Check List the journal of biodiversity data
ANNOTATED LIST OF SPECIES

Terrestrial mammal diversity at Hansen Dam (Los Angeles, California, USA): flood control area acts as habitat in a human-dominated landscape

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Abstract. Urban expansion is a prominent threat to biodiversity, particularly for terrestrial mammals, which are significantly impacted by disruptions in habitat connectivity and loss. It can also lead to increased human-wildlife conflicts that contribute to species decline. Urban public works projects, such as flood control areas, may coincidentally preserve significant habitat, but their potential for conservation remains understudied. Hansen Dam, located in the city of Los Angeles, California, USA, is one of these flood control areas, hosting some of the last remaining riparian habitat in the greater Los Angeles area. We deployed motion-triggered camera traps at 36 stratified random locations and completed small mammal trapping at 20 sites at Hansen Dam. We detected a total of 15 species, not including domesticated animals, but there is potential that additional species inhabit the area. All species detected were common and expected but demonstrate that the Hansen Dam flood control basin has a terrestrial mammal community similar to that reported for other urban habitats. These results suggest incidental habitat conservation could play a significant role in future conservation planning efforts.

Key words. camera trapping, diversity, Mammalia, urban conservation, urban wildlife

Privett-Mendoza AG, Oganesyan S, Fisher RN, Hitchcock CJ, Clark DR, Zellmer AJ (2025) Terrestrial mammal diversity at Hansen Dam (Los Angeles, California, USA): Flood control area acts as habitat in a human-dominated landscape. Check List 21 (1): 198–215. https://doi.org/10.15560/20.6.198

INTRODUCTION

Urban expansion is one of the most pressing issues threatening biodiversity because it fragments and isolates natural areas of habitat in the landscape, disrupting connectivity and patch size (Güneralp et al. 2013; McKinney 2002; Riley et al. 2006). It can also lead to increased human-wildlife interactions and conflicts, the latter of which can contribute to species decline (Seiler and Helldin 2006; Gross et al. 2021). While the majority of urban development is detrimental to wildlife, some urban land uses may benefit certain species. Urban infrastructure requiring large land areas, such as powerline corridors (Oki et al. 2021; Ouédraogo et al. 2020) and military bases (Nasser 2021), may paradoxically act as habitat refuges within and adjacent to cities. Debris basins are one of these understudied but potentially important areas for habitat conservation. These basins contain structures designed to protect downstream communities by capturing high flows, sediment, boulders, and vegetative debris that are washed down from canyons during heavy storms (LACDPW 2023). Often, the land immediately surrounding the debris basin may be void of development and therefore act as a corridor to adjacent forests or other natural areas.

In an effort to reduce the risks of flooding on an expanding population into the foothills and flood banks of the Los Angeles Basin, the U.S. Army Corps of Engineers (hereafter U.S.A.C.E.) established 162 debris basins (McPhee 1998). These debris basins, which are now managed by the Los Angeles Flood Control District, help mitigate future damage to adjacent communities by controlling the flow of the Los Angeles River. Vegetation periodically reestablishes in the basins but is cleared out once the basin becomes 25% full of debris and sediment (LACDPW 2013), resulting in varying periods of time when vegetation may provide habitat for local wildlife.

OPEN ACCESS
Academic editor: Terrence C. Demos
Received: 12 July 2024
Accepted: 3 October 2024
Published: 14 February 2025

Negative impacts of urbanization and habitat fragmentation on mammals are well documented (Dickson et al. 2005; Riley et al. 2006; McKinney 2008; Poessel et al. 2014; Fraser et al. 2019; Riley et al 2021). Los Angeles County is one of 11 counties identified as hotspots for endangered species in the United States (Dobson et al. 1997) and moreover, the city of Los Angeles is one of two megacities in the world with resident large predatory cats (Braczkowski et al. 2018; Riley et al. 2021; NPS 2022). Many of these mammal species need large, undisturbed, contiguous areas of habitat to thrive (Beier 1993). In Los Angeles County, the presence of medium to large mammals such as Bobcats, Gray Foxes, and Mountain Lions, is negatively correlated with increased proximity to and intensity of urbanization (Ordeñana et al. 2010). Collecting baseline data on mammal species and their use of habitat in development projects, such as debris basins, will allow for a more accurate assessment of changes to wildlife populations in response to further development and may help inform future management decisions. One flood control basin relevant for studying wildlife responses to development is the Hansen Dam with its surrounding recreational area in the Lake View Terrace neighborhood of Los Angeles, CA (hereafter Hansen Dam). Hansen Dam hosts some of the last remaining low-elevation riparian habitat in Los Angeles County that continues to exhibit natural hydrological and biological processes typical of coastal southern California (Hanes et al. 1989; Delaney et al. 2001).

Despite being one of the last intact fragments of lowland riparian habitat in the area, little information on the terrestrial mammalian population exists for the Hansen Dam flood control area. To compile a baseline record of the terrestrial mammal species present at this location, we deployed camera traps and Sherman traps (H. B. Sherman Inc., Tallahassee, FL; hereafter Sherman traps) throughout the U.S.A.C.E. surrounding the dam. We hypothesized that the region would provide habitat for numerous mammal species, including urban tolerators such as Coyote (*Canis latrans* Say, 1822), Raccoon (*Procyon lotor* Linnaeus, 1758), Striped Skunk (*Mephitis mephitis* Schreber, 1776), and Desert Cottontails (*Sylvilagus audubonii* Baird, 1858), and urban avoiders, such as Bobcats (*Lynx rufus fasciatus* Rafinesque, 1817), known to reside within natural areas in Los Angeles County.

