

Cataloging UCLA's Urban Mammal Biodiversity

Sustainability Action Research 2026



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ABSTRACT

Urban development is widely recognized as a major driver of biodiversity loss, altering both habitat availability and species distributions across landscapes. Although biodiversity research at UCLA has improved in recent years, mammals remain comparatively understudied at the campus scale. Here, we evaluate urban mammal biodiversity at UCLA, establishing a baseline inventory of mammal species and distribution across six sites on campus. Our objectives are to assess which species are present, determine how their spatial distributions vary, and understand which habitat associations can be deduced by such distributions. We additionally aim to offer conservation and management solutions for native mammal biodiversity informed by our findings.

Our assessment of mammal diversity was conducted primarily with camera-trapping and bioacoustic monitoring, supplemented by community science records and expert interviews. A total of 22 mammal species were recorded on campus, 17 of which were observed directly with our field methodology. The sampling site with the most recorded mammal diversity was Sage Hill, with a total of 13 mammal species observed over the course of our study, including 3 bat species recorded with ultrasonic detectors. Our data reflect a general pattern of native species presence in less disturbed habitats and higher numbers of urban-tolerant species in developed areas. The findings presented here offer a deeper understanding of species presence and habitat usage at UCLA, and will help inform conservation and management strategies that support the campus's mammal biodiversity moving forward.

INTRODUCTION

Mammals are a fundamental component of terrestrial ecosystems, playing key roles in ecological processes and influencing community dynamics across a variety of habitats. Previous studies on biodiversity in the greater Los Angeles area show that human disturbances can alter

the presence of mammals, and that mammals persisting in urbanized habitats tend to be those classified as urban-tolerant species (Schwemm, 1993; Curti et al., 2024; Privett-Mendoza et al., 2025). Assessing mammal biodiversity at the campus scale is essential for informing management strategies that support the persistence of native species. It also provides a foundation for communicating the impacts of urbanization and the importance of ecosystem conservation and restoration for small mammal communities. A 1997 biological assessment of Stone Canyon Creek and Sage Hill at UCLA found that when compared to records of mammals preceding the university's construction, both mammal richness and density had declined (UCLA Department of Geography, 1997). Additionally, a past 2025 SAR project, *Conserving Big Eared Woodrats*, established that native species such as the Big Eared Woodrat (*Neotoma macrotis*) have a habitat preference for native trees, which adds to our understanding of the relationship between urbanization and campus mammal diversity.

The UCLA Urban Mammal Biodiversity Sustainability Action Research (SAR) team for the 2025-2026 academic year assessed mammal presence on UCLA's main campus over the course of the Winter and Spring quarters. Employing both quantitative and qualitative methodologies, our team presents a comprehensive report of the campus's mammal biodiversity, detailing both findings and implications for the management of our urban mammal populations. With the use of direct field observations, community science records, and expert interviews, our study answered the following questions: Which small mammals exist on campus? How does their distribution vary across UCLA's landscape, and which habitat characteristics are different species associated with? Which conservation management solutions can be prioritized to support the native mammals present?

METHODS

Sampling Locations

For the collection of quantitative data, our team chose to sample six different sites across UCLA's campus. These sampling sites included Sage Hill, Sunset Canyon Recreational Center, Stone Canyon Creek, the Murphy Sculpture Garden, the Mathias Botanical Garden, as well as a dumpster site (a location at Sproul Hall was used the first round of sampling, and a second location at Ackerman Union was used for the second and third rounds of sampling) (See Appendix [A]). These sampling sites were selected from locations expected to yield the highest probability of mammal occurrence based on natural habitat features.

Camera Traps

In the field, we utilized two primary field methods: camera traps and bioacoustics. Our first method of camera trapping was chosen for its non-invasive nature and ability to capture continuous quality imagery in both bright and low-light conditions. Additionally, studies have shown that camera traps are effective within a university campus setting, as they are more likely to capture small mammals in closed habitats, such as campus green spaces, and they do not disturb the movement of mammals within their respective habitats (Clucas & McCluskey, 2025; Wearn & Glover-Kapfer, 2019).

For our camera trapping, we used the Meidase SL22 Pro Trail Camera. Two cameras were deployed at consistent times within each of our six sampling locations, and three rounds of sampling were conducted with deployment sampling intervals to avoid bias in our findings. Cameras were baited with oats, peanut butter, and apples to increase the probability of capturing mammals, and were left in place for a period of one week to record and capture imagery. During our second round of sampling, we implemented box cameras along with the free-standing cameras to better capture some of the smaller rodent species on campus (See Appendix [B],

Figure [1] and Figure [2]). After the week-long period, camera data was collected from each of the twelve deployed cameras, and the following information was recorded within ArcGIS Field Maps: camera ID number, exact camera coordinates, date and length of deployment, primary vegetation and habitat type, and other anthropogenic features such as lighting or nearby road traffic.

Bioacoustics

Our second field method, bioacoustic monitoring, was also chosen for its non-invasive nature and ability to record ultrasonic bat calls in order to detect and distinguish between various species of bats that are present on campus (Linhart et al., 2022). Bioacoustic monitoring was performed using the Echo Meter Touch 2 monitor, and sampling was held within the same six locations where camera traps were deployed. Recordings were taken starting 30 minutes after sunset and lasted for a 1-hour time period. Various team members took turns collecting samples to avoid bias and ensure coverage of every site. After collection, the following information was recorded in ArcGIS Field Maps: bioacoustic recorder ID number, exact sampling coordinates, date and length of sampling, vegetation and tree cover type, and other anthropogenic features. The ultrasonic calls collected were then analyzed using SonoBat software, a reference library of North American bat calls, and a vetting table to gain a comprehensive understanding of the diversity and distribution of bat species on campus.

