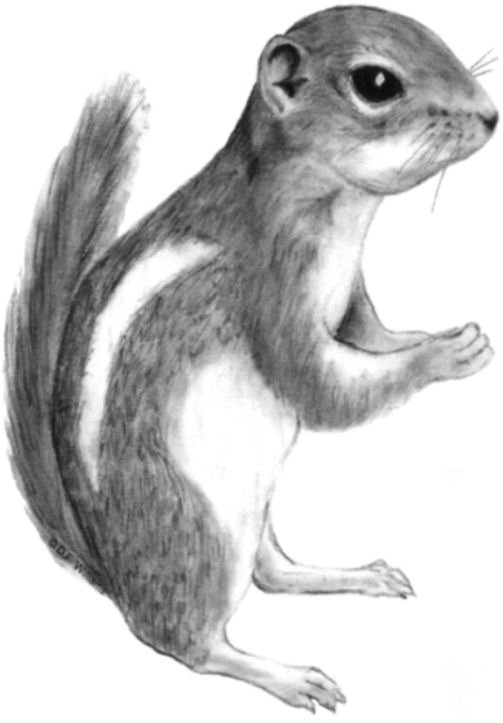
San Joaquin Valley
Natural Communities Conference

March 30, 2023

Hodel's Country Dining, Bakersfield

Program and Abstracts



San Joaquin Valley Natural Communities Conference
March 30, 2023

8:00 – 8:30	**Doors open**	***Breakfast buffet, poster set up, mingling***
8:30 – 8:45	**Erica Kelly** **Brian Cypher**	***Welcome, schedule details, and announcements***
8:45 – 9:05	**Tory Westall**	*Demographic and Ecological Responses of San Joaquin Kit Foxes to the Panoche Valley Solar Farm*
9:05 – 9:25	**Nicole Deatherage**	*Fostering Orphaned Pups of Endangered San Joaquin Kit Foxes (Vulpes Macrotis Mutica): Four Case Studies*
9:25 – 9:40	**Lucas Hall**	*The Influence of Sympatric Carnivores on the Activity Patterns of San Joaquin Kit Foxes in an Urban Environment*
9:40 – 9:55	**Brian Cypher**	*Potential Habitat and Carrying Capacity of Endangered San Joaquin Kit Foxes in an Urban Environment: Implications for Conservation and Recovery*
9:55 – 10:10	**Erica Kelly**	*Impact of a Sarcoptic Mange Epidemic on a Population of Endangered San Joaquin Kit Foxes*
10:10 – 10:30	**BREAK**	***Grab snacks, use the restroom, stretch your legs, and take a look at the posters and silent auction items***
10:30 – 10:45	**Megan McCullah-Boozer**	*Educational Partners and Citizen Science, A Tool for Monitoring Mange in an Urban San Joaquin Kit Fox Population*
10:45 – 11:00	**Aaron Jones**	*Estimating the Population Size of the San Joaquin Kit fox (Vulpes macrotis mutica) Using a Camera Capture-Recapture Approach*
11:00 – 11:20	**Daisy Carrillo/ Melissa Dabulamanzi**	*Bakersfield Cactus Restoration at Wind Wolves Preserve*
11:20 – 11:40	**Celia Tarcha**	*Behavior and Ecology of the Riparian Brush Rabbit as Determined by Camera Traps*
11:40 – 12:00	**Megan Maitland**	*California Living Museum Wonderful Wildlife Care Clinic and Future Expansion Plans*
12:00 – 1:00	**LUNCH**	***Registered participants will be served a buffet lunch. Informal poster session***
1:00 – 1:20	**Mark Halverson/ Steven Sharp**	*Management of Blunt-nosed Leopard Lizard (Gambelia sila) Assurance Colony at the Fresno Chaffee Zoo, Year Two! (or Part Deux)*
1:20 – 2:20	**Quick Talks**	**Keyanna Pinto**: *Observed Infanticide in Gambelia sila (Blunt-nosed Leopard Lizard)* **Leah Gordillo**: *Presence of Desert Toads at Man-made Water Sources in Comparison to Natural Water Sources* **Marcos Ramirez**: *MegaDetector Coding: Developing a Workflow to Improve Camera Trap Image Sorting* **Nathalie Larios Chavez**: *Does Critical Habitat Designation Make a Difference in Shrew Detections at the Kern National Wildlife Refuge?* **Jazlyn Lopez-Serrano**: *The Influence of Biotic and Abiotic Factors on the Virginia Opossum (Didelphis virginia) in an Urban Environment* **Francisco Ruiz-Ponce**: *The Influence of Road Proximity on Den Activity of San Joaquin Kit Foxes (Vulpes macrotis mutica)* **Maria Valdez**: *The Influence of Biotic and Abiotic Factors on San Joaquin Kit Foxes' (Vulpes macrotis mutica) Activity at the Carrizo Plain National Monument* **Erin Tennant**: *Methods for Surveying Legless Lizards (Anniella sp.)*

		Kacy Twist: *eDNA Detection of Temblor Legless Lizard (Anniella alexanderae) from Coverboards and Soil Samples*
2:20 – 2:40	**Ted Papenfuss**	*Temblor Legless Lizard Ecology, San Joaquin Valley Distribution, and Conservation*
2:40 – 3:00	**BREAK**	***Grab more snacks! Silent auction closes and items are purchased***
3:00 – 3:15	**SJV Chapter**	*Announcements and updates*
3:15 – 3:35	**Mary Whitfield**	*Yellow-billed Cuckoo Population Dynamics on the South Fork Kern River*
3:35 – 3:55	**Patrick Lorch**	*Monitoring bird use of the Kern River Valley and desert springs using Motus and ARUs*
3:55 – 4:15	**Erika Noel**	*Seasonal Composition of Bats in Higher and Lower Elevations Along the Kern River in California*
4:15 – 4:35	**Mario Gaytan**	*Determining Effects of Restoration Treatments to Guide Management for the San Joaquin Valley Giant Flower-Loving Fly (Rhaphiomidas trochilus)*
4:35 – 4:55	**Mike Westphal**	*The San Joaquin Restoration and Resilience Project*
4:55 – 5:00	**Erica Kelly**	***Thanks to speakers and organizers, chapter meeting details, photo contest winners announced***

