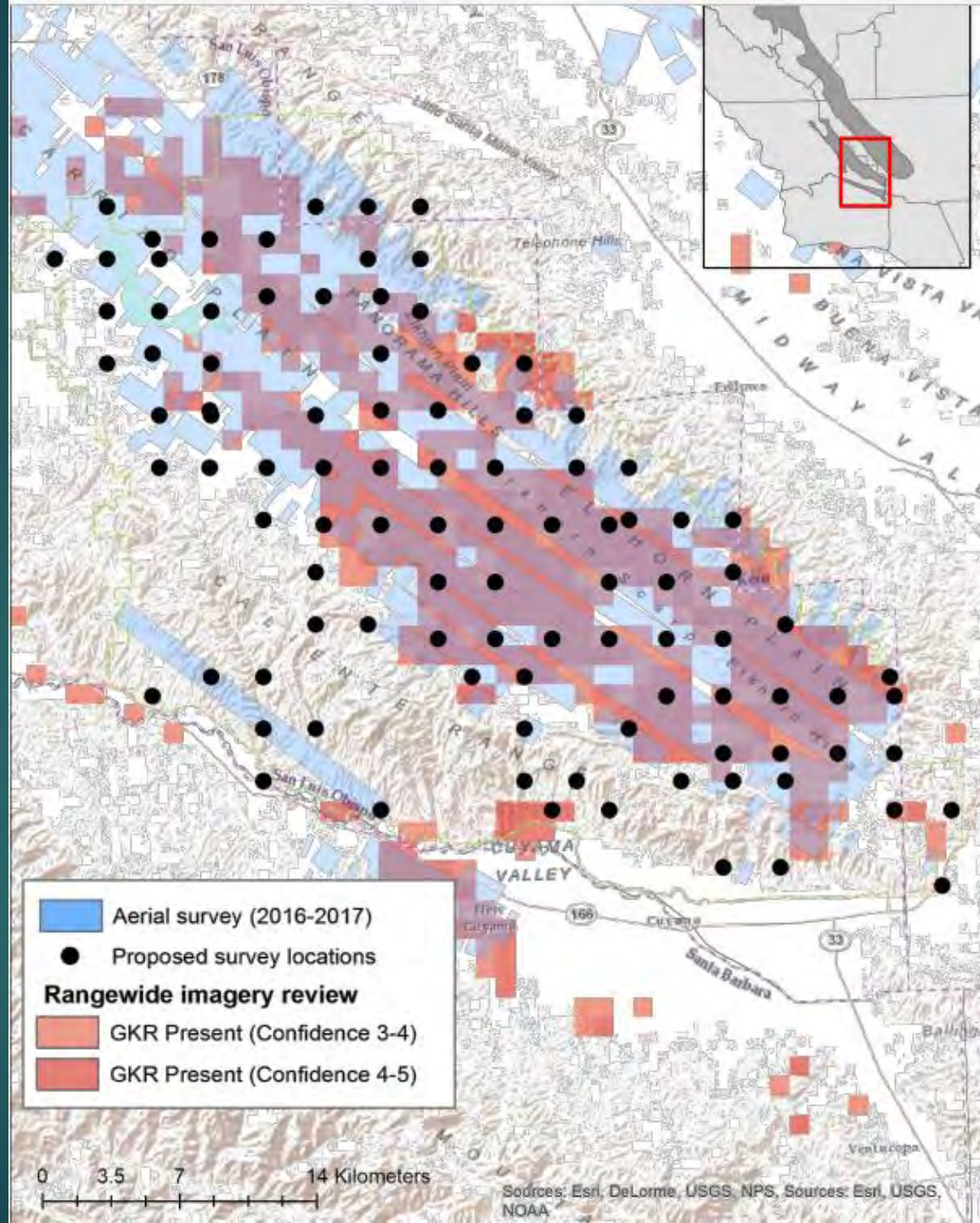


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- ▶ An area of approximately 2,000 acres was surveyed, which included a total of 40 known occurrences, as well as 12 new occurrences across all three taxa, as follows:
    - ▶ - 12 historical, 1 non-historical, and 2 new occurrences of California jewelflower
    - ▶ - 3 historical, 6 non-historical, and 2 new occurrences of San Joaquin woollythreads
    - ▶ - 3 historical, 15 non-historical, and 8 new occurrences of Kern mallow

# Giant Kangaroo Rat (*Dipodomys ingens*)









# San Joaquin Kit Fox (*Vulpes macrotis mutica*)







( 13 °C / 55 °F

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# Western Spadefoot (*Spea hammondi*)

- ▶ USGS conducts annual surveys.