Species Identification & Incorporation of Community Science

The Addax Data Science platform was employed to filter through large files of photos from our camera-trapping collection. The identification feature uses AI to detect and flag images that include people and animals. After running the files through the AI, team members identified the species in photos that were flagged for having animals in them with high confidence (>0.5).

Our findings were also supplemented with citizen science through the use of the iNaturalist platform. iNaturalist features crowdsourced data of flora and fauna occurrences, as well as species identification suggestions for uploaded images. This platform provided us with mammal observations on campus not accounted for by our sampling efforts, which were appended to our species list. iNaturalist was also used to assist in the verification process of mammal images that were challenging to identify. To complement our field data with qualitative, place-based knowledge we distributed a voluntary survey to UCLA grounds and horticultural staff using Google Forms. The survey consisted of ten open ended questions addressing which species staff encounter most frequently, where wildlife activity is concentrated, observed changes in animal presence over time, and staff preferences for a potential wildlife reporting system. Responses were collected anonymously and identified through recurring themes across the small pool of respondents.

EQUITY, DIVERSITY, AND INCLUSION

Equity, Diversity, and Inclusion (EDI) principles are incorporated throughout this project in several ways. First, the use of community science platforms such as iNaturalist allowed members of the public to contribute biodiversity observations, making ecological research more accessible and enabling broader participation in scientific data collection. Second, our study relies on non-invasive survey methods, which minimized disturbance to wildlife while still providing valuable ecological information. Third, we sought to incorporate the knowledge of UCLA's groundskeeping staff, whose daily work places them in direct and sustained contact with campus wildlife. Grounds and horticultural workers are frontline observers of human-wildlife interactions, yet their knowledge is often excluded from formal ecological assessments. By surveying these staff members through the use of Google Forms, we aimed to value place-based,

community knowledge alongside instrument-based data to ensure that the people most affected by campus mammal management had a voice in shaping our recommendations. Finally, by examining the historical and contemporary mammal distributions across Los Angeles, this project explores how urbanization and land-use change have shaped wildlife communities over time. Understanding these historical patterns can help inform more equitable and sustainable approaches to urban conservation that benefit both biodiversity and the human communities that share these environments.

CHALLENGES

Equipment

Throughout the duration of our research, we faced and overcame several different logistical and methodological challenges. Early on in our project, the primary challenge we dealt with was gathering necessary equipment, then learning how to effectively use each different tool for our research purposes. Our team initially only had access to a limited number of cameras for our camera trapping, so this limited the number of sites and sampling trials we believed we would be able to complete. Through persistence with our stakeholder and other campus faculty, we were able to acquire more than enough cameras for sampling of six different campus locations. We also were able to acquire the funding necessary to power several different cameras over a ten-week period.

Once we had the cameras in our possession, the team all had to spend significant time learning how to configure the camera settings to be the same across all sites. Some settings from the Meidase SL122 Pro Trail Camera include photo mode, capture intervals, and motion sensitivity. During our sampling, some cameras failed to capture imagery, and this may have been a result of incorrect setting configurations that were not corrected prior to camera posting.

Beyond configuring the cameras, our team had to learn how to properly set up the cameras in the field and how to best position the cameras to avoid landscape features that may inhibit quality image capture. In our test run of sampling, some of our cameras were not secured well enough in the field, and this resulted in cameras falling and not capturing any imagery for the time they were posted. Continued practice with the cameras allowed us to refine our sampling methodology and has led to the collection of hundreds of quality photos of a variety of different mammals on campus.

Later on in our project, we gained access to two Echo Meter Touch 2 bat detectors, which also had a learning curve. The team had to gain an understanding of how the detectors worked and how to interpret the spectrograms produced from the various different bat calls we collected. When using this equipment, many false positive identifications were made by the software. This was challenging to sort through, as none of our team has had past experience with bat sampling and was confident enough to distinguish between different calls and false positive observations. To overcome this challenge, we got in touch with bat expert Dr. Joseph Curti, and he was able to help us accurately identify between true bat calls and background noise picked up by the detectors.

Data Analysis

One of the biggest challenges we faced during this project was processing and analyzing the large amount of camera trap data we collected throughout the quarter. Camera traps generated thousands of photographs across multiple sampling locations and deployment periods. Some individual camera deployments produced especially large amounts of data. For example, during the second trial, one camera placed in the Murphy Sculpture Garden produced 1,992

photographs. This created a large amount of data that needed to be reviewed and organized before any analysis could begin.

A major reason for the high number of photographs was the camera settings used during sampling. The box cameras were programmed to capture two photographs every ten seconds whenever motion was detected. While this setting increased the likelihood of capturing wildlife activity, it also resulted in many photographs that did not contain identifiable animals. Cameras were frequently triggered by wind moving vegetation, changes in lighting conditions, shadows, insects passing close to the lens, or animals that were too far away to be clearly visible. In some cases, the camera was activated repeatedly throughout the night without capturing a mammal that could be identified. Some deployments contained many photographs of the same individual animal moving through the frame over a short period of time.

Another challenge involved deciding which photographs were relevant to the goals of the project. Although our focus was on mammals, the camera repeatedly captured humans, birds, insects, and domestic dogs. These observations were recorded when necessary, but they were not the primary focus of the study. To improve efficiency, we later incorporated AddaxAI software into our workflow. The software helped identify photographs that potentially contained animals and reduced the amount of manual review required. However, the software was not perfect and still produced many false positives. Some photographs flagged by the software contained only vegetation, shadows, or other non-target objects. Every detection still needed to be reviewed by a team member to confirm whether an animal was actually present.