Posters

Sarah Bullock	*Importance of Bureau of Land Management Lands for Temblor Legless Lizard (Anniella alexanderae) and Other Special Status Species Studies*
Autumn Corrow	*The Effects of Fire on Bat Activity in Sequoia and Kings Canyon National Park*
Amy Fetters	*Degradation of Low-density Polyethylene and Plantanus acerifolia Leaves in an Ephemeral Pond and Arid Grassland*
Alyse Gabaldon	*Multi-Species Den Use and its Potential Effects on the Distribution of Sarcoptic Mange in an Urban San Joaquin Kit Fox (Vulpes macrotis mutica) Population*
Patrick Lorch	*Motus Wildlife Tracking System*

*San Joaquin Valley Chapter Meeting Immediately Following at Rusty's Pizza Parlor, 5430 Olive Drive

** Field trip to the Carrizo Plain National Monument on Friday (limited to 20 attendees)

Abstracts

Oral Presentations

DEMOGRAPHIC AND ECOLOGICAL RESPONSES OF SAN JOAQUIN KIT FOXES TO THE PANOCHE VALLEY SOLAR FARM

Tory L Westall; Endangered Species Recovery Program
Brian Cypher; Endangered Species Recovery Program
Erica Kelly; Endangered Species Recovery Program
Nicole Deatherage; Endangered Species Recovery Program

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San Joaquin kit foxes (*Vulpes macrotis mutica*) are listed as Federally Endangered and California Threatened, primarily due to profound habitat loss throughout their range. The San Joaquin kit fox now persists in a metapopulation consisting of three main "core" populations, one of which is in Panoche Valley California. In spring of 2019, following the completion of the Panoche Valley Solar Farm, a 3-year investigation of ecological and demographic traits of San Joaquin kit foxes within Panoche Valley was initiated to determine how the population is affected by this anthropogenic disturbance. To investigate these effects, kit foxes were monitored on two sites within Panoche Valley. The solar site was located within a 1.5-km buffer of the Panoche Valley Solar Farm arrays and the reference site was located on Silver Creek Ranch in relatively undisturbed habitat. Kit foxes were collared with GPS collars and tracked regularly to dens and resting areas. Over the course of the study, 99 individual foxes were captured and we were able to determine the size and space use of 77 foxes. We also documented similarities and differences in reproduction, survival, mortalities, and diet between the two sites.

FOSTERING ORPHANED PUPS OF ENDANGERED SAN JOAQUIN KIT FOXES (*VULPES MACROTIS MUTICA*): FOUR CASE STUDIES

Nicole Deatherage; CSU-Stanislaus, End. Spp. Rec. Prog.
Brian Cypher; CSU-Stanislaus, End. Spp. Rec. Prog.
Erica Kelly; CSU-Stanislaus, End. Spp. Rec. Prog.
Tory Westall; CSU-Stanislaus, End. Spp. Rec. Prog.

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We describe four case studies in central California in which young San Joaquin kit fox (*Vulpes macrotis mutica*) pups were orphaned and either fostered for a period of time in captivity and released, or provisioned entirely in the wild by caretakers. In February 1992, six pups whose mother had died by predation were temporarily fostered in captivity. Four of the pups were then placed in the den of their father and an unrelated female (Case 1) and the remaining two pups were placed with an entirely unrelated family group (Case 2). In April 2019, a mother of five

pups died by vehicle strike. These pups appeared to be weaned though no other adults were present, so they were provisioned at their natal den (Case 3). In spring 2022, one abandoned pup was hospitalized for sarcoptic mange concurrently with an unrelated family group consisting of an adult female and her three pups. The orphaned pup was introduced into the family group while in captivity and all were released together following recovery (Case 4). Of the 12 orphaned pups in all cases, at least seven survived till dispersal age, two survived into the following year, and one reproduced.

THE INFLUENCE OF SYMPATRIC CARNIVORES ON THE ACTIVITY PATTERNS OF SAN JOAQUIN KIT FOXES IN AN URBAN ENVIRONMENT

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The endangered San Joaquin kit fox (*Vulpes macrotis mutica*; hereafter 'kit fox') is a small carnivore subject to competition and predation from larger carnivores. Over time, kit foxes have evolved behaviors to avoid potentially lethal interspecific interactions with other carnivores. Due to loss of natural habitat, kit foxes have since occupied the urban environment. The urban environment, however, has species that may pose novel interspecific interactions for kit foxes as the latter may not have evolved mechanisms of defense or avoidance. This may be the case for kit foxes in the San Joaquin Valley as they share the urban environment with novel carnivores. We hypothesized that the presence of novel competitors and predators would influence the activity of kit foxes, causing kit foxes to avoid locations where other carnivores were present, with larger, dominant species (e.g., dogs [*Canis lupus familiaris*], coyotes [*C. latrans*]) eliciting the strongest avoidance response. We used remote cameras at university, college, and high school campuses across the southern San Joaquin Valley to monitor the activity of kit foxes and other urban carnivores from 2020 to 2022. We used generalized linear mixed models and AIC model selection to determine if the spatial activity of kit foxes was associated with that of other urban carnivores. We observed substantial spatial overlap between kit foxes and most carnivores. However, the effects of other carnivores on kit foxes were mixed. For example, domestic cats (*Felis catus*) and striped skunks (*Mephitis mephitis*) had strong positive associations with kit foxes, whereas opossums had a strong negative association with kit foxes. Our findings do not support the hypothesis that kit foxes spatially avoid larger, dominant species in an urban environment.

POTENTIAL HABITAT AND CARRYING CAPACITY OF ENDANGERED SAN JOAQUIN KIT FOXES IN AN URBAN ENVIRONMENT: IMPLICATIONS FOR CONSERVATION AND RECOVERY

Brian L. Cypher; CSU-Stanislaus, End. Spp. Rec. Prog.
Nicole A. Deatherage; CSU-Stanislaus, End. Spp. Rec. Prog.
Tory L. Westall; CSU-Stanislaus, End. Spp. Rec. Prog.
Erica C. Kelly; CSU-Stanislaus, End. Spp. Rec. Prog.
Scott E. Phillips;CSU-Stanislaus, End. Spp. Rec. Prog.