# Longhorn Fairy Shrimp (*Branchinecta longiantenna*) & Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)







Sampling Pool 10, San Luis Obispo County, California – vegetation community as  
seen on April 9, 2023

McCormick Biological, Inc.

Federal Permit: 59559C-2

California Scientific Collecting Permit: S-211160001-22059-001

Ashleigh Pryor, Senior Biologist

[apryor@mcbioinc.com](mailto:apryor@mcbioinc.com), 661-319-0209

Report Prepared on January 30, 2024



# Kern Primrose Sphinx Moth (*Euproserpinus euterpe*)







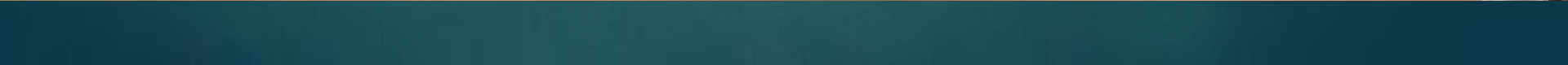
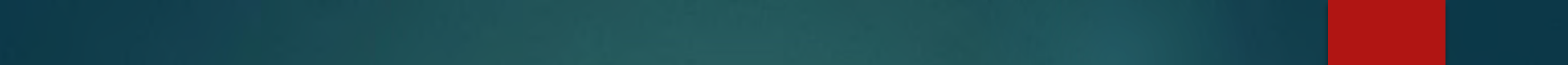






# CA Bumble Bee Atlas 2024

- ▶ 10 surveys from April to July = 7.5 hrs
- ▶ 208 bumble bees captured
- ▶ 147 or 71% were Yellow-faced Bumble Bee (*Bombus vosnesenskii*)





