Tracking the Eastern Expansion of the Coyote (Canis latrans var.) on Long Island

Preprint · April 2024

DOI: 10.13140/RG.2.2.14852.23687

1 author:

Miura Traficante
Stony Brook University
14 PUBLICATIONS **550** CITATIONS

SEE PROFILE

Tracking the Eastern Expansion of the Coyote (*Canis latrans* var.) on Long Island

Miura T. Traficante

SUNY Old Westbury, Dept. of Biological Sciences Old Westbury, NY

Tracking the Eastern Expansion of the Coyote (*Canis latrans* var.) on Long Island

Traficante, M[1]

Abstract

Eastern coyotes (*Canis latrans* var.) are expanding their range in New York State (NYS), with no known breeding populations on Long Island (LI) prior to 2015. Presently, at least 12 coyotes inhabit Nassau County, including at least 2 breeding pairs. Camera traps were deployed on the campus of State University of New York at Old Westbury (SUNY OW), situated in eastern Nassau County, to monitor the expansion of coyotes on LI, in collaboration with the LI Coyote Monitoring Project. The heavily wooded SUNY OW campus provides an appealing habitat for coyotes and other fauna. Over the study period from December 2021 to December 2023, a single male coyote was observed on camera, initially confined to the southeastern portion of the campus but later expanding its range into the northwestern area. As of September 2023, a second coyote has been observed on the camera located on the southeastern portion of the campus, suggestive of a mating pair. The camera footage also captured potential coyote prey and commensal species, such as white-tailed deer (*Odocoileus virginianus*), eastern gray squirrels (*Sciurus* carolinensis), eastern cottontails (*Sylvilagus floridanus*), northern raccoons (*Procyon* lotor), Virginia opossums (*Didelphis virginiana*), red foxes (*Vulpes vulpes*), and feral cats (*Felis catus*). Eight unique mammalian species and four individual bird species have been identified on campus. We anticipate future research to shed light on the impact of coyotes on these species' populations and contribute to our understanding of the genetic origins of eastern coyotes.

Keywords: *Camera Trap, Canis latrans var, Eastern Coyote, White-tailed Deer*

Background

The establishment of a breeding population of eastern coyotes was not confirmed until 2015 (Weckel et al., 2015), although sightings of non-breeding eastern coyotes have been documented in scientific literature as early as 2013 (Nagy et al., 2017). Prior to these documented occurrences, occasional sightings were reported as early as 1940 and more frequently in the 1980s, although these were seldom confirmed and relied mainly on hearsay (Nagy et al., 2017). Presently, sightings have been primarily limited to the five boroughs and Suffolk County, with a confirmed slight presence of the population near and around the border of Queens and Nassau County (Nagy et al., 2017). Specifically, there have been reported sightings in Lattingtown and Manhasset, New York (NY), but photographic evidence has been sparse and often blurry. In 2022, previous research indicates high genetic relatedness among coyotes in the metropolitan area, suggesting a small population, further supporting the notion that the coyote populations in NY are likely small but established (Caragiulo et al., 2022). Eastern coyotes, larger than their western counterparts (Way, 2007), prey upon white-tailed deer, especially when in packs (Kilgo et al., 2019). Without natural predators like bears, wolves, or bobcats, the deer population, which consume and therefore reduce plant diversity (Averill et al., 2017), remained unchecked. Regulating these populations, as well as the rodent and stray cat populations through the introduction of a predator such as the eastern coyote can enhance diversity from the top down, facilitating greater success for other animal populations (Delong et al., 2021), significantly contributing to the natural ecosystem.