Image quality also affected data analysis. Many photographs were taken at night using infrared settings. Some images were dark or partially obstructed by vegetation. In certain cases,

an animal was only visible for a brief period of time before leaving the frame. This made analysis more difficult and at times prevented species-level identification.

Species Identification

Species identification was another major challenge throughout the project. Although camera traps and bioacoustic monitoring allowed us to document wildlife without disturbing animals, these methods sometimes limited our ability to identify species without complete certainty. Many observations were straightforward, particularly for larger mammals such as coyotes, raccoons, opossums, and squirrels. However, identification became much more difficult when animals were small, moving quickly, or only partially visible in the photograph. Many camera trap images captured animals at a distance from the camera. In some photographs, only the eyes, tail, ears, or a small portion of their body could be seen. Other animals moved before the camera was fully triggered, resulting in images that showed only part of the animal as it exited the frame.

One of the most significant challenges involved identifying rodent species. Several rodent species recorded on campus share similar body shapes and coloration. Since the project relied on non-invasive methods, we were unable to physically examine individual animals or collect measurements that could assist with identification. We were also not able to collect droppings or other field evidence because we were not able to procure the necessary equipment during the study period. Distinguishing between rats and mice was often difficult, particularly when animals were photographed from a distance. Adult black rats (*Rattus rattus*) and big-eared woodrats (*Neotoma Macrotis*) were generally easier to identify because of their large body size and longer tails. However, juvenile rats frequently appeared similar in size to multiple mouse species. This

created uncertainty in some observations because size is one of the most useful characteristics for distinguishing between these groups.

Deer mice (*Genus Peromyscus*), western harvest mice (*Reithrodontomys megalotis*), house mice (*Mus musculus*), and pocket mice (Family *Heteromyidae*) can have overlapping characteristics in camera trap photographs. Features such as ear size, body proportions, tail length, and coloration were often used to make identifications, but these characteristics were not always visible. Some animals could only be identified to a broader taxonomic group rather than a specific species because there was not enough evidence available in the image. To improve identification accuracy across all taxa, we compared observations with species descriptions, historical records, expert recommendations, iNaturalist observations, and the California Mammal Checklist.

Bioacoustic Bat Data

At the time of our sampling, we were informed by Dr. Joseph Curti that local bat populations were currently in their maternity season. This meant that bat activity would likely be low, as female bats would be congregating and remaining in maternity roosts for several weeks during our sampling trials. With this information in mind, we knew that we would likely not capture as many different bat species as hoped, since activity levels would be far below the normal range. Despite this, we decided to sample regardless of activity levels at all of our six sites to increase the probability of capturing any bat species that might be present on campus.

We were able to capture a few different species that are local to southern California, but with this came the challenge of distinguishing between their different calls. Each bat call has its unique frequency, shape, and pattern, but our team was unable to determine which species each

call belonged to. To accurately identify different species, we utilized the frequency vetting table and SonoBat software to analyze the calls we gathered and distinguish between them.

RESULTS

Expert Interviews

Our team conducted a series of expert interviews with various campus staff members in order to further inform our research methodology and gain insights on historical small mammal presence in the general Los Angeles area.

Our initial interview was conducted with Travis Longcore, a professor at UCLA who specializes in environmental health, urban conservation, and biodiversity. In the past he has contributed to research on UCLA's natural history (Longcore & Rich, 1998) and biological assessments on the Coastal Sage Scrub habitat found on UCLA's campus (UCLA Department of Geography, 1997), and he was able to provide insight on best practices for understanding, analyzing, and writing about biological and ecological data that is collected over time, and incorporating that into current research. Longcore suggested that for the extent to which we will incorporate historical records, they are best used for establishing presence. The historical record of vegetation and habitat types that once existed in an area provides an indication of what species might be found there, in the past and now, as there is a reciprocal relationship between the habitat type and inhabiting species. By establishing a baseline understanding of historical species presence, we can see the discrepancies from the findings of our current research and highlight which species are absent.

Our second interview was conducted with Bonny Bentzin, Deputy Chief Sustainability Officer at UCLA and a stakeholder for the previous SAR team's 2025 report on Integrated Pest Management. Bentzin was able to provide insight into the more anthropogenically influenced

mammal behavior and distribution, particularly with respect to the populations of rodents and pests on campus. Human behaviors dramatically impact the distribution of these rodents, both through presence and absence: waste that is not properly managed can quickly become the site of an infestation, but Bentzin also made note of the impact of COVID and a vacated campus on small mammals. She provided personal observations that some rodents seem to now be more present during the daytime (potentially becoming more active in response to the absence of food), while big-eared woodrat (*Neotoma Macrotis*) nests found on campus by Drake Stadium may indicate that woodrats expanded from Sage Hill during the lockdown.

Our third interview was conducted with Anthony Friscia, a mammal paleontologist and associate professor at UCLA, who has conducted previous research on small mammal presence within UCLA and the general Los Angeles area (Friscia et al., 2023). Friscia provided important ecological context for understanding mammal distributions on UCLA's campus, describing the Santa Monica Mountains as a source habitat and urban green spaces as ecological islands connected by varying levels of habitat connectivity. Drawing from his previous research on small mammal biodiversity, he noted that Sage Hill was the only site where small mammals were detected, likely due to the presence of native vegetation, and emphasized that roads and urban development act as major barriers to movement throughout campus.