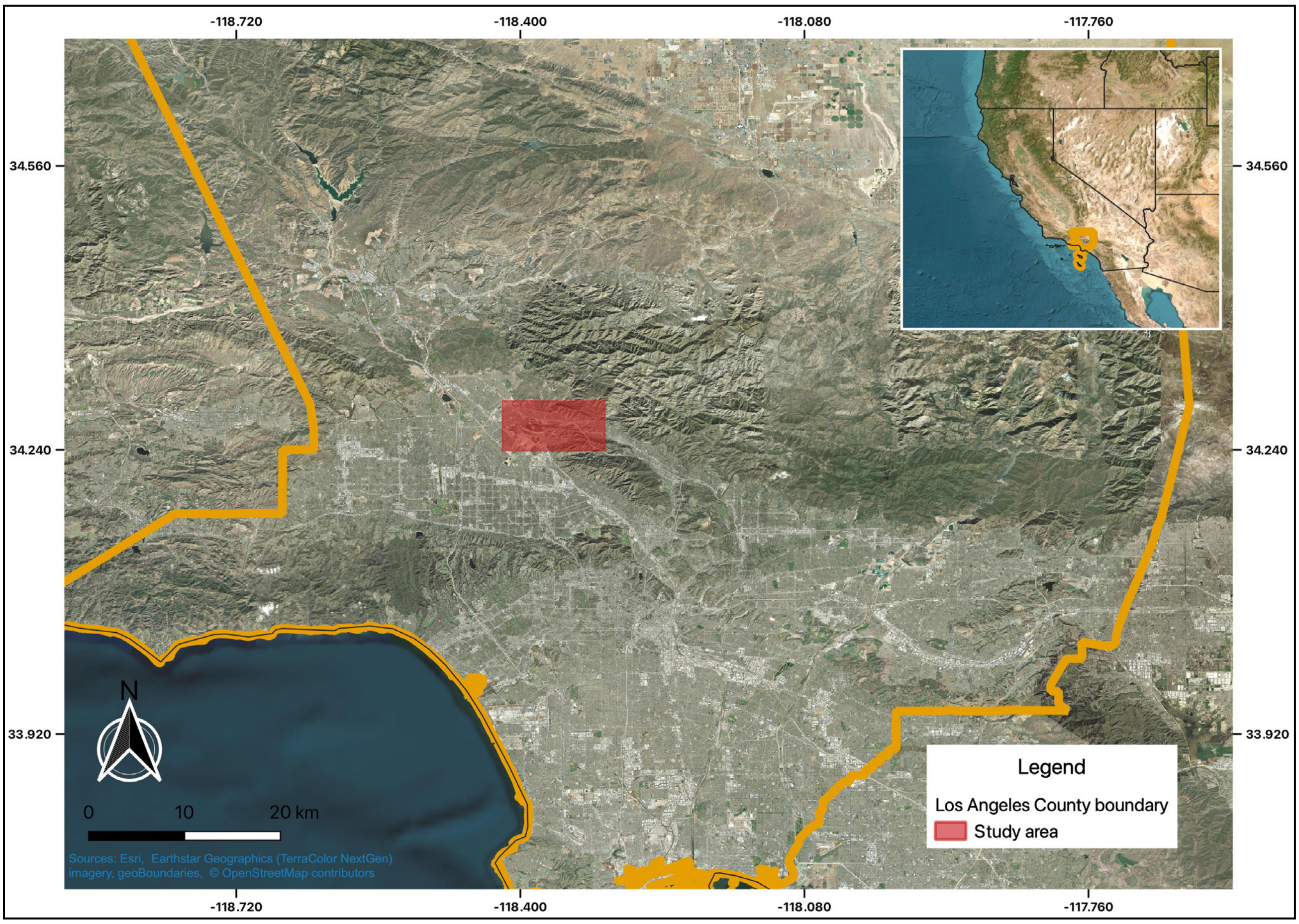

Figure 1. Map illustrating Los Angeles County. The red box indicates the location of Hansen Dam in the San Fernando Valley. The inlay in the top right corner depicts the southwestern United States of America. The black lines outline states and the orange outline depicts Los Angeles County in Southern California, USA.

STUDY AREA

Hansen Dam is located in the northeastern San Fernando Valley in Los Angeles County (Figure 1). Hansen Dam is a flood control unit built by the U.S.A.C.E. and currently managed by the Los Angeles County Flood Control District. The dam and reservoir area total 591.36 ha, 525.52 of which are leased to the city of Los Angeles for recreational use. It is located at the junction of the Big and Little Tujunga Washes and is one of few large open spaces in the area (Vermy 2020). The area is fenced off along its boundaries and has designated entrance points at a numerous locations.

The predominant climate in Los Angeles County is Mediterranean, with highly seasonal rainfall ranging from 50.8–88.9 cm in the foothills and increasing with elevation (Rundel and Gustafson 2005). Most precipitation occurs between the months of November to March (CA OEHHA 2024). Hansen Dam has two lake areas with year-round water, occupying approximately 12 ha. The percentage flooded area is highly variable and dependent on annual rainfall. High rainfall years can result in some recreational trails and riparian habitat areas becoming temporarily inaccessible. However, the dam has a maximum capacity of 24 billion gallons of water (LACDPW 2021) and therefore, even in high rainfall years, much of the area remains accessible.

Notably, the location is included in the boundary adjustment proposed in the National Park Service's final recommendation in the Rim of the Valley Corridor Special Resource Study (2015). The Rim of the Valley Corridor is a network of parks, trails, and open spaces connecting the mountains surrounding the San Fernando, La Crescenta, Santa Clarita, Simi, and Conejo Valleys (NPS 2015). Many parcels of land in this network are currently protected under federal, state, local, and nonprofit jurisdiction, but the project to fully connect these areas is not yet fully complete. Hansen Dam is connected to the San Gabriel Mountains via the Big and Little Tujunga Washes and located adjacent to the Verdugo Mountains which were also included in the boundary expansion.

The inclusion of Hansen Dam, among other sites, under the recommended boundary adjustment, emphasizes its significance as part of this regional wildlife corridor (NPS 2015). Several types of habitats are found here, including scrub, sandy washes, riparian (though disturbed), and the critically threatened Alluvial Fan Sage Scrub. Hansen Dam is surrounded by densely developed urban areas and experiences high recreational usage.

METHODS

Camera Trapping. Initial sampling took place using Bushnell™ Core Brown Low Glow – 24 megapixel motion-sensor trail cameras installed at seven locations throughout the property to document medium to large mammals (those weighing more than 1 kg). Cameras were encased in metal lock boxes and secured to trees or metal stakes hammered into the ground facing game trails and areas that might be used by wildlife. Locations of several cameras were switched or replaced due to theft and vandalism, and two additional cameras were added to the site after our initial installations. Cameras were deployed from 24 March 2021 to 29 July 2021 (Figure 2, Table A1). Cameras were initially set to shut off during the daytime

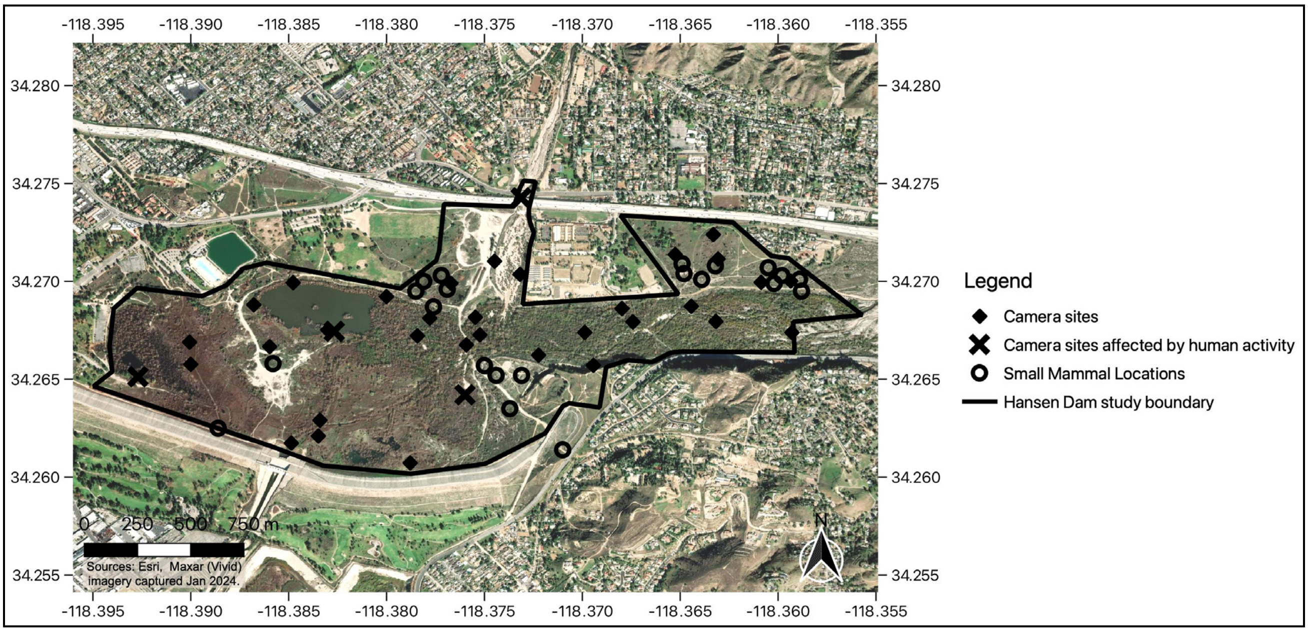

Figure 2. Map of Hansen Dam in Los Angeles County, CA, USA. Black diamonds indicate camera trap locations. Black x symbols indicate camera sites impacted by human activity. Black dots indicate small mammal trapping sites. Black outlined area indicates the flood control basin and area of focus for sampling.