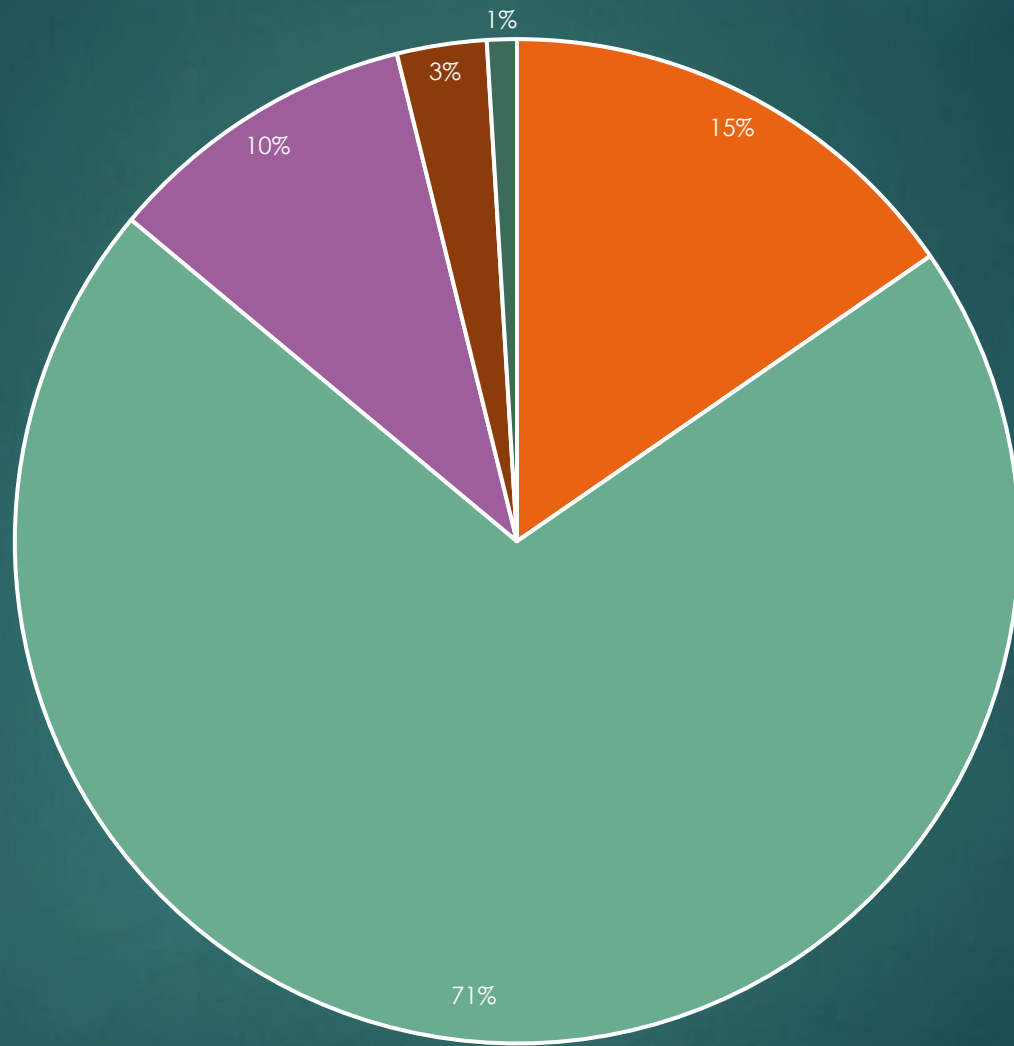
# CA Bumble Bee Atlas 2024

- ▶ 10 surveys from April to July = 7.5 hrs
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- ▶ 147 or 71% were Yellow-faced Bumble Bee (*Bombus vosnesenskii*)
- ▶ 32 or 15% were Crotch's Bumble Bee (*Bombus crotchii*)





## Carrizo Plain - Bumble Bees 2024



■ *B. crotchii*

■ *B. vosnesenskii*

■ *B. melanopygus*

■ *B. californicus*

■ *B. vandykei*

# Tule Elk

- ▶ Between 250-300 head of Tule Elk continue to use the wildlife water troughs at the northwestern part of the monument near Selby Campground, Painted Rock and Coyote Hill.





# Pronghorn

- ▶ About 20 Pronghorn are persisting in the monument and are also utilizing the wildlife water troughs.





☾ 26 °C / 78 °F

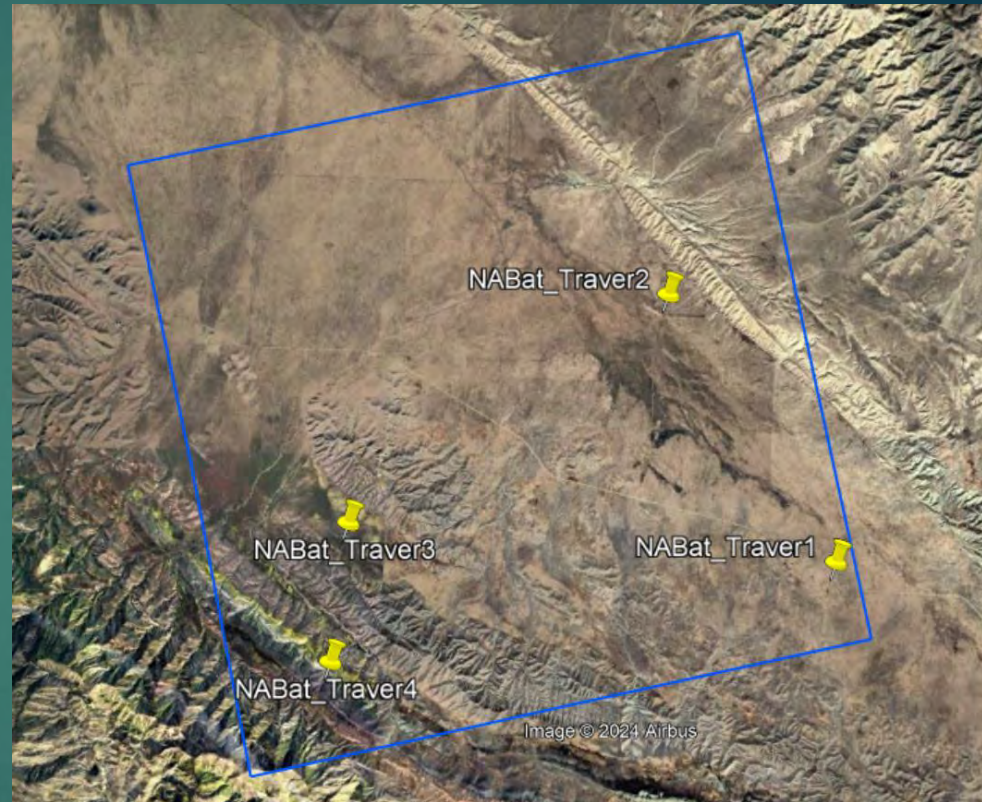
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# North American Bat surveys (NABat)