Our fourth interview was with Joey Curti, a postdoctoral researcher studying bat ecology across urban areas. Curti provided guidance on survey methods for assessing bat activity on UCLA's campus, recommending acoustic monitoring as the most effective approach for documenting presence and activity. He further trained our team in the use of acoustic analysis software, and outlined the best practices for processing and interpreting echolocation readings. He noted the importance of conservative species identification, noting that many bat species

produce similar calls. Overall, his guidance provided knowledge that informed our bat survey design and data analysis procedures.

Groundskeepers Survey

In addition to expert interviews, we surveyed UCLA groundskeepers to incorporate the perspectives of those who interact with campus wildlife daily. We received three responses, all from staff working at the Mathias Botanical Garden; while this limits the geographic scope of the survey, it provided detailed, location specific insight into one of our sampling sites.

Several themes emerged from the responses. All three respondents identified eastern fox squirrels (*Sciurus niger*) as the species they encountered most frequently, which aligns with the distribution of the species documented in our camera trap data. Respondents also independently described an apparent decline in rodent and squirrel activity associated with the presence of avian predators. This observation aligns with our own detection of avian activity and suggests that natural predation may contribute to rodent control within the garden. All three respondents also indicated that they had received no formal training for responding to wildlife encounters on campus. When asked about potential wildlife reporting systems, respondents favored a low effort digital format such as a mobile application feature or text-based reporting line.

The most actionable theme concerned waste management. As respondents reported that the garden's previous trash bins that were made "squirrel-proof" were difficult to open one-handed, which led visitors to leave their waste on top of the bins and inadvertently increased the local rat and squirrel population. Staff noted that subsequently removing the bins entirely and having visitors take their own trash, reduced the rodent issues. This finding illustrates how

design solutions made without input from the staff who maintain these areas can produce unintended ecological consequences and directly informs the management recommendations.

Mammal Species

Larger mammal species detected directly through field observations over the three sampling intervals included the virginia opossum (*Didelphis virginiana*), racoon (*Procyon lotor*), coyote (*Canis latrans*), bobcat (*Lynx Rufus*), brush rabbit (*Sylvilagus bachmani*), california ground squirrel (*Otospermophilus beecheyi*), and eastern fox squirrel (*Sciurus niger*).

Smaller mammal species identified included the pocket mouse (Family *Heteromyidae*), California vole (*Microtus californicus*), big-eared woodrat (*Neotoma Macrotis*), deer mouse (Genus *Peromyscus*), western harvest mouse (*Reithrodontomys megalotis*), house mouse (*Mus musculus*), and black rat (*Rattus rattus*). It is important to note that while most species identifications for small mammals were verified through expert consultation, not all camera trap images were able to capture individuals at angles that allowed for definitive species level identification. Because of this, some mammal observations were conservatively classified more broadly at the genus or family level.

Bat Species

During the month of May, our team collected ultrasonic echolocation calls from bats in the same six study sites using the Echo Meter Touch 2. In total, we were able to collect five ultrasonic recordings of confirmed bat species, all located at Sage Hill. Despite prior expectation of species presence at other locations, we did not observe bat presence at the Mathias Botanical Garden, Murphy Sculpture Garden, or Stone Canyon Creek, although each possess open water and vegetation. In total, we identified at least three unique bat species as well as one call that could be a fourth species; however, we have insufficient acoustic data to confidently classify the

final call. Two calls were confirmed as a Canyon Bat (*Parastrellus hesperus*); one was a Big Brown Bat (*Eptesicus fuscus*); and one was identified as a Yuma Myotis (*Myotis yumanensis*). The final call was categorized as either a Big Brown Bat or Silver-haired Bat (*Eptesicus fuscus* / *Lasionycteris noctivagans*). It is possible that the only duplicate species call (Canyon Bat) we recorded indicates that this particular species is more common at Sage Hill; or the calls could have originated from the same individual.

Species List

As a final deliverable, our team produced a full species list documenting every mammal species we recorded during our study. The list includes scientific and common names of six distinct orders of mammals, with the order Rodentia being the most highly documented. In total, we directly observed 17 unique species through camera traps or bioacoustic monitoring, and secondarily recorded 16 species through iNaturalist research grade observations. In summation, we found 22 distinct mammal species across the six different sampling sites on UCLA's campus throughout our study (see Appendix [C]).

Species Richness and Distribution Across Sites

Species richness was calculated as the number of unique mammal species observed at each site (see Appendix [D]). The Mathias Botanical Garden, Sunset Recreational Center, and combined dumpster sites each had a total species richness of 3 mammals. Murphy Sculpture Garden had a total species richness of 4 mammals, and Stone Canyon Creek had a total species richness of 5 mammals. Sage Hill exhibited the highest mammal species richness, with 13 total species recorded, and also contained the greatest overall diversity of native vegetation and habitat, suggesting a potential relationship between habitat complexity and mammal diversity.

The distribution of mammals across our sites of interest reveals the extent to which certain species have become urban adapters, exploiters, or avoiders. It's evident from our GIS efforts that certain species are largely distributed and occur across multiple sites on campus (see Appendix [E] and Appendix [F]). The species found to be the most widely distributed included the eastern fox squirrel (*Sciurus niger*), black rat (*Rattus rattus*), and coyote (*Canis latrans*). In contrast, many native species such as the California vole (*Microtus californicus*), western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Genus Peromyscus*), and California ground squirrel (*Otospermophilus beecheyi*), were localized to a single observation site, Sage Hill.