when humans were expected to be most active in the Hansen Dam Recreational Area; however, this setting was incompatible with the motion sensor trigger on the model of camera used. Cameras were ultimately re-programmed to take photos 24 hours/day only when the motion sensor was triggered. Motion sensor sensitivity was set to "low", and cameras were set to take three 5-megapixel (MP) photos in succession when triggered for this initial survey. A new session began each time the SD card was collected, and a new blank SD card was installed. This occurred every 3–4 weeks during the sample period. Batteries were also checked at this time and replaced if necessary. A quiet period of 5 minutes (min) was applied post-hoc to remove extraneous and repeated photos of the same individual.

Photos were viewed and scored by species in Microsoft Access. Scoring meant that each photo was tagged with a species identification (including people, horses, dogs, vehicles, and bikes), or "none" if there were no species in the photo. All captures were reviewed for accuracy and loaded to a central database that could be queried. False triggers were eliminated from the dataset and stored separately from the species photos.

Additional field sampling at Hansen Dam was conducted using Browning trail cameras (Dark Ops Max HD # BTC 6HD-MAX) for month-long periods from 16 November to 18 December 2021 and 11 February to 15 March 2022 (Figure 2, Table 1). Following the protocol recommended by Kays et al. (2020), 25 total motion-triggered camera traps were deployed at stratified random points at least 0.09 km apart throughout the landscape. Cameras were placed in metal security boxes to protect them from the elements and human disruption. Cut-resistant python locks were used to secure the cameras to trees or shrubs. Researchers conducted mid-month checks at each site to check batteries, exchange them if necessary, and replace the memory card. Photos were downloaded at that time, in addition to at the end of the sample period. The active period was 24 hours/day, and the cameras were programmed to take single photographs with a 30-second delay post-hoc. Pictures were processed using the computer vision model Megadetector (Beery et al. 2019) to remove empty photos and images of people at a 0.80 confidence level. The remaining dataset was scored by species in Microsoft Excel and validated by two or more researchers.

Small Mammal Trapping. An initial visit was made to assess the habitats and determine the best locations for setting small mammal traps. Trap locations were selected based on the general habitat type used by this taxonomic group. One hundred and five Sherman live-traps were set across the landscape in five main sections of the U.S.A.C.E. property at Hansen Dam. Traps were set on the evening of July 26 and checked on the mornings of July 27–29. Groups of five live traps (three measuring 10.2 cm × 11. cm × 38.1 cm and two measuring 7.6 cm × 8.9 cm × 30.5 cm) were placed (Figure 2, Table A2). All traps were baited with heat-inactivated rolled oats, birdseed, and alfalfa, and checked for three consecutive days. Traps were deployed in the evenings and were checked for captures early the following mornings.

Individuals were identified to species by USGS mammal expert Denise Clark at the time of capture and assessed for age, sex, and reproductive condition. For further species verification, weight (g), body length (mm), tail length (mm), hind foot length (mm), and ear length (mm) were taken for all specimens. A minimum of one animal specimen per cluster was photographed. All animals were temporarily batch-marked by clipping a small amount of fur from the hip area or marking with a marker to document recaptures.

Data Analysis. We calculated species richness for mammals from both camera trap data and small mammal trap data using Hill numbers (Hernandez-Hernandez and Chavez 2021) and the R package iNEXT (Hsieh et al. 2016).

RESULTS

Overall, 15 mammal species, belonging to four orders, nine families, and 11 genera were detected. Three additional species were detected via direct observation, but were not added to the annotated list because they were not collected or sampled to confirm species identification. Of the recorded species, none are considered threatened or endangered.

Camera Trapping. The total sampling force (# operational days per period * # cameras per period) was 2,141 days. A variety of habitats were sampled, including shrub/scrub, woody wetlands, and emergent herbaceous wetlands. Rabbits (*Sylvilagus* spp.) had the highest number of observations (*n* = 636), followed by Coyote (*Canis latrans*; *n* = 394), and Bobcat (*Lynx rufus fasciatus*; *n* = 91). Coyotes were detected at the greatest number of camera sites (*n* = 23), followed by rabbits (*n* = 19), then Bobcats (*n* = 17) (Figure 3). Of the two domestic species detected, horses had the highest number of observations (*n* = 5,263) followed by domestic dogs (*n* = 215). Domestic species were excluded from analyses.

Small Mammal Trapping. A total of 143 captures of eight different species were made during the three days of small mammal trapping (Table 1, Figure 6). Three additional small mammal species were observed during other surveys at Hansen Dam. The most often documented small mammal was Bryant's (desert) Woodrat (*Neotoma bryanti; n* = 57) followed by Pacific Kangaroo Rat (*Dipodomys agilis*; *n* = 43) and California Pocket Mouse (*Chaetodipus californicus*; *n* = 23). Two of the additional small mammal species

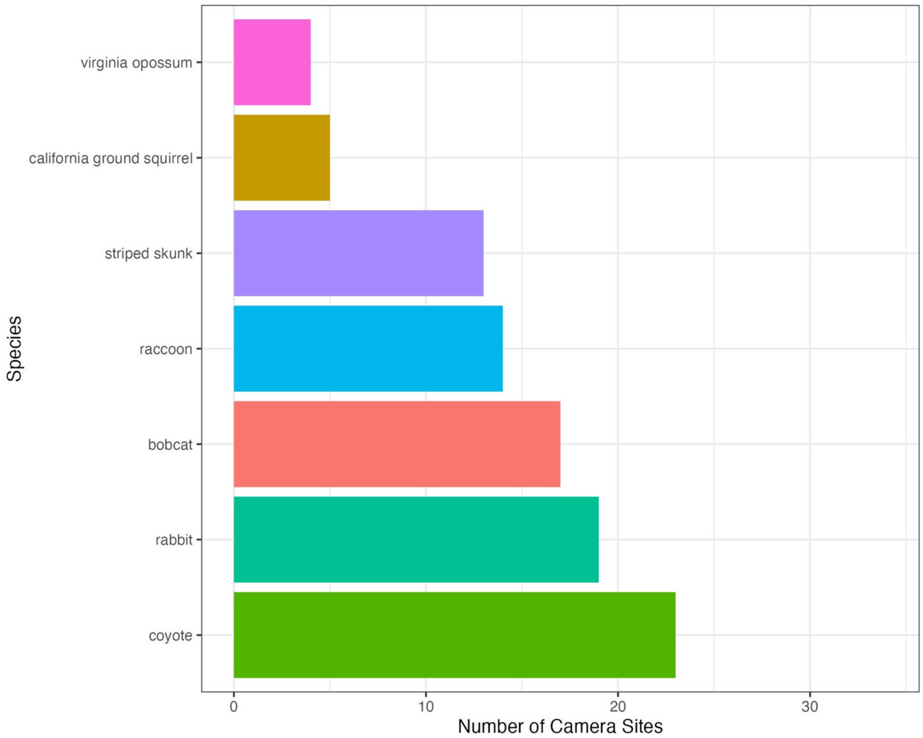

Figure 3. Visualization of the number of sites where each species was observed across the Hansen Dam study area, which included 36 camera sites in total. (Virginia Opossums are not native to Southern California).