Materials and Methods

Camera Traps

Data collection for the Coyote Project, LI Coyote Study Group, Gotham Coyote Project, and the LI-Coyote-Mon at SUNY Old Westbury has been ongoing from January 1st, 2020, to April 2024. This collaborative effort involves the installation of camera traps across Nassau and Suffolk counties, with cameras operated by volunteers, researchers, educators, and others. There is no standardized protocol for timing, spacing, or camera models. The specific sub-project conducted at SUNY Old Westbury focuses on cameras situated in Nassau County, NY. Presently, two cameras are deployed on the SUNY OW campus within forested areas: camera OW1 in a 102-acre forest patch east of the campus, and camera OW2 in a separate 41.8-acre forest patch, both separated by a road. Cameras, provided by Columbia University, are affixed to tree trunks at knee height and operate via motion activation, targeting, and sensor detection. Each trigger event results in the capture of five photographs dependent on the animal's presence in the frame. Cameras remain active year-round, with deployment durations ranging from four to six months. Photo data is stored on Standard Definition (SD) cards, replaced every six months, and subsequently uploaded to the free web application, Wildlife Insights.

Photo Identification

Following data collection, photos are processed and initially identified automatically using Wildlife Insights' artificial intelligence (AI) assisted photo recognition system, with images containing humans automatically filtered out. Subsequently, each photo is manually reviewed by

a researcher to verify the accuracy of the AI-generated identifications, confirming species names and group sizes. Blank photos are scrutinized to ensure no animals were overlooked by the AI, and each animal in a sequence is checked for the presence of a red box, indicating confirmation by the researcher. This process facilitates ongoing improvement of the AI's identification accuracy.

Data Analysis

Upon identification, project data is downloaded and imported into Tableau and Excel for visualization purposes. Downloaded data includes the start and end times and dates of each photo sequence, species names, camera locations (OW1 or OW2), and whether the photo was captured during the day or at night. This dataset is analyzed to determine diurnal and nocturnal activity patterns by camera and species, individual appearance frequencies per species, and to generate activity summaries for eastern coyotes and red foxes.

Results

Data reported herein, utilizing data visualization, includes observations up to May 2023. An additional deployment from May 2023 to February 2024 has not yet been analyzed for visualization but is included in the results. Since the initial deployment of cameras in January 2020, 17 camera deployments spanning 3,278 sampling days have been processed, capturing 8,393 sequences, of which 3,285 are wildlife sequences. On average, there are approximately 493 sequences per deployment across 11 total deployments.

The presence of one lone male coyote was captured, first observed on camera OW1 in December 2021 and later appearing on camera OW2 in May 2022. In the latest deployment, as of September 2023, two unique coyotes have been observed on camera OW1.

Eight mammalian species were identified, including white-tailed deer *(Odocoileus virginianus*), eastern gray squirrels (Sciurus carolinensis), eastern cottontails (*Sylvilagus floridianus*), northern raccoons (*Procyon lotor*), Virginia opossums (*Didelphis virginiana*), red foxes (*Vulpes vulpes*), feral cats *(Felis catus*), and striped skunks (*Mephitis mephitis*). Additionally, four bird species were detected, including Canada goose (*Branta canadensis*), American robin (*Turdus migratorius*), red-tailed hawk (*Buteo jamaicensis*), and blue jays (*Cyanocitta cristata*).

Activity patterns varied among species, with coyote and eastern cottontail activity predominantly nocturnal, while white-tailed deer, gray squirrels, and red foxes exhibited mostly diurnal activity. There was minimal overlap between the daily activity of eastern coyotes and red foxes, with the red fox last captured on 09/26/21 and the coyote first appearing on 12/29/2021, indicating no seasonal overlap between these animals.

White-tailed deer had the highest number of appearances overall (43,190 images within 2,406 sequence captures), followed by northern raccoons (4,554 images within 526 sequences) and gray squirrels (1,653 images within 245 sequences). Eastern coyotes were observed in 23 sequences. Images marked as "unknown" have been omitted from the results as they have not been reassessed for re-identification by seasoned researchers with expert identification skills.

Discussion and Future Research

Given our campus's extensive array of Coyote preferred foraging options, ample acreage, Given the extensive range of preferred foraging options, ample acreage, and minimal human activity within wooded areas on our campus, it is plausible that our campus serves as an ideal landscape for coyotes to establish dens. Coyotes typically disperse at around 9 months of age, covering an average range of 150 miles, and commence breeding between January and March of their second or third year (Zepeda et al., 2021).