Annotated Species Checklist

In order to expand on these efforts, a written annotated species checklist was created to catalogue our observations and situate them within a historical context. This checklist included a discussion of where these species were observed on campus, with which method they have been observed (i.e. iNaturalist, field observations, previous record), and what vegetation they are commonly associated with. This checklist will serve as a useful reference for future sustainability efforts in promoting campus biodiversity.

DISCUSSION

Urban Tolerance

The distribution of species observed in this study indicates variation in how wildlife utilizes urban areas across campus. The species found to be most widely distributed across campus included the eastern fox squirrel (*Sciurus niger*), black rat (*Rattus rattus*), and coyote (*Canis latrans*). These three species were detected across a broad range of habitat types, including both developed zones as well as more natural green spaces, suggesting strong overall adaptability to urban conditions. The widespread presence of these species additionally

highlights their ability to persist in close association with human activity. Eastern fox squirrels (*Sciurus niger*) and black rats (*Rattus rattus*) likely benefit from abundant anthropogenic food sources and structural habitat provided by buildings and landscaping, while coyotes demonstrate behavioral flexibility allowing them to persist across widespread developed and naturalized areas. This high level of urban tolerance likely contributes to their broad and relatively uniform distribution across campus compared to more native or habitat-sensitive species observed in this study.

In contrast, native species showed more restricted and patchy distributions, often limited to areas with suitable habitat structure or lower levels of disturbance. Overall, the prevalence and widespread occurrences of these urban-adapted species suggest that urban environments tend to favor flexible, disturbance-tolerant species, leading to a community composition dominated by a small number of widely distributed species.

Habitats Supporting Native Species

Our findings suggest that the habitats supporting the greatest diversity of native mammals were Sage Hill and Sunset Canyon Recreation Center. Sage Hill had the highest species richness of any site sampled and supported many of the native mammals documented during this study. Several native species, including the California vole (*Microtus californicus*), western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Genus Peromyscus*), California ground squirrel (*Otospermophilus beecheyi*), coyote (*Canis latrans*), brush rabbit (*Sylvilagus bachmani*), desert cottontail (*Sylvilagus audubonii*), and big-eared woodrat (*Neotoma Macrotis*), were either directly observed or associated with these less developed areas. Native bat species, including the Canyon Bat (*Parastrellus hesperus*), Yuma Myotis (*Myotis yumanensis*), and Big Brown Bat

(*Eptesicus fuscus*), were also detected throughout this natural habitat. This suggests that despite being located within a highly urbanized campus, native mammals continue to rely on remnant habitat patches for shelter and reproduction.

One reason Sage Hill likely supported greater mammal diversity is the variety of habitat types present within a relatively small area. Unlike many developed locations on campus, Sage Hill contains native grasslands, coastal sage scrub, oak woodland habitat, and dense understory vegetation. This vegetation provides food resources, nesting materials, protective cover, and movement pathways for wildlife. Small mammals in particular depend on dense vegetation because it reduces their exposure to predators and human disturbance. Areas with more natural vegetation also tend to support a greater abundance of insects, seeds, and other food sources that many mammals rely on. The presence of big-eared woodrats (*Neotoma Macrotis*) further demonstrates the importance of these habitats. Woodrats were observed at both Sage Hill and Sunset Canyon Recreation Center, which are among the least developed locations included in the study. The sites contain dense vegetation and natural cover that provide suitable nesting habitat. During expert interviews, we learned that woodrats (*Neotoma Macrotis*) expanded beyond Sage Hill during the COVID-19 pandemic when human activity was greatly reduced. Observations during that period included locations near Drake Stadium, Sunset Canyon Recreation Center, and the Los Angeles Tennis Center. This suggests that woodrats (*Neotoma Macrotis*) may be capable of utilizing a wider portion of campus when disturbances are reduced, and movement opportunities increase.

The bat detections recorded during this project also demonstrate the value of natural habitat. While additional monitoring is needed to confirm species presence, bats were primarily detected near areas with vegetation and open foraging space. These habitats may provide insect

prey, roosting opportunities, and travel routes that are not available in highly developed parts of campus. The presence of both rodents and bats indicates that these habitat patches support multiple components of UCLA's mammal community rather than a single species group. In contrast, many of the highly developed locations on campus were dominated by species that are well adapted to urban environments. Black rats (*Rattus rattus*), eastern fox squirrels (*Sciurus niger*), and Virginia opossums (*Didelphis virginiana*) were more commonly observed near buildings and recreational facilities, which both experience higher levels of human activity. These species are often able to take advantage of anthropogenic food sources and modified landscapes. Native species were generally less common in these developed areas, suggesting that urbanization may limit habitat suitability for some wildlife. Sage Hill and Sunset Canyon Recreation Center appear to function as important refuges for native mammals.

Importance Of Green Space & Habitat Corridor Implications

Green spaces on campus play a key role in supporting local biodiversity, with natural areas such as Sage Hill and Stone Canyon Creek exhibiting the highest species richness values compared to other sampled locations. These habitats also supported species that were not detected elsewhere on campus, suggesting that less disturbed environments provide unique ecological resources that are not present elsewhere.

Stone Canyon Creek further highlights the importance of habitat connectivity, as it was found to function as a corridor between UCLA's campus and the Santa Monica Mountains. The repeated detection of a bobcat (*Lynx rufus*) at this site over multiple nights, as well as images of it captured with prey in its mouth, indicates regular use of this site. This suggests that the site facilitates wildlife movement between fragmented urban habitats and larger natural areas.

Together, these findings emphasize the importance of preserving natural green spaces and maintaining ecological connectivity to support wildlife biodiversity.