- ▶ Stationary acoustic NABat surveys in “adopted” grid cells.
- ▶ North American Bat Monitoring Program (NABat) ([usgs.gov](https://usgs.gov))









# Bats of Carrizo Plain

- **Canyon Bat** (*Parastrellus hesperus*), V, S, A
- **\*Pallid Bat** (*Antrozous pallidus*) V, S, A
- **\*Townsend's Big-eared Bat** (*Corynorhinus townsendii*) V, S, A
- **Big Brown Bat** (*Eptesicus fuscus*) V, A
- **California Myotis** (*Myotis californicus*) V, A
- **Western Small-footed Myotis** (*M. ciliolabrum*) V, S, A
- **Long-eared Myotis** (*M. evotis*) A
- **Long-legged Myotis** (*M. volans*) A
- **Yuma Myotis** (*M. yumanensis*) V, A
- **\*Western Red Bat** (*Lasiurus frantzii*) A
- **Hoary Bat** (*L. cinereus*) V, A
- **\*Western Yellow Bat** (*Dasypterus xanthinus*) A
- **Silver-haired Bat** (*Lasionycteris noctivagans*) A
- **\*Big Free-tailed Bat** (*N. macrotis*) A
- **Mexican Free-tailed Bat** (*Tadarida brasiliensis*) V, S, A

► \* Denotes California species of concern



# The Bats That Call Traver Ranch Home: Genetic Identification of Bat Species at a Roost and a Comparison of Sample Storage Methods

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<sup>1</sup>Mammalian Ecology and Conservation Unit, Veterinary Genetics Laboratory, University of California, Davis

<sup>2</sup>Bureau of Land Management, California



## Introduction

Bats (order Chiroptera) comprise about a fifth of all mammals (Dooley, 2020) and are among those most sensitive to the effects of climate change due to their small size as heterotherms and slow reproductive rates. At least 16% of Chiroptera species are threatened with extinction due to anthropogenic factors such as urban expansion (Festa et al., 2023). To help conserve species, it is important to understand organisms' responses to climate change, which for bats most frequently results in shifts in range and changes in species diversity patterns (Festa et al., 2023). Thus, protected lands, like the Carrizo Plain National Monument, that ensure unfragmented habitats, are evermore critical. Some protected lands feature abandoned structures that have become hallmark as a specific species' habitat; such is the Traver Ranch in the Carrizo Plain for bat roosts. Because they are small, nocturnal, and can fly, bats are uniquely challenging to species ID and record. Their guano provides a non-invasive resource of DNA for species ID as it is easy to find and collect (Walker et al., 2016). Additionally, there are multiple methods for storing fecal samples from which DNA will be extracted, commonly including desiccant beads and ethanol solution. The preservation success of these storage methods have yet to be evaluated for bat guano.

## Objectives

- Use noninvasive methods to determine which of the 12 bat species that are known to occur in the Carrizo Plain NM are present at the Traver Ranch roost.
- Analyze sequencing success statistics between the 15 desiccant-stored and 15 ethanol-stored samples.