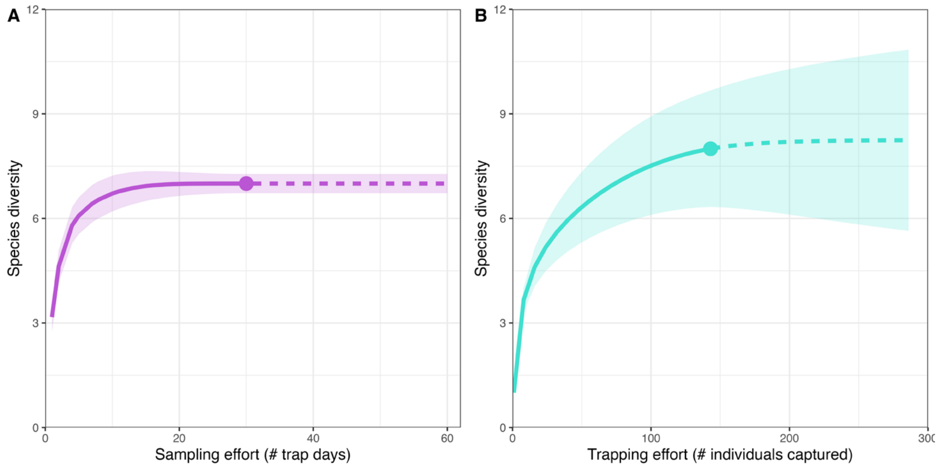

Figure 4. Species accumulation curves. Species accumulation curves for mammal species richness ($q = 0$) based on (**A**) camera trap data and (**B**) small mammal trap data, where interpolated and extrapolated values are based on sampling units. Sampling units for camera trap data are the number of camera trapping days. The shaded area represents a CI of 95%. The extrapolated values extend up to twice the trapping effort.

documented from other surveys were the Western Harvest Mouse (*Reithrodontmys megalotis*), recorded from under a board, and a dead Broad-footed Mole (*Scapanus latimanus*), which was encountered during a fish survey (14 April 2021). We also observed evidence of Pocket Gophers while walking the property.

An asymptotic trend in the species accumulation curve for the camera data indicates that the sampling effort was adequate (Figure 4A). No additional species were detected with the camera traps after the 20th sample day. The graph of species richness using the individuals caught with Sherman traps shows that by the 55th capture, we had six different species (Figure 4B). No additional species were detected with the Sherman traps after the 55th capture.

ANNOTATED LIST OF SPECIES

Order Carnivora
Family Canidae

***Canis latrans* (Say, 1822)**
Coyote
Figure 4A

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID P04-05, P10–P11, 2–3, 8–9, 19–21, 23–26, 29–31, 34–35 (Table 1); first record on 24.III.2021; camera trap photos.

Identification. This is a medium to large canid with black, gray, white, and reddish-brown fur. The underside from the belly to the snout is white, with reddish brown legs and shoulders. It has large, triangular ears and a narrow snout. The tail is black at the tip. There are several subspecies of *Canis latrans* throughout the continental United States (Bekoff 1977).

Family Felidae

***Lynx rufus fasciatus* (Rafinesque, 1817)**
Bobcat
Figure 5B

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID P02, P09–P10, 3, 5, 7–9, 16–17, 20–21, 23–26, 35 (Table 1); first record on 28.III.2021; camera trap photos.

Identification. This is a medium-sized, tan feline with spots along its underside. The cat is named for its short tail which is white along the underside with a black tip. These cats have horizontal lines along their tail and legs, most noticeably on the forelegs. They are differentiable from domestic cats by their larger size, robust legs, and pointed ears. This is one of two subspecies of bobcat to occur in the continental United States (Kitchener et al. 2017).

Table 1. List of taxa identified during our trapping surveys at Hansen Dam, Los Angeles, CA, USA. N indicates the species is native to the region and I indicates the species is introduced to the region. Ct = camera trap, St = Sherman trap. Conservation status according to the IUCN Red List (2024) and the CNDDB (2024). IUCN categories: (LC) Least Concern, (NT) Near Threatened, and (EN) Endangered. California Threatened and Endangered Species List categories: (NL) Not Listed.* N = native and I = introduced.

Order	Family	Species	Common name	Record type	California risk status	IUCN risk status	Native/ introduced
Carnivora	Canidae	*Canis latrans*	Coyote	Ct	NL	LC	N
	Felidae	*Lynx rufus fasciatus*	Bobcat	Ct	NL	LC	N
	Procyonidae	*Procyon lotor*	Northern Raccoon	Ct	NL	LC	N
Didelphimorphia	Didelphidae	*Didelphis virginiana*	Virginia Opossum	Ct	NL	LC	I
Lagomorpha	Leporidae	*Sylvilagus audubonii*	Desert Cottontail	Ct	NL	LC	N
	Mephitidae	*Mephitis mephitis*	Striped Skunk	Ct	NL	LC	N
Rodentia	Cricetidae	*Neotoma fuscipes*	Dusky-Footed Woodrat	St	NL	LC	N
		Neotoma bryanti	Bryant's (desert) woodrat	St	NL	LC	N
		Peromyscus eremicus	Cactus Mouse	St	NL	LC	N
		Peromyscus maniculatus	North American Deer Mouse	St	NL	LC	N
	Heteromyidae	*Chaetodipus californicus*	California Pocket Mouse	St	NL	LC	N
		Dipodomys agilis	Pacific Kangaroo Rat	St	NL	LC	N
	Sciuridae	*Otospermophilus beecheyi*	California Ground Squirrel	Ct	NL	LC	N

*Species categorized as "Not Listed" are not classified as endangered or threatened by the California Fish and Game Commission.