Smaller green spaces distributed throughout campus also contribute meaningfully to urban biodiversity by providing localized habitats for certain species. For example, green space within Sunset Canyon Recreational Center supported native Big-Eared Woodrats (*Neotoma macrotis*), which were only also observed at Sage Hill. The area adjacent to the Sculpture Garden was additionally the only location observed to support house mice (*Mus Musculus*). These observations indicate that even small and relatively isolated habitat patches can sustain wildlife populations and add overall ecological value to the campus landscape.

Future Research

While this project provides a baseline inventory of mammal biodiversity at UCLA, there are many opportunities for future research. One of the most important next steps is expanding monitoring efforts to additional locations across campus. Our results suggest that vegetation structure and habitat characteristics play an important role in determining which mammal species are present. Future studies could compare areas with different vegetation communities and varying levels of development to better understand which habitat features attract native mammals and support greater biodiversity. Several locations may be especially valuable for future monitoring. One location is the Chancellor's Residence, which is surrounded by vegetation that may provide suitable habitat for a variety of native mammals. Another area of interest is Parking Structure 8. An Urban Ecology research group conducting bat surveys on campus informed our team that several bat species had been detected near this location. Additional monitoring could determine whether bats are regularly using the area for nesting or roosting. If bats are consistently present, the site could become an important focus for future conservation efforts.

Future studies should also investigate additional dumpster locations across campus. Our observations suggest that some urban-adapted species may be associated with concentrated anthropogenic food sources, so expanding monitoring to other waste collection areas would help determine whether this pattern is consistent across campus.

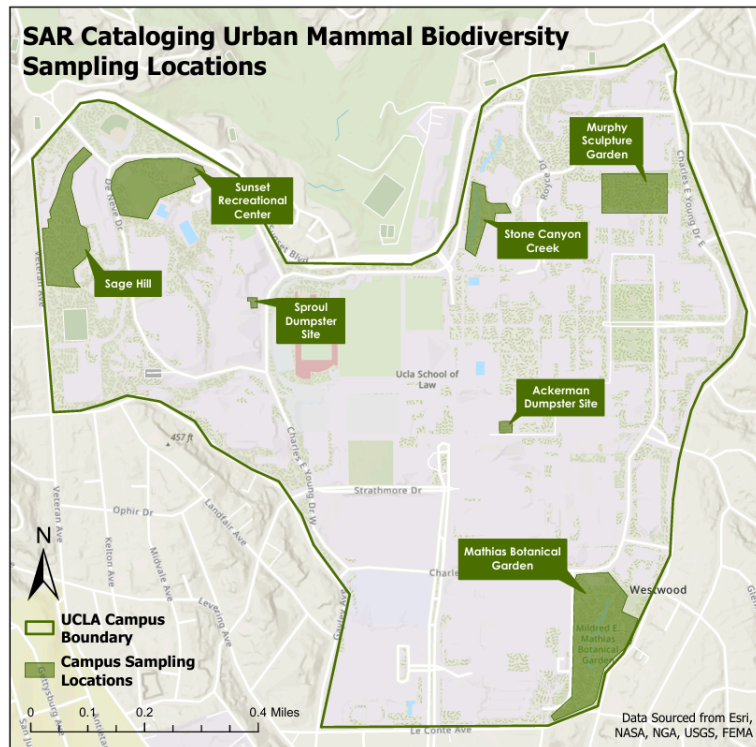
Another important area of future research involves examining seasonal changes in mammal activity. Our study was conducted over a limited period of time, and species behavior can vary considerably throughout the year. During portions of our sampling period, bats were in maternity season, which may have influenced their activity patterns and reduced detections. Monitoring across multiple seasons would provide a better understanding of breeding behavior, juvenile development, habitat use, and seasonal shifts in species presence. It may also reveal whether certain species use campus habitats only during specific times of the year. Future projects could also expand the timing of camera trap monitoring. Our non-box cameras were programmed to operate primarily between 5:00 PM and 7:00 AM because many mammals are nocturnal. However, extending monitoring into daylight hours may reveal additional species and behaviors that were not captured during this study. Daytime monitoring could be especially informative during academic breaks, including winter break and summer break, when campus activity is substantially reduced. Our groundskeeper survey also points toward management directions that complement future monitoring. By establishing clear guidance alongside a low effort reporting tool, such as a mobile application or text-based line, that could expand the campus's biodiversity monitoring capacity at minimal cost while giving frontline staff a voice in conservation decisions. As grounds staff interact with wildlife daily they are an underused source of ecological knowledge that can be utilized beyond campus grounds.

Future research would also benefit from improved equipment and additional expert consultation. More advanced bat detectors could produce clearer recordings and improve the accuracy of species identifications. Higher quality camera systems may also improve image resolution and make it easier to identify small mammals. Additional consultation with mammalogists, bat researchers, and wildlife specialists could help resolve uncertain observations and improve confidence in species identifications. Guidance from experts could also help determine which field guides, identification resources, and monitoring methods are most effective for studying urban mammals.

Finally, long-term monitoring would provide valuable information about how UCLA's mammal community changes over time. Repeating surveys over multiple years would allow researchers to identify trends in species presence and habitat use. Long-term data could also help evaluate the effectiveness of future conservation efforts and habitat restoration projects. Establishing a continued monitoring program would build upon the baseline inventory created through this project and contribute to a better understanding of urban wildlife ecology on campus. Understanding how mammals interact with both natural and human-modified environments will be important for balancing conservation goals with the continued use and development of campus spaces.