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A population of endangered San Joaquin kit foxes (*Vulpes macrotis mutica*; SJKF) occurs in the urban environment in the city of Bakersfield, California, and may be important for SJKF conservation. We used a systematic camera station survey and occupancy analysis to identify suitable habitat for SJKF in Bakersfield and to estimate a conceptual carrying capacity. We identified high, medium, and low suitability habitat totaling 121 km2, 196 km2, and 40 km2, respectively. Based on a mean urban kit fox home range size of 0.78 km2 and an assumption of two adults in high suitability home ranges and one adult in medium suitability ranges, we estimated the adult carrying capacity in Bakersfield to be 561 foxes. A carrying capacity of 561 adults would increase the estimated range-wide carrying capacity by as much as 38%. Adult density estimates derived for the urban SJKF population based on the carrying capacity (1.57/km2) and home range size (2.56/km2) were higher than estimates for foxes in natural habitats. The urban SJKF population in Bakersfield is substantial and therefore could contribute significantly to conservation and recovery efforts for SJKF. Given our results, a potential conservation strategy may be to encourage or even establish additional urban SJKF populations.

IMPACT OF A SARCOPTIC MANGE EPIDEMIC ON A POPULATION OF ENDANGERED SAN JOAQUIN KIT FOXES

Erica Kelly; CSU-Stanislaus, End. Spp. Rec. Prog.
Brian Cypher; CSU-Stanislaus, End. Spp. Rec. Prog.
Tory Westall; CSU-Stanislaus, End. Spp. Rec. Prog.
Nicole Deatherage; CSU-Stanislaus, End. Spp. Rec. Prog.
Jaime Rudd; UC-Davis, CA Dept. Fish and Wildlife
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A population of endangered San Joaquin kit foxes (*Vulpes macrotis mutica*) occurs in the city of Bakersfield, CA. In spring 2013, sarcoptic mange was detected in this population and the disease quickly spread. In January 2019, the disease appeared in a smaller kit fox population in nearby Taft, CA. Over the last 10 years there have been over 474 reports of kit foxes with

mange, 100 confirmed deaths, 141 foxes treated in the field, and 157 foxes treated at the California Living Museum (CALM). In conjunction with treating foxes, the Endangered Species Recovery Program (ESRP) has also conducted an annual citywide camera survey in Bakersfield since 2015 and Taft since 2019 to assess mange among kit foxes and its spatial spread. The data collected is consistent with opportunistic sightings, trapping efforts, and reports from the public, all of which indicate a substantial decline in the urban kit fox population. The periodic confirmation of healthy foxes throughout both urban areas as well as population modeling indicates that the disease will remain indefinitely. Mange response, camera survey monitoring, and research projects will continue in order to treat sick foxes and further study the effects of mange on the urban kit fox population.

EDUCATIONAL PARTNERS AND CITIZEN SCIENCE, A TOOL FOR MONITORING MANGE IN AN URBAN SAN JOAQUIN KIT FOX POPULATION

Megan R. McCullah-Boozer; California State University, Bakersfield
Danielle L. Farrell-Carrisalez; North High School, Kern High School District
Brittney Beck; California State University, Bakersfield
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The San Joaquin kit fox, *Vulpes macrotis mutica*, is a federally endangered nocturnal carnivore occupying urban and non-urban environments in the San Joaquin Valley. The primary threat to this species has been habitat loss, but a relatively new threat, in the form of sarcoptic mange (*Sarcoptes scabiei*), was identified in 2013 in the urban population of kit foxes in Bakersfield, California. In approximately 5 years, the urban kit fox population declined by an estimated 40%. As individuals of this species have no natural defense to mange, mange cases can result in 100% mortality within three months without human intervention. Because kit foxes are nocturnal, they can be difficult to observe, but, the use of remote camera traps has allowed us to consistently monitor kit foxes across Bakersfield and surrounding cities. The issue we face however, is that processing the abundance of images generated by many cameras delays our ability to detect mange and deploy intervention efforts in a timely manner. Image processing is also costly, requiring many person-hours to categorize pictures manually. The objective of our work is to partner the ongoing kit fox research in Bakersfield to citizen science opportunities by connecting with local high school science teachers and students. Collaborating with teachers to create a supplemental high school biology curriculum using citizen science and the San Joaquin kit fox as a model species. These classrooms will participate in ongoing conservation research by monitoring their campus camera traps and alerting conservationists to possible mange outbreaks. The goal of our work has many parts: 1) to improve timeliness of disease intervention in endangered species, 2) enhance public awareness, dialog, and interest in the plight of the kit foxes, and 3) provide young student scientists with meaningful, tangible opportunities to contribute to local conservation research/science.

ESTIMATING THE POPULATION SIZE OF THE SAN JOAQUIN KIT FOX (*VULPES MACROTIS MUTICA*) USING A CAMERA CAPTURE-RECAPTURE APPROACH

Aaron Jones; Department of Biology, CSU Bakersfield
Cody Hurt; Department of Biology, CSU Bakersfield
Leah Gordillo; Department of Biology, CSU
Alyse Gabaldon; Department of Biology, CSU Bakersfield
Alexis Vega; Department of Biology, CSU Bakersfield
Lucas K. Hall; Department of Biology, CSU Bakersfield
Brian Cypher; Endangered Species Recovery Program, CSU Stanislaus
Tory Westall; Endangered Species Recovery Program, CSU Stanislaus
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The San Joaquin kit fox (*Vulpes macrotis mutica*) is an endangered species native to the Central Valley that faces population decline due to habitat loss, subsequently it is important to understand their population status. However, it can be challenging to determine the population size of kit foxes as they are small and nocturnal. To address this issue, population ecologists have traditionally used capture-mark-recapture (CMR) methods to estimate population size of species that are not easily observed and counted. Additionally, using the traditional CMR methods can be difficult due to a fox's cooperation to be captured or recaptured, so there is a need for additional methods to be used in conjunction to those already in place. Our objective was to evaluate the use of remote cameras to estimate population size of kit foxes without needing to physically capture them. We conducted this study at California State University Bakersfield (CSUB) where we captured and marked 18 foxes (with a unique pattern using a fur dye) from June 13 through July 7, 2022. We then monitored marked and unmarked foxes using nine remote camera traps arranged in a grid around campus. Each camera trap was visited weekly for rebaiting and data collection. We used pictures of foxes from camera traps to identify marked and unmarked foxes. Upon analysis of photos, we found 15 unmarked individuals to produce a total of 33 foxes. With our data, we used the Lincoln-Peterson and Schnabel indexes to estimate population abundance of foxes on CSUB's campus. We found a population estimate of 37 kit foxes with the Schnabel index in contrast to an estimate of 48 foxes with the Lincoln-Petersen index. In conclusion, our population estimates in the Schnabel index approximated the number of foxes we detected on campus.