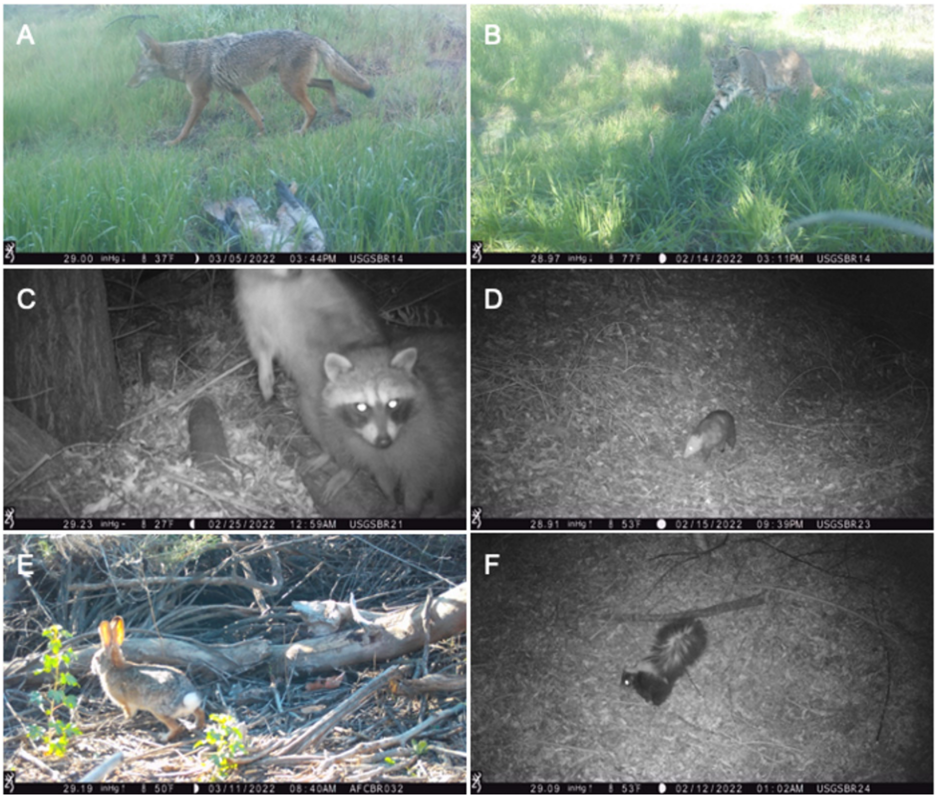

Figure 5. Examples of biodiversity captured on camera traps. **A.** Coyote (*Canis latrans*) walking past deceased Red Tail Hawk (*Buteo jamaicensis* (Gmelin, 1788)). **B.** Bobcat (*Lynx rufus fasciatus*). **C.** Two Northern Raccoons (*Procyon lotor*). **D.** Virginia Opossum (*Didelphis virginiana*), non-native to Southern California. **E.** Desert Cottontail Rabbit (*Sylvilagus audubonii*). **F.** Striped Skunk (*Mephitis mephitis)*.

Family Procyonidae

***Procyon lotor* (Linnaeus, 1758)**
Northern Raccoon
Figure 5C

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID P02, P10–P11, 1, 3, 7–8, 17, 19, 21, 24–25 (Table 1); first record on 29.III.2021; camera trap photos.

Identification. This is a medium-sized procyonid with a robust body and short legs. Their body fur is often gray and long. The face has an identifiable black mask covering the eyes and cheeks and extending from the nose to the forehead and across the middle of the eyes (GBIF Secretariat 2021).

Family Mephitidae

***Mephitis mephitis* (Schreber, 1776)**
Striped Skunk
Figure 5D

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID P02, P09, P11, 2, 7–9, 19, 21, 25–26, 30 (Table 1); first record on 2.IV.2021; camera trap photos and opportunistic observations.

Identification. This medium-sized skunk is black with a white stripe across the length of its body. The stripe starts from the head, then splits into two stripes down its back. The tail is a mixture of black and white fur. It has a triangular head with small, round ears (Wade-Smith and Verts 1982).

Order Didelphimorphia
Family Didelphidae

***Didelphis virginiana* (Kerr, 1792)**
Virginia Opossum
Figure 5E

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID 1–2, 7, 26 (Table 1); first record on 15.II.2022; camera trap photos.

Identification. This is a medium-sized marsupial mammal with a distinctive white face and pink nose in a pointed snout, black ears, and a prehensile tail. It typically has a thick, white undercoat sometimes with black tips and there is variation in fur coloration throughout its range. Its tail is long, usually a pinkish color with few hairs, (Gardner 1982). This opossum was introduced to California in 1910, with the first wild specimens captured in 1914 (Grinnell 1915). They are now found throughout the continental United States (McManus 1974).

Order Lagomorpha
Family Leporidae

Sylvilagus audubonii **(Baird, 1858)**
Desert Cottontail
Figure 5F

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 9, 20, 25, 30 35 (Table 1); first record on 25.II.2022; camera trap photos and opportunistic observations.

Identification. The Desert Cottontail is larger than others of the *Sylvilagus* genus. They have long hind legs and a large, white tail. Their ears are long, pointed, and have black fur at the tip of the inner side. There are several subspecies throughout the continental United States (Chapman and Willner 1978).

Order Rodentia
Family Cricetidae

Neotoma fuscipes **(Baird, 1857)**
Dusky-footed Woodrat
Figure 6A

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 2.1, 5.3 (Table 2); first record on 21.VII.2021; Sherman trap.

Identification. The Dusky-footed Woodrat is a medium-sized rodent. The common name comes from the dark color on the tops of its feet. Its fur is usually dark brown, and it has a long unicolor tail. *N. fuscipes* has a longer tail, hind foot, and ears than *N. bryanti* (Jameson and Peeters 1988). It is distinguishable from *N. albigula* Hartley, 1894 by its baculum, which is straight as opposed to slightly curved (Carraway and Verts 1991). Matocq (2002) presented evidence for a taxonomic split that elevated *N. macrotis* Thomas, 1893, formerly a subspecies of *N. fuscipes*, to a separate species. There is potential for disagreement in the species assignment due to this taxonomic split.

Neotoma bryanti **(Merriam, 1887)**
Bryant’s (Desert) Woodrat

Figure 6B

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 1.2, 2.2, 2.4, 3.1–3.3, 3.5, 4.2–4.5, 5.3 (Table 2); first record on 27.VII.2021; Sherman trap.

Identification. Bryant’s Woodrat is a large woodrat. It has large ears and a long, bicolored tail that is grayish brown on top and lighter underneath (Alvarez-Castañeda and Yensen 1999). It has a mix of darkish and clay-colored fur along its back, with whitish fur on its underbelly. It is slightly larger and darker than *N. lepida* Thomas, 1893 which occupies a similar range. *N. bryanti* is distinguishable from *N. albigula* by its throat hairs that are plumbeous at the base rather than white. It is distinguishable from *N. fuscipes* and *N. phenax* (Merriam, 1903) because *N. fuscipes* does not have a distinctly bicolored tail and *N. phenax* has a unicolor dusky tail (Alvarez-Castañeda and Yensen 1999).

Peromyscus eremicus **(Baird, 1857)**
Cactus Mouse
Figure 6C

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 4.3-4.4 (Table 2); first record on 28.VII.2021; Sherman trap.

Identification. *P. eremicus* is notably smaller than *P. californicus* (Gambel, 1848) and has a strong mixture of dark brown or black pelage (Veal and Caire 1979). It has naked soles on the hind feet, a hairless tail, and a distinctive lateral line of earthly red-yellow buff (Veal and Caire 1979). The most easily distinguishable characteristic of cactus mice from other species in the subgenus *Haplomylomys* is the shape of the baculum – it is relatively short, broad, and dorsally curved (Veal and Caire 1979).

Figure 6. Photos of species observed during small mammal trapping at Hansen Dam, 2020–2021. Individuals were identified to species by USGS mammal expert Denise Clark. **A.** Dusky-footed Woodrat (*Neotoma fuscipes*). **B.** Bryant's (desert) Woodrat (*Neotoma bryanti*). **C.** Cactus Mouse (*Peromyscus eremicus*). **D.** Deer Mouse (*Peromyscus maniculatus*). **E.** California Pocket Mouse (*Chaetodipus californicus*). **F.** Pacific Kangaroo Rat (*Dipodomys agilis*). **G.** California Ground Squirrel (*Otospermophilus beecheyi*). Small mammal photos by D. Clark and T. Matsuda.