APPENDIX

Appendix A - Sampling Locations



Appendix B - Camera Equipment



Fig. 1. Free Standing Camera

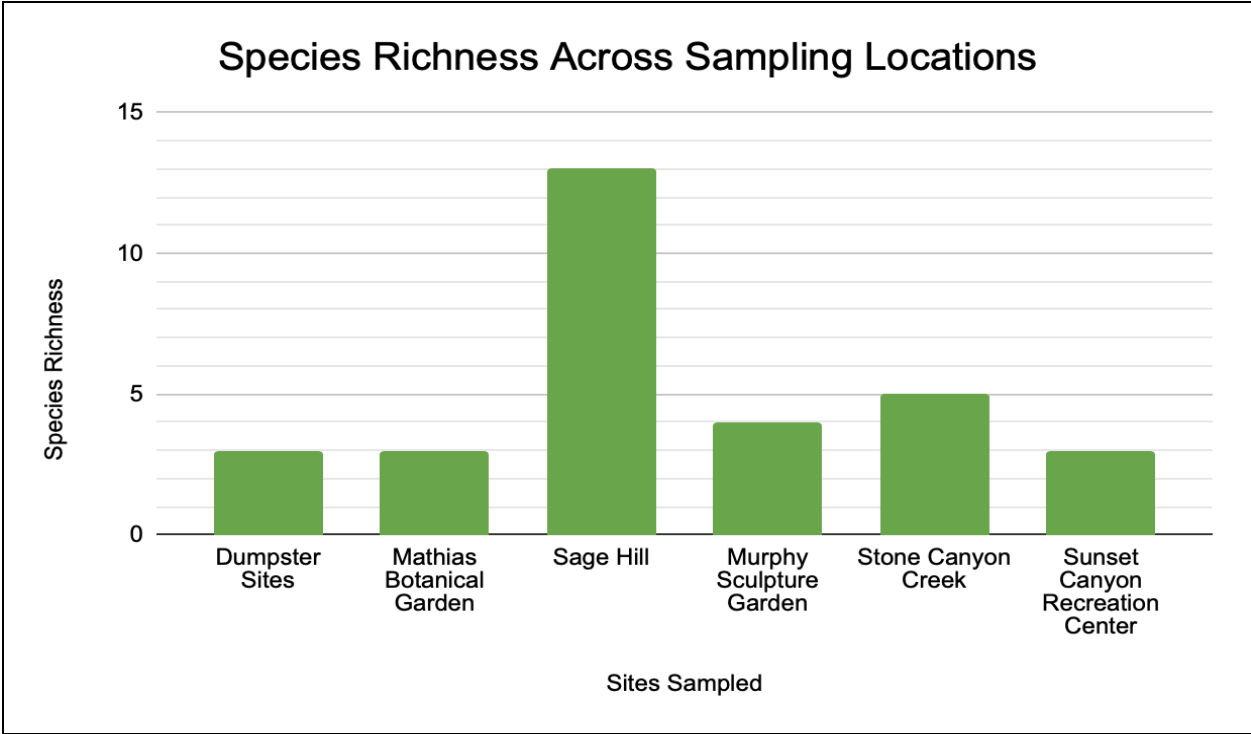


Fig. 2. Box Camera

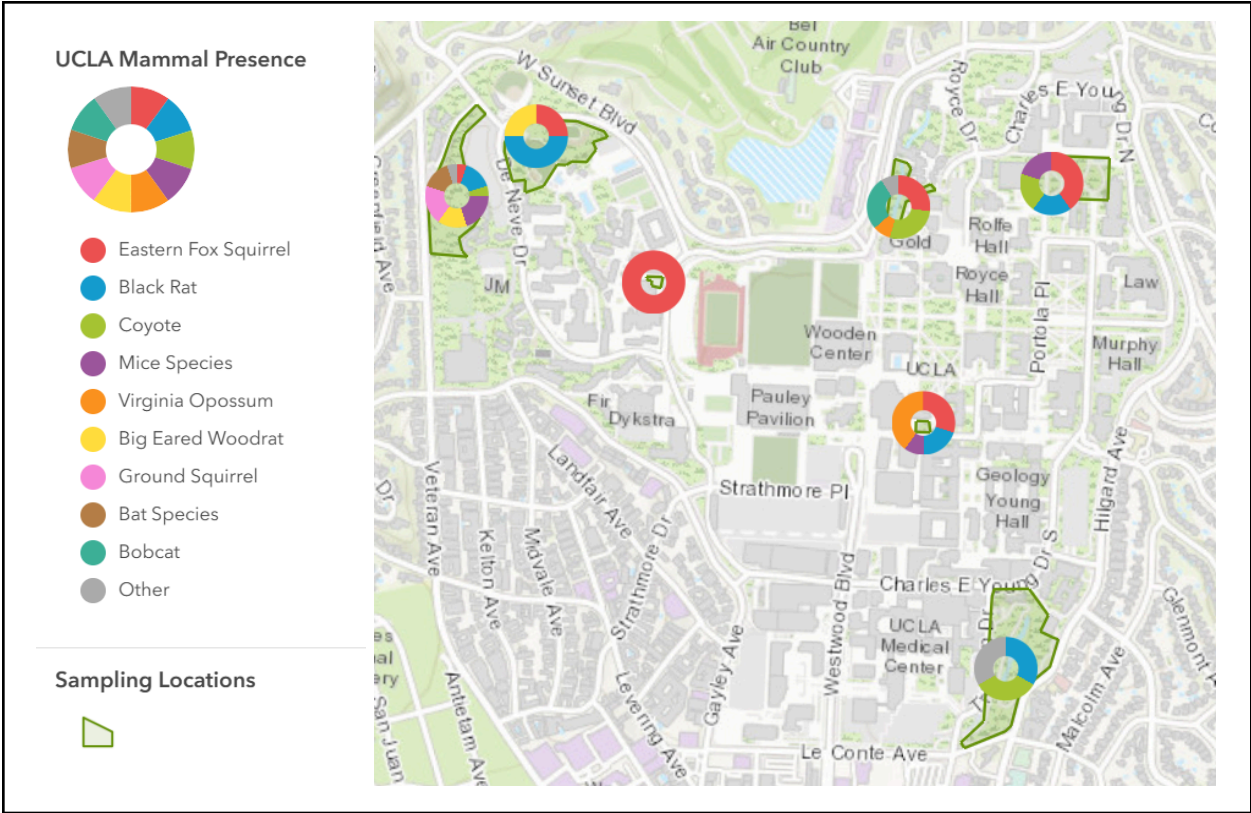
Appendix C - Species List

Scientific Name	Common Name	Field Observations	Research Grade iNaturalist Observations
ORDER DIDELPHIMORPHIA			
<i>Didelphis virginiana</i>	Virginia Opossum	X	X
ORDER CARNIVORA			
<i>Procyon lotor</i>	Raccoon	X	X
<i>Canis latrans</i>	Coyote	X	X
<i>Lynx Rufus</i>	Bobcat	X	
<i>Felis catus</i>	Domestic Cat		X
ORDER ARTIODACTYLA			
<i>Odocoileus hemionus</i>	Mule Deer		X
ORDER RODENTIA			
<i>Otospermophilus beecheyi</i>	California Ground Squirrel	X	X
<i>Sciurus niger</i>	Eastern Fox Squirrel	X	X
<i>Megascapheus bottae</i>	Botta's Pocket Gopher		X
Family <i>Heteromyidae</i>	Pocket Mouse	X	
<i>Microtus californicus</i>	California Vole	X	X
<i>Neotoma Macrotis</i>	Big-Eared Woodrat	X	X
Genus <i>Peromyscus</i>	Deermouse	X	
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	X	X
<i>Mus musculus</i>	House Mouse	X	X
<i>Rattus rattus</i>	Black Rat	X	X
<i>Rattus norvegicus</i>	Brown Rat		X
ORDER LAGOMORPHA			
<i>Sylvilagus audubonii</i>	Desert cottontail		X
<i>Sylvilagus bachmani</i>	Brush rabbit	X	X
ORDER CHIROPTERA			
<i>Eptesicus fuscus</i>	Big Brown Bat	X	
<i>Parastrellus hesperus</i>	Canyon Bat	X	
<i>Myotis yumanensis</i>	Yuma Myotis	X	

Appendix D - Species Richness by Sampling Location



Appendix E - Map: Campus Distribution of Mammal Presence by Sampling Location



Appendix F - Table: Campus Distribution of Mammal Presence by Sampling Location