## Methods

### Species Identification

**Step 1: Noninvasive Fecal Sampling**  
30 Fecal samples were collected from Traver Ranch in the Carrizo Plain National Monument (Fig.1). Sheets were placed under bat roosts to collect the guano.



Created with BioRender

### Step 2: DNA Extraction

- DNA was extracted using the EURx GeneMATRIX Stool DNA Purification Kit.
- Polymerase chain reaction amplification with cytochrome c oxidase subunit I primers: SFF\_145f & SFF\_351r.
- Sanger-sequenced in forward and reverse directions.

### Step 3: Sequence Analysis

- Resulting sequences were analyzed and trimmed with Sequencher.
- Species identified by comparison to other sequences in GenBank using NCBI BLAST.
- Phylogenetic tree created with known bats from the Carrizo Plain NM to confirm unknown samples' species.

### Storage Analysis

Sequencing success percentages were compiled and analyzed with an unpaired t-test.



Figure 1. Map of where Carrizo Plain National Monument is located with a marker for Traver Ranch.



Townsend's big-eared bat (*Corynorhinus townsendii*). Photo by Bureau of Reclamation.



Traver Ranch. Photo by David Meyer.



## Results



Pallid bat (*Antrozous pallidus*). Photo by Devra Cooper.

- All 30 samples were the same species.
- When ran through BLAST, they were identified as *Antrozous pallidus*.
- A maximum likelihood phylogeny made with MEGA was used to confirm.
- There was no significant difference between the desiccant-stored and ethanol-stored samples' sequencing success ( $t(58) = 1.2, p = .22$ ).

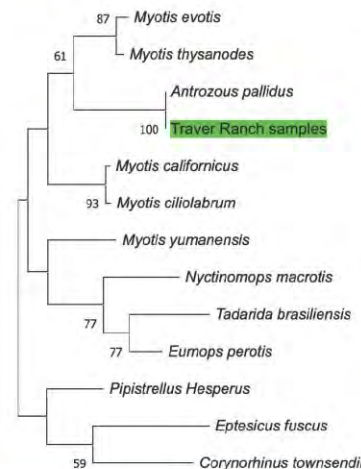


Figure 3. Maximum likelihood phylogeny (1000 bootstraps) of bat species that are known to occur in the area including our unknown samples highlighted in green.

## Conclusions

- All samples from this roost site were identified as pallid bats.
- Continued preservation of Traver Ranch is vital to this population.
- Pallid bats have not been identified before at this site or in the Carrizo Plain since 2019 on iNaturalist.
- Further research may be aimed at identifying Chiroptera species at other landmarks in the area to determine their distributions and changes in range.
- Both desiccant and ethanol stored samples produced similar sequencing success percentages, thus both are viable options for short-term bat guano storage.
- More research may be needed to determine longer-term storage differences.
- This data will serve as comparison for future bat range surveys, which will aid management in mitigating the effects of climate change on bats in the Carrizo Plain.

## References



## Acknowledgements

We thank The Bureau of Land Management and the Carrizo Plain National Monument for sample acquisition and the MECU for the resources, mentorship, and support.

## Contact Info

Email: [grajiang@ucdavis.edu](mailto:grajiang@ucdavis.edu)

This project stems from an undergraduate project completed through the Animal Biology Program at UC Davis.