BAKERSFIELD CACTUS RESTORATION AT WIND WOLVES PRESERVE

Daisy Carrillo; The Wildlands Conservancy
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The federally and state listed endangered Bakersfield cactus (*Opuntia basilaris var. treleasei*) is endemic to the southeastern corner of the San Joaquin Valley, and only remains in fragmented clusters. The third largest extant population is found in the Pleito Hills of The Wildlands Conservancy's 93,000 acre Wind Wolves Preserve. When a lightning-caused wildfire swept through the population in 2011, The Wildlands Conservancy acquired a Research and Management Permit under the California Endangered Species Act from the California Department of Fish and Wildlife to collect pads from this historic population and to expand the distribution of Bakersfield cactus across the Preserve. Since the first planting season during the wet months of 2012-2013, staff and volunteers have planted over 11,000 cactus pads across five population sites on the Preserve. Between 700-1500 pads were collected each winter, and the first planting methodology involved potting the individual cactus pads and storing them in a greenhouse until the following winter, then planting the single pads in the field with a rebar cage for protection from ungulates. Throughout the last decade, collection and planting methods have changed based on observations during annual monitoring. Pads are now collected from the Pleito Hills population each winter and allowed to callous at the scar site for at least two weeks, then planted out in the field that same winter in clusters of seven. Survival rates range from 68%-97% across the populations and yearly cohorts. Mortality factors include drought, grasshopper herbivory, and invasive grass competition. Our methods for collection, planting, and monitoring of cactus continue to evolve as we analyze the survivability of the cactus, assess our own capacity, and collaborate with experts and partners when challenges arise. The Wildlands Conservancy intends to renew our collection permit with CDFW to continue restoration of Bakersfield cactus.

BEHAVIOR AND ECOLOGY OF THE RIPARIAN BRUSH RABBIT AS DETERMINED BY CAMERA TRAPS

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The endangered riparian brush rabbit (*Sylvilagus bachmani riparius*; RBR) is a brush species found in a few areas of the San Joaquin Valley of California. The subject of large restoration projects, little is known of RBR habits or interactions. Camera traps can capture activity and behavior in their dense habitat, providing insight into their habitat usage and, potentially, their recovery. Originally a Master's camera trap project with goals of studying behavioral interactions and usage of restored sites. Extreme flooding in 2017 stranded the study population with concentrated prey and predator populations. In response, the camera study shifted to capture this pulse event at San Joaquin River National Wildlife Refuge from February to August 2017.

Camera traps captured RBR performing a variety of behaviors, including territorial and reproductive behaviors, despite the limiting circumstances. In contrast to the crowded conditions, most behaviors recorded were individual, suggesting a solitary lifestyle. Interspecific interactions were primarily with competitor species, mostly the desert cottontail (*Sylvilagus audubonii*). Further, camera traps captured RBR interacting with exotic plants and supplemental feed in addition to native plant species. Overall, this study highlighted the additional knowledge gained from behavior and camera studies.

CALIFORNIA LIVING MUSEUM WONDERFUL WILDLIFE CARE CLINIC AND FUTURE EXPANSION PLANS

Meg Maitland; CALM

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As the first inland oiled wildlife response center and animal hospital, the Wonderful Wildlife Care Clinic will act in a multipurpose role for inland oil spill response, zoo collection veterinary care, and wildlife rehabilitation operations. The WCC partnerships with numerous agencies allowed for the building's completion in spring of 2023. A 20-year master includes a renovation of our wildlife rehabilitation efforts and exhibit additions of California native species.

MANAGEMENT OF BLUNT-NOSED LEOPARD LIZARD (*GAMBELIA SILA*) ASSURANCE COLONY AT THE FRESNO CHAFFEE ZOO, YEAR TWO! (OR PART DEUX)

Steven Sharp; Fresno Chaffee Zoo
Mark Halvorsen; Fresno Chaffee Zoo

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The Blunt-nosed leopard lizard (*Gambelia sila*) is an endangered and charismatic lizard species native to California's Central Valley. In partnership with The Bureau of Land Management and the Telemeco Reptile Ecology and Evolution lab at California State University, Fresno, emergency permission was granted to collected adult *G.sila* (4 male and three female) from the Panoche Hills plateau. This colony was taken to Fresno Chaffee Zoo to form the first captive assurance colony of *G.sila*. Since the 2021 collection the program has produced over 60 lizards and have produced F2 animals. Our presentation will review our program successes, challenges and the future of our work this species.

OBSERVED INFANTICIDE IN *GAMBELIA SILA* (BLUNT-NOSED LEOPARD LIZARD)

Keyanna Pinto; California State University, Fresno
Mark Halvorsen; Fresno Chaffee Zoo
Stephanie Doria; California State University, Fresno
Rory Telemeco; California State University, Fresno, Fresno Chaffee Zoo

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The blunt-nosed leopard lizard (*Gambelia sila*) is a large predatory lizard belonging to the family Crotaphytidae, and is a state- and federal-listed endangered species endemic to the San Joaquin Desert. During regular surveys at Little Panoche Valley, on 11 September 2022, we observed an adult female *G. sila* attack and kill a juvenile at ~10:30am. Blood and other damage was visible on the head of the juvenile, and the adult *G. sila* did not attempt to eat the juvenile. Although *G. sila's* diet mainly consists of insects like orthopterans, they are known to eat lizards such as side-blotched lizards (*Uta stansburiana*), and in the literature, there are two prior accounts of them eating small conspecifics from the 1990's (Germano and Williams 1994). We suspect that this 2022 event represents infanticide rather than simple foraging-associated cannibalism, as we frequently observe *G. sila* capture arthropod prey in Little Panoche Valley, but have never witnessed a *G. sila* attack or eat *U. stansburiana* in over 3y of surveys on this site despite their high abundance and suitable size. Given *G. sila's* general lack of interest in *U. stansburiana* as prey, we think that this juvenile *G. sila* was specifically targeted by the adult and not opportunistically attacked as a generic lizard prey item. Increased intraspecific competition late in the active season resulting from low arthropod food abundance might also explain this attack, and also suggests that there is selection for the temporal separation between juveniles and adults. As this observation is something that is rarely witnessed, our observation will add to the previous instances of observed cannibalism and saurophagy in *G. sila*.