Species Common Name	Species Latin Name	Sunset Canyon Recreation Center	Sage Hill	Stone Canyon Creek	Dumpster Site	Mathias Botanical Garden	Murphy Sculpture Garden	Field Cameras (All Sites)	iNaturalist Observations
Big-Brown Bat	<i>Eptesicus fuscus</i>		X					X	
Big-Eared Woodrats	<i>Neotoma Macrotis</i>	X	X					X	X
Black Rats	<i>Rattus rattus</i>	X	X		X	X	X	X	X
Brown Rat	<i>Rattus norvegicus</i>								X
Bobcat	<i>Lynx Rufus</i>			X				X	
Botta's Pocket Gopher	<i>Megascapheus bottae</i>								X
Brush Rabbit	<i>Sylvilagus bachman</i>		X					X	X
Canyon Bat	<i>Parastrellus hesperus</i>		X					X	
Deer Mouse	Genus <i>Peromyscus</i>		X					X	
Desert Cottontail	<i>Sylvilagus audubonii</i>								X
Domestic Cat	<i>Felis Catus</i>								X
California Vole	<i>Microtus californicus</i>		X					X	X
Coyote	<i>Canis latrans</i>		X	X		X	X	X	X
California Ground Squirrel	<i>Otospermophilus beecheyi</i>		X					X	X
Eastern Fox Squirrel	<i>Sciurus niger</i>	X	X	X	X		X	X	X
House Mouse	<i>Mus musculus</i>						X	X	X
Mule Deer	<i>Odocoileus hemionus</i>								X
Pocket Mouse	Family <i>Heteromyidae</i>		X					X	
Virginia Opossum	<i>Didelphis virginiana</i>			X	X			X	X
Common Raccoon	<i>Procyon lotor</i>			X		X		X	X

Western Harvest Mouse	<i>Reithrodontomys megalotis</i>		X					X	X
Yuma Myotis	<i>Myotis yumanensis</i>		X					X	

Appendix G - Camera Photos of Representative Species



Big-Eared Woodrat



Black Rat



Bobcat



Brush Rabbit



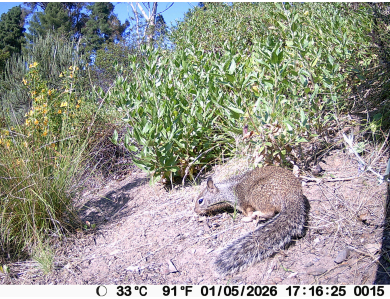
Deer Mouse



California Vole



Coyote



California Ground Squirrel



Eastern Fox Squirrel



House Mouse



Pocket Mouse



Virginia Opposum



Common Raccoon



Western Harvest Mouse

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