***Peromyscus maniculatus* (Wagner, 1845)**
Deer Mouse
Figure 6D

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 1.1, 2.3, 4.5, 5.4 (Table 2); first record on 27.VII.2021; Sherman trap.

Identification. *P. maniculatus* are generally between 119-222 mm long, weigh between 10-24 grams, and have round, slender bodies (Baker 1983). *P. maniculatus* have short, dense, soft, fur that is gray to reddish-brown with white underparts. Their tails are variable in length between populations and ranges, have fine hairs, and are distinctly bicolored with the top half darker and the lower half lighter (Baker 1983). This strong separation of tail colors differentiates *P. maniculatus* from other *Peromyscus* species, where this is less distinct. *P. maniculatus* has hind feet measuring 22 mm or less, distinguishing it from *P. leucopus* (Rafinesque, 1818). Another distinguishing factor from *P. leucopus* is the coloring and fur – *P. maniculatus* has a more richly colored brown or tawny fur, compared to *P. leucopus* which has a more pink or grayish color and scattered dark hairs (LTER 1998).

Family Heteromyidae

***Chaetodipus californicus* (Merriam, 1889)**
California Pocket Mouse
Figure 6E

Material examined. UNITED STATES – CALIFORNIA • Hansen Dam; sampling points ID 1.1, 1.2, 2.1, 2.2, 2.5, 4.3, 4.5 (Table 2); first record on 27.VII.2021; Sherman trap.

Identification. These mice are most easily distinguishable using ear length and shape. The ears of *C. californicus* are longer, notably parallel-edged, and oval-shaped compared to *C. fallax* (Merriam, 1889) (Erickson and Patten 1999). They also have spinous, white hairs on their shoulders which are not present on *C. fallax* (Erickson and Patten 1999). These mice also have well-haired tails and dark brown coloring dorsally (Veal and Caire 1979).

***Dipodomys agilis* (Gambel, 1848)**
Pacific Kangaroo Rat
Figure 6F

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID 1.1-1.4, 2.1, 2.3-2.4, 3.1-3.3, 4.2- 4.4, 5.4 (Table 2); first record on 28.VII.2021; Sherman trap.

Identification. *D. agilis* is a medium-sized kangaroo rat, with large ears and a narrow face (Grinnell 1992). The upper parts of the fur are typically dark reddish-brown, or a cinnamon color and the tail is bicolored with a dull brownish-black crest and tuft at the end (Wilson et al. 2016). *D. agilis* is most similar to *D. simulans* (Merriam, 1904), which is smaller in size and has smaller ears and a narrower face. It is also similar to *D. venustus* (Merriam, 1904), which is larger with longer ears and a narrower face, and *D. heermanni* LeConte, 1853, which is larger with smaller ears and a wider face (Wilson et al. 2016).

Family Sciuridae

***Otospermophilus beecheyi* (Richardson, 1829)**
California Ground Squirrel
Figure 6G

Material examined. UNITED STATES – California • Hansen Dam; sampling points ID P04, 2 7-9, 19, 21, 25-26, 30 (Table 1); first record on 16.II.2022; camera trap photos and opportunistic observations.

Identification. These squirrels have gray, white, and light and dark brown fur with spots along their back. They have a white patch around their shoulders and neck and a white outline around their eyes. Their sides are also lighter colored. There are multiple subspecies of California ground squirrels throughout the state and through Baja California (Smith et al. 2016).

DISCUSSION

We completed a baseline assessment of the terrestrial mammals at Hansen Dam in the San Fernando Valley of California, USA. Using camera traps and small mammal traps, we detected a total of 15 species, not including domesticated animals. These results demonstrate that this important lowland riparian area supports a community of urban-tolerant mammals. The majority of mammals detected were tolerant of urban environments, with few urban avoider species (sensu McKinney 2002) detected. None of the species detected are currently considered endangered or species of special concern. Thus, while our results show that there is an opportunity for these public works projects to provide support to urban wildlife conservation, mitigation may be needed if conservation of more sensitive mammal species is desired.

The camera trap data demonstrated variation in the detection of each medium to large mammal species across the study area. Coyotes (*Canis latrans*), rabbits (*Sylvilagus* spp.), and Bobcats (*Lynx rufus fasciatus*) were detected on over half of the deployed cameras, while California Ground Squirrels (Richardson, 1829) were found on only five (Figure 3). Fox Squirrels (*Scuius niger* Linnaeus, 1758) were expected (Muchlinski and Garcia 2017), but not detected on any cameras. *Sylvilagus* spp. were grouped together in analyses to avoid inflating the number of positively identified species. Desert Cottontail Rabbits and Brush Rabbits (*Sylvilagus bachmani* (Waterhouse, 1839)) co-occur in this region, the latter of which is difficult to positively identify by photo. Future surveys may consider doing supplementary trapping efforts to confirm the presence of Brush Rabbits at Hansen Dam.

While our camera trap results demonstrate that Hansen Dam supports a community of urban-tolerant and exploiter mammal species, we found little evidence to suggest the area currently supports species that are highly sensitive to urbanization. The available habitat appears to be suitable for species such as American Badgers (*Taxidea taxus* Schreber, 1777), Gray Foxes (*Urocyon cinereoargenteus* Schreber, 1775), and Ringtails (*Bassariscus astutus* Lichtenstein, 1830), but we did not detect them. American Black Bear (*Ursus americanus* Pallas, 1780), Mule Deer (*Odocoileus hemionus* Rafinesque, 1817), and Mountain Lion (*Puma concolor* Linnaeus, 1771) were also not detected despite being present in surrounding areas (CDFW 2022). Human and dog presence has been shown to affect Mule Deer behavior and may explain their absence at Hansen Dam (Miller et al. 2001). Mountain Lions were not expected to be detected due to their sensitivity to and avoidance of humans (Smith et. al. 2017), but it is possible they could utilize Hansen Dam as a wildlife corridor due to its location at the juncture of Big Tujunga Wash and Little Tujunga Creek. Impacts from habitat fragmentation, including the patch size of our study area or isolation from larger habitat areas, may also be affecting likelihood of detection.

Lack of detection for the aforementioned species may also be explained by the sampling methods used. This includes height, angle, and direction of the camera, as well as distribution of cameras across the landscape. For this study, cameras were placed randomly across the landscape at a set minimum distance from one another. While this can provide unbiased data for species richness, composition, and relative abundance, methods such as grid sampling along trails have been shown to increase probability for detecting large carnivores and, more specifically, felines (Tanwar et al. 2021). This type of biased data could provide further insight for more sensitive species present at the site, such as Bobcats. A future large-scale survey should consider looking at occupancy and relative abundance to better assess changes to the populations over time. It is also recommended to investigate how the presence of different predator and prey species and activity patterns impacts the detection probability in this region.

The extensive presence of humans also created a challenge for our camera study, with four out of 32 camera deployments being affected by camera theft or loss. Site selection was complicated by the need to deploy in areas accessible to the research team but hidden enough from people recreating or occupying the area. Research taking place in areas with high human activity should plan for data loss by deploying cameras at more sites than needed for sufficient sampling.