PRESENCE OF DESERT TOADS AT MAN-MADE WATER SOURCES IN COMPARISON TO NATURAL WATER SOURCES

Leah N. Gordillo; California State University, Bakersfield
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Gisel Larios; California State University, Bakersfield
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Amphibians rely on water for reproduction, and this is especially clear for amphibians in desert environments. However, as climate change continues to affect habitats, natural sources of water may be affected and become unreliable resources for desert amphibians. Man-made water sources may be able to off-set the effects of diminishing natural water sources and benefit desert amphibians. Our objective was to determine if there was a difference in the presence of desert amphibians at man-made and natural water sources. To test this idea, we sampled 89 water sources in the Great Basin and Mojave Deserts in 2010 and 2011. At each water source, we

conducted a visual encounter survey between 2100-2300 hours to observe presence of amphibians. To account for environmental differences between water sources, we recorded several metrics specific to each water source, and these included measures of vegetation cover, soil type, topographic position, dimensions of water body, and accessibility to water. We also used ArcGIS to determine distances between water sources and near drainage points. We used logistic regression models and model selection to determine the influence of water source type (natural or man-made) after accounting for site-specific and landscape-level variables. We detected the Great Basin spadefoot (*Spea intermontana*) at 15 water sources in the Great Basin study area and the red-spotted toad (*Anaxyrus punctatus*) at 28 water sources in the Mojave Desert. Our analysis showed that the most informative variables were in our study were edge (circumference of the water source) and access height (the height between the ground and the edge of the water source). After accounting for informative variables, we found that the water source type variable was uninformative. Based on our study, there was no difference in the presence of desert toads at natural or man-made water sources.

MEGADETECTOR CODING: DEVELOPING A WORKFLOW TO IMPROVE CAMERA TRAP IMAGE SORTING

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MegaDetector is an artificial intelligence (AI) model that uses machine learning to detect objects and animals in camera trap images and then classify images accordingly. This AI tool allows for large batches of images to be processed and classified automatically with relatively high rates of accuracy. Our objective was to evaluate the processing rate and the accuracy of MegaDetector's ability to classify images collected as part of an ongoing monitoring program for the endangered San Joaquin kit fox (*Vulpes macrotis mutica*) across university, college, and high school campuses across the greater Bakersfield area. An estimated amount of 100,000 photos have been sorted by MegaDetector. We discovered that MegaDetector's overall error rate was 1.7%. We found that 36% of the images classified by MegaDetector were empty (i.e., did not contain an animal or object), thereby reducing manual classification load by 36%. This reduced load allowed us to redistribute our efforts to the remaining 64% of photos that contained an animal. Furthermore, MegaDetector had an average processing rate of 2.9 seconds per image stored locally and 4.9 seconds per image stored on a cloud service (I.e., Box). In our study, MegaDetector was an accurate AI tool that reduced researcher effort to classify large batches of camera trap images. By increasing the efficiency that large batches of images are classified, this AI model enhances current data processing abilities, thereby improving the flow of information that can be used to further understand wildlife populations and potential threats that they face.

DOES CRITICAL HABITAT DESIGNATION MAKE A DIFFERENCE IN SHREW DETECTIONS AT THE KERN NATIONAL WILDLIFE REFUGE?

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Lucas K. Hall; Department of Biology, CSU Bakersfield
Kathryn Jimenez; Kern National Wildlife Refuge, U.S. Fish and Wildlife Service

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The Buena Vista Lake ornate shrew (*Sorex ornatus relictus*; BVLOS) is an endangered insectivore endemic to the Tulare Basin of Central California. Located in the southwest region of the Tulare Basin, the Kern National Wildlife Refuge (NWR) had its first shrew detection in 1992. In 2013, the Federal Register established 156 hectares of critical habitat for the BVLOS at Kern NWR, which accounted for most of the riparian habitat and the Poso Creek water delivery channel. While some surveys have been conducted to determine habitat preferences and presence of BVLOS, little is known about the shrew's distribution across the refuge. Our objective was to determine if there was a difference in BVLOS presence in designated critical habitat and non-designated critical habitat. We used remote cameras to monitor BVLOS presence in locations inside and outside designated critical habitat. We sampled 135 locations between September 2022 and February 2023. Locations where a shrew was not initially detected were revisited in the winter season. By the end of the fall and winter seasons, we observed 38 detections of BVLOS in seasonal wetlands, moist-soil wetlands, riparian habitat, and along the edge of the water delivery channel. Using these detection locations, we conducted a chi-square analysis to determine if we detected BVLOS in designated critical habitat and non-designated critical habitat. Based on our chi-square results, we did not find a statistical difference in shrew detections inside or outside critical habitat. Our findings imply that management activities outside critical habitat are not inadvertently influencing the presence of BVLOS.

THE INFLUENCE OF BIOTIC AND ABIOTIC FACTORS ON THE VIRGINIA OPOSSUM (*DIDELPHIS VIRGINIA*) IN AN URBAN ENVIRONMENT

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Understanding the ecology of invasive species in novel environments can provide information that guides management strategies. The Virginia opossum (*Didelphis virginiana*) is an invasive species of marsupial that was introduced to California in the early 20th Century. Since its introduction, the opossum has become a common species in urban environments in California. However, there is little known about the opossum and its relationship with the biotic (e.g., competitors) and abiotic (e.g., weather) components of the urban environment. The purpose of this study was to determine if potential competitors and weather factors influence the activity of opossums in an urban environment. To achieve our purpose, we set up remote camera traps at

high school and college campuses across the greater Bakersfield area to monitor the activity of opossums and other species of urban carnivore. We used generalized linear mixed effects models and AIC model selection to determine the relative importance of biotic and abiotic factors on opossum activity. From Dec 2020 to Apr 2021, we camera-sampled nine campus locations and we captured 956 pictures of opossums and 11,186 pictures of other urban carnivores, descending from San Joaquin kit foxes (*Vulpes macrotis mutica*), domestic cats (*Felis silvestris catus*), striped skunks (*Mephitis mephitis*), domestic dogs (*Canis lupus familiaris*), and raccoons (*Procyon lotor*). Based on our analysis, our top model included all other urban carnivores, and this model was closely followed by two additional models including dewpoint temperature (C) and minimum vapor pressure deficit (hPa), respectively. While the strength and direction of these variables on opossum activity varied, our study demonstrates that biotic and abiotic factors influence the activity of opossums in an urban environment. The results of our study add basic ecological information to our understanding of invasive species in urban environments.