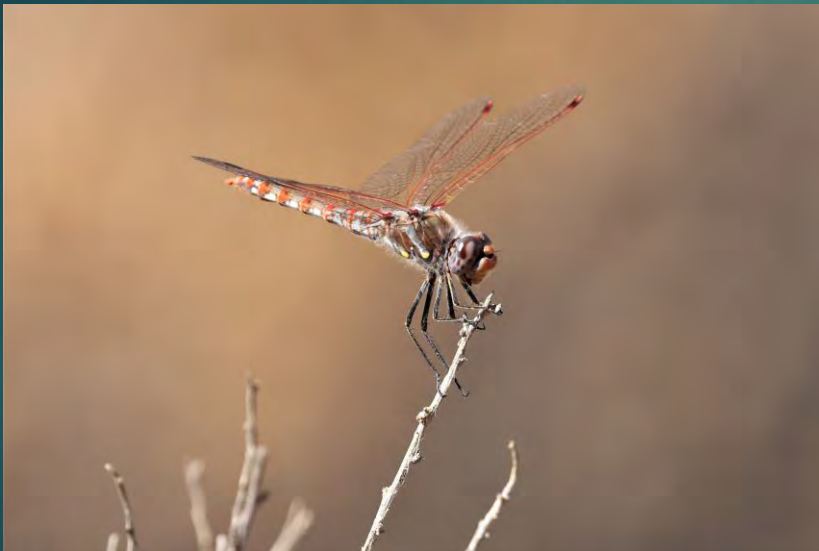
# LeConte's Thrasher Surveys

- ▶ A secretive species, LeConte's Thrasher nest in arid and sparsely vegetated scrub, mainly in *Ephedra* bushes along Elkhorn Rd.



# Dragonfly Surveys

- ▶ Up to 8 species of dragonfly have been recorded during the fall migration.



Variagated Meadowhawk



Flame Skimmer





**BioOne** COMPLETE

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**A Preliminary Exploration of an Understudied Lichen  
Flora: Lichens of the Basin of Carrizo Plain National  
Monument, California**

Authors: Fryer, Emma R., Mulroy, Michael, Hodge, Chloe, Eulensen-Wallace, Jujú E., Dart, Jason, et al.

Source: *Evansia*, 41(2) : 35-46

Published By: The American Bryological and Lichenological Society

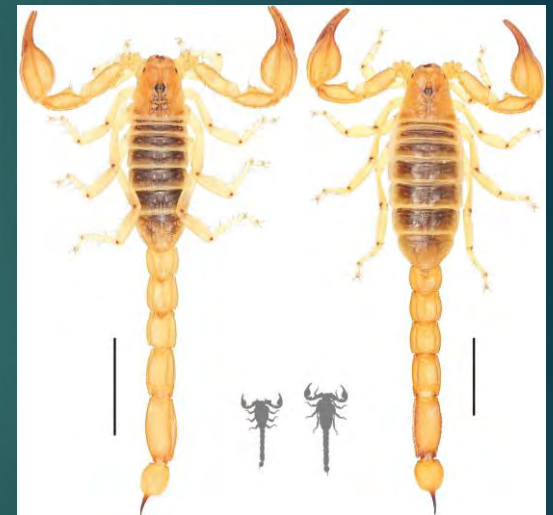
URL: <https://doi.org/10.1639/0747-9859-41.2.35>

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- **Abstract.** While Carrizo Plain (California, USA) is a hotspot for rare and endangered species, little effort has been made to sample the lichen flora of the Plain. To assemble a preliminary checklist of lichens from the basin floor of Carrizo Plain, we sampled along a transect from the basin's alkali complex to its western edge, as well as from clay slickspots with high sodium content, and a rocky site in the eastern Plain. We document a substantial lichen flora on the Plain and note several collections that were the first record for a species in the region: **five species were the first in San Luis Obispo County, and nine were the first for the San Joaquin Desert.** We include notable collections and observations on potential ecological patterns and highlight Carrizo Plain as a promising hotspot for research on lichen ecology, particularly for species adapted to extreme environmental conditions.



# Soda Lake Scorpion

- ▶ A new species of scorpion was discovered in 2021 at Soda Lake by recently California teenagers. A short note was published in collaboration with California Academy of Sciences.
- ▶ Two new alkali-sink specialist species of *Paruroctonus* Werner 1934 (Scorpiones, Vaejovidae) from central California ([pensoft.net](http://pensoft.net))



# New Salticid Jumping Spider species

- ▶ A new species to science, a jumping spider in the Genus *Terralonus* was discovered this summer from an iNaturalist observer. Survey efforts are being made to refind, collect and classify this species.
- ▶ [Terralonus from Carrizo Plain National Monument, Santa Margarita, CA, US on August 22, 2022 at 07:40 PM by skullroy · iNaturalist](#)





Thank you!