Small mammal trapping covered a variety of habitats across the U.S.A.C.E. property. All seven species captured in the Sherman traps were common and anticipated (Table 1, Figure 6A–G). A carcass of what could have been a Western Harvest Mouse (*Reithrodontomys megalotis* (Baird, 1857)) was documented during a separate herpetofauna survey in the sampling area but was not collected or sampled to confirm species identification. No harvest mice were captured during the trapping session to confirm their presence despite traps being set sensitive enough for smaller-sized rodents. Future surveys may also consider examining and documenting bacula of male specimens, which could provide further evidence to use in off-site confirmation of species identification (Matocq 2002; Matocq et al. 2007).

The absence of *Rattus* or *Mus* in the traps indicates the native rodent community was intact, if slightly depleted. Shrews, moles, and pocket gophers may also be on the property but are not typically captured in Sherman traps due to their fossorial nature. This was further evidenced by an incidental finding of a dead Broad-footed Mole (*Scapanus latimanus* (Bachman, 1842)) adjacent to Big Tujunga Creek. Additionally, evidence of pocket gophers was observed by researchers while in the field, but none were captured. Therefore, we know pocket gophers and moles occur within the U.S.A.C.E. Hansen Dam property. A different trapping method might be considered to better document the presence of these species. The lack of detections via trap for these species might also be due to the sampling method used in this study. Future surveys might consider more explicit transect or grid sampling to assess relative abundance for the small mammal population (Pearson and Ruggiero 2003). Future surveys should also consider conducting trapping at additional times of the year to account for seasonal variation in species composition.

The plateau of the species accumulation curve from the camera trap survey suggests sufficient sampling of the region (Figure 4A). Additionally, we detected a majority of the expected medium to large mammal species for the area (Figure 5A–F). While camera traps have a higher detection rate compared to other survey methods, such as tracks (Silveira et al. 2003; Fragoso et al. 2016), some species can be difficult to detect and accurately identify with cameras, particularly smaller-bodied mammals. We combined photos of species that were not reliably distinguishable by visual inspection into a single taxonomic group for our species accumulation curve. As a result, our camera trap survey likely underestimates the true number of mammal species present. The small mammal trap data showed that by the 55th capture (of 143), no additional species were captured. However, the accumulation curve for the small mammal data suggests additional sampling may be warranted (Figure 4B). This result is in agreement with the observations of *Reithrodontomys megalotis* and *Scapanus latimanus,* which were observed independently from the small mammal survey efforts. By conducting both camera trap and small mammal trapping surveys, the assemblage of mammals at Hansen Dam was more comprehensively surveyed than if either method had been used alone.

Hansen Dam has high levels of human activity including horseback riding, hiking, and biking. Further, human pressure has recently intensified due to people taking up residence in the woody wetlands, along the wash, and across the basin. Despite notable human presence throughout the entirety of Hansen Dam, wildlife was detected across the study site. These results support previous findings that more tolerant species can coexist in areas highly impacted by human activity. Urban Coyotes have been shown to exploit urban landscapes and generally avoid human activity (Gehrt et al. 2009) by using suitable habitat areas in proportion to availability (Way et al. 2004). Raccoons (McKinney 2002; Bozek et al. 2007) and skunks (Bateman and Fleming, 2012) are well known to benefit from anthropogenic resources created and left by humans. The presence of Bobcats, which are more sensitive to urbanization and habitat fragmentation (Crooks 2002; Tigas et al. 2002; Poessel et al. 2014), demonstrates the potential for this area to provide natural habitat and thus make conservation possible for more urban-avoidant species in the Los Angeles metropolitan area.

Hansen Dam has some of the last remaining low-lying riparian habitat in the Los Angeles metropolitan area, making it an important target for conservation efforts. While the region has been designated as critical habitat for some species of special concern, such as the Southwestern Willow Flycatcher (*Empidonax trailii extimus* (Phillips, 1948)) (USFWS 2022), these habitats may not be meeting their full potential to act as urban reservoirs of biodiversity. As such, management and conservation in the region could consider ways to reduce the impact of human activity in some areas of the U.S.A.C.E. property. Restoration of habitat in conjunction with mitigation to reduce human impact in parts of the Hansen Dam Basin and Recreational Area could help to make the region more hospitable to additional sensitive species, especially within habitats such as alluvial fan scrub and riparian areas.

Additionally, Hansen Dam is located at a critical juncture between the Verdugo Mountains and the San Gabriel Mountains and therefore provides a great opportunity for maintaining and restoring connectivity across the region. Corridors passing beneath the nearby 210 freeway are large enough for animals of all sizes, connecting Hansen Dam to the San Gabriel Mountains. Thus, management of the area could consider how to restore and maintain habitat for dispersing wildlife.

In summary, we detected 15 species of terrestrial mammals as part of a mammal study in the Hansen Dam flood control basin (Table 1). Our results demonstrate the potential of this habitat to support urban wildlife and provide insight into what changes may need to occur to support more urban-avoidant species. Regardless, water management areas in southern California, such as Hansen Dam, may play a critical role in sustaining habitat for wildlife in urban areas.

ACKNOWLEDGEMENTS

We would like to thank the Occidental College and Arroyos & Foothills Conservancy camera team, including: Max Yasuda, Machiko Yasuda, Julissa Larios, Isabella Bonomi, Maya Gonzalez, Shuli Wong, Barbara Goto, Alison Cordano, Katie Lam, and Rachel-Ann Arias. Thank you to Michelle Allen, Cristian Caviel, LTC Malia Pearson, John Rishi, of the U.S.A.C.E. and Carlton Rochester, Monique Wong, Lindsay Marston, Andrew Louros, and Tritia Matsuda of the U.S. Geological Survey. We also thank all the Hansen Dam Recreational Area park managers, and dam operations officers including Bobby Clifton, Robert Moreno, Steve Sauceda, Frank Barone, and Jesse Mauck, for their cooperative efforts to accommodate our field survey schedule day and night. We thank CDFW and the Bureau of Land Management (BLM). Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government. We thank the reviewers and editors for their time and effort reviewing the manuscript and providing comments and suggestions which helped to improve its quality.

ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

This research was authorized by California Department of Fish and Wildlife under Scientific Collecting Permit (Entity): SCP838 and the U.S. Fish and Wildlife Service under 10(a)1(A) Recovery Permit TE-045994-19 (authorized individuals: Adam Backlin, Elizabeth Gallegos, Cynthia Hitchcock, Katherine Baumberger, Monique Wong, Jared Heath, Tiffany May, Daniel Cooper, and Robert Fisher).

Funding

Funding for this project was provided by Occidental College and the Disney Conservation Fund. Additional funding for the small mammal trapping and collection of our initial camera data was provided by the U.S. Army Corps of Engineers through cooperative interagency agreements W81EYN11404066 and W81EYN92413397.

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Stella Oganesyan: Data curation; Investigation
Robert N. Fisher: Conceptualization; Writing - review and editing; Funding acquisition; Validation
Cynthia J. Hitchcock - Writing - review and editing; Resources
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Data availability

Partial data are available in the main text, appendix, and supplemental files. The complete data are either not available or may have limited availability owing to restrictions on specific locality information for sensitive native species. Contact authors at Occidental College or USGS for further information.

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APPENDIX

Table A1. Camera site locations for mammals at Hansen Dam, Los Angeles, CA, USA, and deployment periods. P at the beginning of the site ID indicates preliminary camera sampling sites.