THE INFLUENCE OF ROAD PROXIMITY ON DEN ACTIVITY OF SAN JOAQUIN KIT FOXES (*VULPES MACROTIS MUTICA*)

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The San Joaquin kit fox (*Vulpes macrotis mutica*) is the only North American species of endangered canid that uses dens year-round. Severe loss of natural habitat has led this species to occupy urban environments, and as a result, it now faces novel threats. One of these threats is vehicle strikes, which constitute the main source of mortality for urban kit foxes. However, the way in which kit foxes use dens in response to roads is still coming into view in the urban environment. Because roads are an important source of mortality for foxes, we wanted to determine if dens close to roads were used less often than dens far from roads. We conducted a study at California State University Bakersfield (CSUB) from Jun to Dec 2022 where we located kit fox dens. At each den, we took a GPS point and placed a camera at the entrance of the den to monitor kit fox activity. Then we measured den proximity to non-busy road and busy roads on and around CSUB. We used generalized linear mixed effects models to determine if the proximity of roads influenced the activity of foxes at dens. We did not find a statistical relationship between activity of kit foxes at dens and the location of dens with respect to roads (busy or non-busy). Our findings in an urban environment support previous research conducted in a natural environment. There are likely other factors that influence the activity of kit foxes at dens other than the proximity of dens to roads.

THE INFLUENCE OF BIOTIC AND ABIOTIC FACTORS ON SAN JOAQUIN KIT FOXES' (V*ULPES MACROTIS MUTICA*) ACTIVITY AT THE CARRIZO PLAIN NATIONAL MONUMENT

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An understanding of the relationship between environmental conditions and species interactions is important for the conservation of endangered species. Because environmental conditions can vary with time and can influence predator-prey activity, we investigated whether abiotic and biotic factors of the environment influenced the activity of the federally endangered San Joaquin kit fox (*Vulpes macrotis mutica*) at the Carrizo Plain National Monument (CPNM) during 2014-2019. We conducted a camera trap survey in three areas of the CPNM to determine the visitation rate of kit foxes and competitor/predator species. We used 30 Cuddeback Attack IR trail cameras during 2014-2017, and 40 cameras during 2018 and 2019 to monitor species activity. All cameras were programmed to take pictures for approximately 30 nights each month during the spring and fall season. We also evaluated prey availability for kit foxes and competitor species during 2015-2019 by conducting two burrow transects at each camera station. We used generalized linear mixed effects models and AICc model selection to determine the types of factors that were most influential on kit fox activity. In the five years of sampling, we accrued 1,821 pictures of San Joaquin kit foxes. We found that the factors that influenced kit fox activity were minimum vapor pressure deficit, daily precipitation, and year. The variable year perhaps indicates that during a time sequence kit fox activity increased. Because competitor species such as coyotes were not in the top models, it may indicate that they are not as influential on kit fox activity (as measured by camera traps) as abiotic factors. Overall, the differences in the models suggest that some factors are more influential on kit fox activity than other factors.

METHODS FOR SURVEYING LEGLESS LIZARDS (*ANNIELLA SP.*)

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In 2022, the Temblor Legless Lizard (*Anniella alexanderae*) was given candidate status as a threatened or endangered species under the California Endangered Species Act (CESA). Because of this status change, many questions have arisen about how to survey for this species. We describe survey techniques currently deployed, which include placing various types of cover

boards in appropriate habitat. We will discuss types of cover boards that can be used and appropriate times to place and check the boards.

eDNA DETECTION OF TEMBLOR LEGLESS LIZARD (*ANNIELLA ALEXANDERAE*) FROM COVERBOARDS AND SOIL SAMPLES

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In June 2022, the California Fish and Game Commission accepted for consideration the petition submitted to list the Temblor legless lizard (*Anniella alexanderae*) as threatened or endangered under the California Endangered Species Act and provided notice that the Temblor legless lizards is a candidate species under California's Fish and Game Code. Currently, the only non-invasive survey method used to detect this species is to place cover boards in potential habitat and periodically check underneath for presence of legless lizards. In an effort to expand possible survey detection methods for this species, eDNA samples were collected from coverboards and soil in terrariums housing *A. alexanderae*. Preliminary results are positive for distinguishing this species in soil samples.

TEMBLOR LEGLESS LIZARD ECOLOGY, SAN JOAQUIN VALLEY DISTRIBUTION, AND CONSERVATION

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James Parham; California State University Fullerton
Erin Tennant; California Department of Fish and Wildlife
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The Temblor Legless Lizard (*Anniella alexanderae*) was described as a new species in 2013 from two locations on the western side of the San Joaquin Valley at the base of the Temblor Range. Because these two sites are degraded due to human activities, including agriculture and energy extraction, *A. alexanderae* was considered as a rare species of conservation concern. In 2014, the CDFW funded field and genetic surveys of *Anniella* that were reported in 2019. This report formed the basis for the Center of Biological Diversity's 2020 petitions to the CDFW and USFWS to list *A. alexanderae* as threatened or endangered. In June 2022, the California Fish &

Wildlife Commission voted to give *A. alexanderae* Candidate Species protection for one year so that the CDFW could study options for listing or not listing. The Commission authorized a six-month extension so that CDFW biologists could do more research. Now we are surveying many locations using hundreds of coverboards. After three years of drought with limited legless lizard activity near the surface, the rains this year have made field searches more successful. In addition to the four sites known by the 2019 report, by March 6 of this year, we have confirmed seven additional sites (for a total of 11). Permission for access to property for field surveys is provided by the BLM, CDFW, and helpful ranch owners in Fresno, Kings, and Kern counties. Both Aera Energy and Chevron environmental staff have authorized access to set cover at all the sites with potential habitat that we have requested. Chevron is funding research on the potential use of eDNA to help determine presence of the species. Regardless of the final decisions about State and/or Federal listing there are already mitigation measures that we have discussed including setting up fencing around patches of habitat and using conservation banking at existing banks or establishing new conservation banks.

YELLOW-BILLED CUCKOO POPULATION DYNAMICS ON THE SOUTH FORK KERN RIVER

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The South Fork Kern River Valley has been recognized as an important Yellow-billed Cuckoo (*Coccyzus americanus*) breeding area for over 40 years and has a long history of cuckoo research (Gaines 1977, Laymon et al. 1997, Whitfield and Stanek 2011, Jacobo et al. 2020). In addition, it is currently the only large population of cuckoos in California outside of the cuckoo population found on the Lower Colorado River (McNeil et al. 2013). The population has historically fluctuated between 2 to 24 pair, with an average of 11 pair (Laymon et al. 1997). After the 2012-2016 drought, the estimated South Fork Kern River Valley cuckoo population plummeted from eight estimated breeding territories in 2012 (Stanek and Stanek 2012) to only one in 2016. The impact of this drought was likely exacerbated by the onset of the prolonged megadrought (2001-2021) that affected most of California and other parts of the southwest (Williams et al. 2022). The Kern cuckoo population, however, has recovered to 10 breeding territories in 2022 despite the ongoing drought. In this presentation, we will talk about the population dynamics of the cuckoo population over the past 35+ years, as well as report a brief summary of the Regionwide western Yellow-billed Cuckoo DPS surveys that were conducted in 11 states this past summer.

MONITORING BIRD USE OF THE KERN RIVER VALLEY AND DESERT SPRINGS USING MOTUS AND ARUS

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Using automated sensors such as radio tag detectors and audio recording units to detect birds is becoming increasingly popular. It allows monitoring in more places and over longer time frames than human observers. We have begun installing AudioMoth Automated Recording Units (ARUs) and Motus stations (https://motus.org) to detect birds passing through and stopping over in the Kern River Valley, and in nearby desert springs. We will describe our strategy for choosing locations and sampling protocols. We have these sensors at three locations in the Kern River Valley and at four locations associated with springs in the desert south of the valley. We are still developing a strategy for scoring audio recordings. We will summarize Motus data collected to date. The Motus station network in the San Joaquin is growing along with the network throughout Western North America. As the network continues to develop, more data on animal movements throughout their life cycle will become more feasible.

SEASONAL COMPOSITION OF BATS IN HIGHER AND LOWER ELEVATIONS ALONG THE KERN RIVER IN CALIFORNIA

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Knowledge of seasonal occupancy and use of riparian habitats by bats in California is very limited. This hampers efforts to assess impacts and provide effective conservation measures. I investigated foraging activity of bats along the Kern River watershed from low elevation areas of the southern San Joaquin Valley to upper elevations of the Kern River near Kernville, California. I hypothesized season and elevation affect abundance of bat species along the Kern River. I predicted: 1) elevation would influence bat abundance, with increased abundance in the upper elevations where less anthropogenic development occurs; 2) the bat species cohort would differ seasonally, with greater species abundance in summer; and 3) differences in habitat conditions between the elevations may influence seasonality. To investigate this hypothesis, I deployed 4 Pettersson D500x acoustic detectors in randomly selected areas within the Kern River watershed. I placed 2 acoustic detectors in each of 2 elevation zones (upper/lower) for 7 consecutive nights, every month for 12 consecutive months, totaling 42 different sites. I processed 50,725 acoustic calls, attributing 21,866 calls to 13 species. Abundance (call minutes) was analyzed separately for each species using single-visit binomial-zero-inflated Poisson N-mixture abundance models. Season (winter/summer) and elevation (lower/upper) were investigated as covariates of abundance and 5 biologically relevant variables were considered as covariates of detection. Five species exhibited significant season association, 4 species showed significant elevation association, and 3 species showed different abundance seasonal patterns at different elevations. My acoustic study suggests the Kern River watershed supports a diverse assemblage of bat

species, and species abundance is influenced by season and elevation. By providing a foundation of the bat cohort on the Kern River, my data will help managers conserve bats in the vicinity, and other rivers of the western Sierra Nevada, where bat abundance patterns are likely similar.

DETERMINING EFFECTS OF RESTORATION TREATMENTS TO GUIDE MANAGEMENT FOR THE SAN JOAQUIN VALLEY GIANT FLOWER-LOVING FLY (*RHAPHIOMIDAS TROCHILUS*)

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When restoring habitat, effective management practices are crucial as improper management could result in the loss of a sensitive species. The San Joaquin Valley giant flower-loving fly (*Rhaphiomidas trochilus*; GFLF) is an endangered, and poorly understood species that resides within the Sand Ridge Preserve of Kern County, California. This preserve has become overrun with dense stands of nonnative annuals (*Bromus diandrus* and *Brassica tournefortii*), which may hinder the recovery of the GFLF. There are increasing interests in determining effective management techniques for GFLF recovery as it is currently under review for protection by the Endangered Species Act. With little life history information such as food sources or specific vegetation preferences documented, there are no sufficient recovery guidelines for habitat restoration or range expansion. Any misstep in future restoration may negatively affect the remaining population. Our objectives are to test whether restoration efforts (i.e. mechanical and herbicide treatments) affect 1) arthropod diversity/abundance (GFLF larvae are thought to be predators of sub-terranean soft-bodied insects and a decrease of these potential food sources may harm the fly), 2) female GFLF perching preference, and 3) male GFLF selection of specific vegetation types (e.g., vegetation structure, color, or species) when searching for perched females. This research could help future management practices for habitat restoration in inland sand dune systems and GFLF life history updates on vegetation preferences. Additionally, it could contribute to recovery efforts to expand current range and improve connectivity between hotspots for the federally-endangered and closely related Delhisands giant flower-loving fly (*R. terminatus abdominalis*).