Site ID	Latitude	Longitude	Set date	Pull date
P01	34.2667	−118.3759	03/24/2021	07/29/2021
P02	34.2674	−118.3826	03/24/2021	07/29/2021
P03	34.2657	−118.3694	03/24/2021	07/29/2021
P04	34.2713	−118.3652	03/24/2021	07/29/2021
P05	34.2700	−118.3593	03/24/2021	07/29/2021
P06	34.2742	−118.3731	03/24/2021	07/29/2021
P07	34.2617	−118.3848	03/24/2021	07/29/2021
P08	34.2710	−118.3744	03/24/2021	07/29/2021
P09	34.2675	−118.3830	03/24/2021	07/29/2021
P10	34.2687	−118.3644	03/24/2021	07/29/2021
P11	34.2699	−118.3847	03/24/2021	07/29/2021
1	34.2686	−118.3679	11/16/2021	12/18/2021
2	34.2703	−118.3731	11/16/2021	12/18/2021
3	34.2723	−118.3633	11/16/2021	12/18/2021
4	34.2673	−118.3698	11/20/2021	12/18/2021
5	34.2662	−118.3722	11/20/2021	12/18/2021
7	34.2651	−118.3927	02/15/2022	03/15/2022
8	34.2657	−118.3900	02/15/2022	03/15/2022
9	34.2666	−118.3850	02/15/2022	03/15/2022
10	34.2629	−118.3830	02/15/2022	03/15/2022
13	34.2642	−118.3759	02/11/2022	03/15/2022
16	34.2668	−118.3900	02/15/2022	03/15/2022
17	34.2688	−118.3867	02/15/2022	02/25/2022
19	34.2672	−118.3784	02/11/2022	03/11/2022
20	34.2681	−118.3777	02/11/2022	03/11/2022

Site ID	Latitude	Longitude	Set date	Pull date
21	34.2672	−118.3752	02/11/2022	03/11/2022
22	34.2607	−118.3787	02/15/2022	02/25/2022
23	34.2621	−118.3834	02/15/2022	03/15/2022
24	34.2679	−118.3674	02/11/2022	03/11/2022
25	34.2679	−118.3631	02/11/2022	03/11/2022
26	34.2673	−118.3592	02/11/2022	03/11/2022
29	34.2692	−118.3800	02/15/2022	03/15/2022
30	34.2699	−118.3767	02/11/2022	03/11/2022
31	34.2681	−118.3754	02/11/2022	03/11/2022
34	34.2711	−118.3630	02/11/2022	03/11/2022
35	34.2699	−118.3608	02/11/2022	03/11/2022

Table A2. Small mammal trap sites at Hansen Dam, Los Angeles County, CA, USA.

Site	Latitude	Longitude
1.1	34.2614	−118.3710
1.2	34.2652	−118.3744
1.3	34.2652	−118.3731
1.4	34.2635	−118.3737
1.5	34.2657	−118.3750
2.1	34.2700	−118.3781
2.2	34.2695	−118.3785
2.3	34.2703	−118.3772
2.4	34.2696	−118.3769
2.5	34.2687	−118.3776
3.1	34.2701	−118.3639
3.2	34.2704	−118.3648
3.3	34.2709	−118.3649
3.5	34.2708	−118.3632
4.1	34.2699	−118.3602
4.2	34.2707	−118.3605
4.3	34.2703	−118.3598
4.4	34.2701	−118.3589
4.5	34.2695	−118.3588
5.3	34.2625	−118.3886
5.4	34.2658	−118.3858

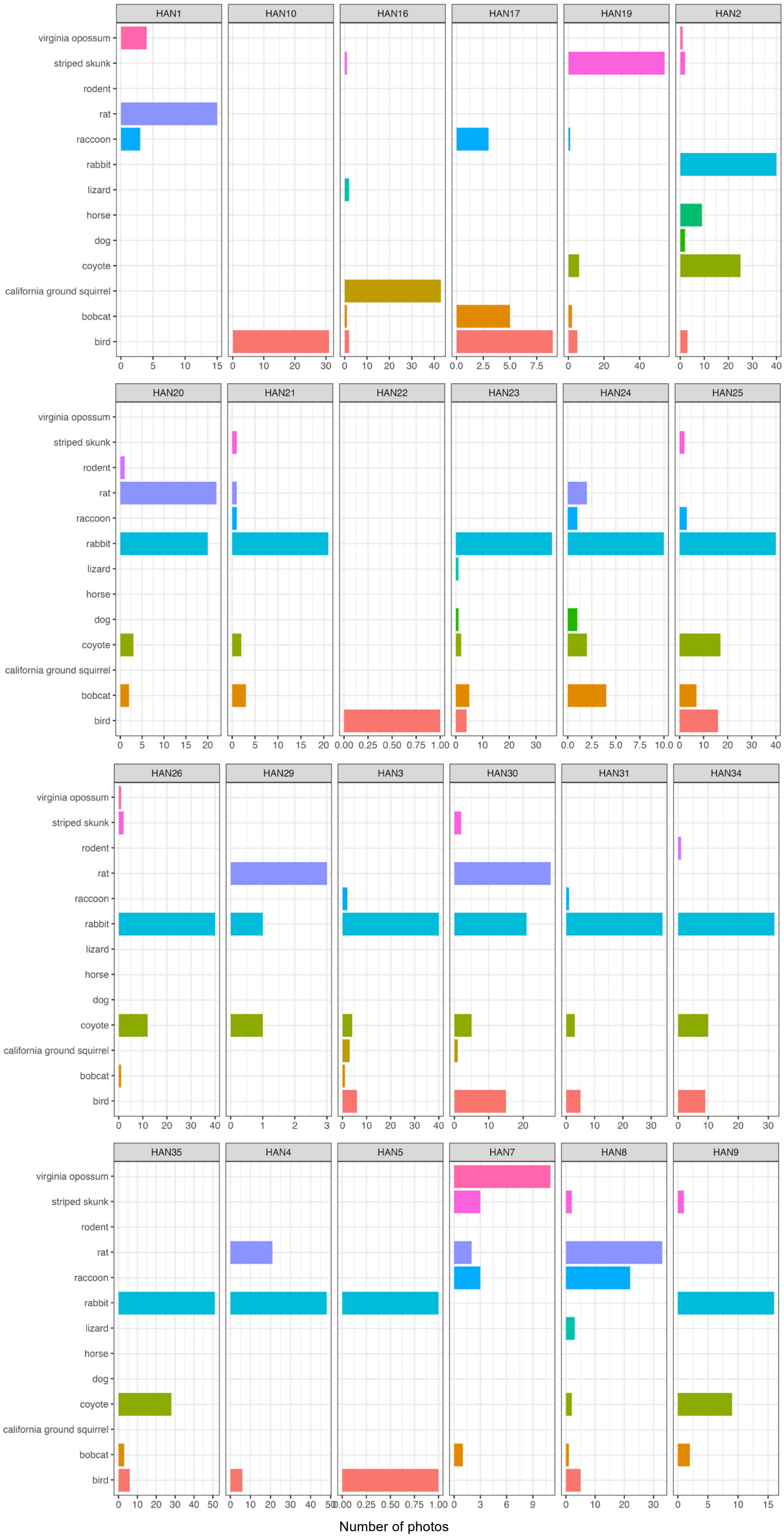

Figure A1. Visualization of the number of detections of each species at each camera trap.

Figure A1. Continued.