THE SAN JOAQUIN RESTORATION AND RESILIENCE PROJECT

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The US Bureau of Land Management has invested heavily in research on the distribution and habitat preferences of the three Federally listed vertebrate species of the San Joaquin Desert (blunt-nosed leopard lizard, giant kangaroo rat, San Joaquin kit fox) as well as a number of other locally endemic desert species. The time has come to leverage the results of this research effort to restore habitat and recover these species to the point of delisting. To that end, BLM has

proposed a program that includes restoration of desert habitat and the captive breeding and repatriation of blunt-nosed leopard lizards and giant kangaroo rats. As the most habitat-limited of the three vertebrates named above, blunt-nosed leopard lizards have been proposed as an umbrella species for the San Joaquin Desert, with the understanding that restoring habitat to the standard of supporting this species will promote all the other San Joaquin Desert species. Giant kangaroo rats are ecosystem engineers and replacing them on the land can potentially deliver important restoration benefits. In partnership with The Nature Conservancy and other Federal and State agencies, BLM proposes to provide funding to educational institutions in underserved communities across the San Joaquin Valley to recruit personnel and conduct small scale nursery operations, mentor youth into careers in conservation, and to capitalize on opportunities to restore lands fallowed under the California groundwater law.

Informal Poster Session

IMPORTANCE OF BUREAU OF LAND MANAGEMENT LANDS FOR TEMBLOR LEGLESS LIZARD (*ANNIELLA ALEXANDERAE*) AND OTHER SPECIAL STATUS SPECIES STUDIES

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The Temblor legless lizard (*Anniella alexanderae*), a small fossorial lizard existent on Bureau of Land Management (BLM) lands within the central valley of California, is currently under a status review for United States Fish and Wildlife Service to determine if whether the petitioned actions are not warranted, warranted, or warranted but precluded for a determination of whether it is an endangered species or a threatened species. The BLM lands are spread widely over 6 % of *A. alexanderae* estimated range and plays a significant role in cooperatively working with a variety of stakeholders to gain much needed information gaps regarding presence, biology, range, and population trends. The BLM policy seeks to manage sensitive species and their habitats to minimize or eliminate threats affecting the status, thus it is crucially important to develop cooperative working relationships to close these information gaps. BLM supports cooperative working relationships for special status species by proactively authorizing different study efforts and by offering funding opportunities. Together, BLM and cooperative entities can monitor populations, inform the Federal, State, and local groups to ensure the most effective program for sensitive species on BLM lands.

THE EFFECTS OF FIRE ON BAT ACTIVITY IN SEQUOIA AND KINGS CANYON NATIONAL PARK

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The purpose of my study is to understand how bats respond to fire-affected habitats. Specifically, the aim of this project is to determine 1) how structural habitat changes due to fire affects the activity patterns of forest-dwelling bats and 2) how the species composition of bat assemblages' changes over a range of fire-managed and affected landscapes. To evaluate the effects of burn severity on bats I conducted acoustic surveys in June-August 2021 and 2022 within the SQF Complex, a complex of two of the August 2020 California lightning wildfires, that burned in Sequoia National Forest and adjacent areas.

DEGRADATION OF LOW-DENSITY POLYETHYLENE AND *PLANTANUS ACERIFOLIA* LEAVES IN AN EPHEMERAL POND AND ARID GRASSLAND

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Plastic pollution is a pervasive contaminant of concern worldwide. To understand the fate of plastic pollution in arid landscapes, I am investigating how low-density polyethylene plastic degrades compared to naturally occurring leaves from *Plantanus acerifolia* (London planetree) in terrestrial and freshwater habitats. I investigated 1) if leaf and plastic degradation rates differ, and if this pattern is consistent across habitats, and 2) how leaf and plastic materials impact macroinvertebrate communities. A traditional leaf pack experiment was conducted with three treatments; natural leaves, plastics, and a mix of both materials. Leaf packs were anchored in a grassland and ephemeral pond in February 2021 (n = 55 treatment habitat-1) and subsets were harvested every 1-3 months for one year (n = 3-6 leaf packs treatment-1 habitat-1). Results indicated that plastic degraded 115 × faster in the grassland compared to the pond, while natural leaves degraded 1.7 × faster in the pond compared to the grassland. Macroinvertebrates did not preferentially colonize certain leaf pack treatments, suggesting that plastic could serve as an alternative habitat resource for macroinvertebrates. This study provides insight into how varying environmental conditions can impact plastic degradation in the environment, advancing knowledge on the fate of plastics in arid habitats.

MULTI-SPECIES DEN USE AND ITS POTENTIAL EFFECTS ON THE DISTRIBUTION OF SARCOPTIC MANGE IN AN URBAN SAN JOAQUIN KIT FOX (*VULPES MACROTIS MUTICA*) POPULATION

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Sarcoptic mange is a transmissible disease that has affected urban populations of the endangered San Joaquin kit fox (*Vulpes macrotis mutica*). Little is known about potential mange vectors in non-canid species leading to mange distribution throughout an urban population. Other species inhabiting the urban environment, such as the striped skunk (*Mephitis mephitis*), are known to share dens with kit foxes. This den-sharing behavior may contribute to mange distribution among different species, including kit foxes. Our objective was to study multi-species den use to determine the potential of mange spread. To achieve our objective, we trapped kit foxes throughout June of 2022 and fitted each adult with a radio collar. We used radio telemetry to track individuals to dens. At each den, we placed a camera to monitor the entrance of the den for species' activity over seven days. Cameras were checked, removed, or placed weekly based on collared fox presence at a den. We recorded species presence from camera images. Presence was measured by an individual showing up and not entering a den. Den use was measured by an individual entering the den. In our six-month study, we found 63 unique dens used by kit foxes that were used by skunks, along with Virginia opossums (*Didelphis virginiana*), California ground squirrels (*Otospermophilus beecheyi*), fox squirrels (*Sciurus niger*), domestic cats (*Felis silvestris catus*), and raccoons (*Procyon lotor*). On average, 22 kit foxes were present at dens and 18 kit foxes used dens within each week. From descending order, the presence and den use of each species were skunks, ground squirrels, cats, opossums, raccoons, and fox squirrels. While it remains uncertain if other species contribute to mange distribution in urban populations, the results of our study demonstrate that consistent den use of non-canid species could contribute to mange distribution in kit foxes.