It is inferred that the first lone male coyote observed on our trail camera OW1 in December 2021, later appearing on camera OW2 on May 11th, 2022, was approximately 9 months old when he made his first appearance. Upon this discovery, speculation arose regarding the potential for the lone male to find a mate. Since coyotes typically mate for the first time when they are 2 to 3 years of age, this suggests that potential mating behavior may occur during the 2024 breeding season, prompting plans to analyze scat samples to determine lineage and assess potential hybridization with domestic dogs or wolves in the absence of suitable mates. Interestingly, a second, smaller coyote, likely a female, was detected on camera 1 in September of 2023, just prior to the mating season. This development indicates the establishment of a mating pair, sparking curiosity regarding potential species expansion and mating patterns, particularly given the species' invasive nature elsewhere (Schelhas et al., 2021). A notable finding is that the introduction of coyotes coincided with the disappearance of our red fox population, prompting further investigation into whether this is due to competitive exclusion or predation by eastern coyotes.

The plan is to expand monitoring by installing a camera in the open fielded area behind the natural science building, complementing the current cameras situated in wooded landscapes, and adding an additional camera trap located on a transect from New York City (NYC) to Nassau County. We intend to invest in higher quality cameras with better night vision, motion detection, pixels, megapixels, and overall performance and increased visibility. Our surveillance strategy will focus on monitoring existing and future trail cameras to track the establishment of a den (indicating breeding), territory expansion, shifts in species diversity, changes in predator and prey populations. With the introduction of the female coyote, we can now compare previous scat samples collected from the lone male with future samples to identify potential interbreeding, estimate population size, discern the male from female, as well as determine the LI population origins (whether from Canada, urban areas such as the boroughs, or the Midwest), and prey species composition. This collection of information will allow us to better understand the impact of coyotes on prey diversity and the overall campus ecosystem.

Acknowledgements

We would like to thank Dr. Christopher Nagy, Director of Research and Education - Mianus River Gorge, Bedford, NY, for setting up the cameras and supporting this project. An additional thank you to Dr. Fernando Nieto PhD and Dr. Coby Klein PhD for their contributions to this paper, which included editing and mentoring throughout this project.

Funding

This project is funded in part by the Panther CURE research program and CSTEP.

References

Averill, K. M., Mortensen, D. A., Smithwick, E. A. H., Kalisz, S., McShea, W. J., Bourg, N. A., Parker, J. D., Royo, A. A., Abrams, M. D., Apsley, D. K., Blossey, B., Boucher, D. H., Caraher, K. L., DiTommaso, A., Johnson, S. E., Masson, R., & Nuzzo, V. A. (2017). A regional assessment of white-tailed deer effects on plant invasion. AoB Plants, 10(1), plx047.

Caragiulo, A., Gaughran, S. J., Duncan, N., Nagy, C., Weckel, M., & vonHoldt, B. M. (2022). Coyotes in New York City Carry Variable Genomic Dog Ancestry and Influence Their Interactions with Humans. Genes, 13(9), 1661.

DeLong, J. P. (2021). Predator ecology: evolutionary ecology of the functional response. Oxford University Press.

Hody, J. W., & Kays, R. (2018). Mapping the expansion of coyotes (Canis latrans) across North and Central America. Zookeys, (759), 81-97.

Kilgo, J. C., Cherry, M. J., Ditchkoff, S. S., Gulsby, W. D., & Miller, K. V. (2019). Coyotes and white-tailed deer populations in the east: A comment on Bragina et al. (2019). The Journal of Wildlife Management, 83(8), 1636-1640.

Nagy, C. M., Weckel, M. E., Monzón, J. D., Duncan, N. P., & Rosenthal, M. R. (2017). Initial colonization of Long Island, New York by the eastern coyote, Canis latrans (Carnivora, Canidae), including first record of breeding. Check List, 13, 901-907.

Schelhas, J., Alexander, J., Brunson, M., Cabe, T., Crall, A., Dockry, M. J., Emery, M. R., Frankel, S. J., Hapner, N., Hickman, C. R., Jordan, R., LaVoie, M. J., Ma, Z., Starinchak, J., & Vukomanovic, J. (2021). Social and Cultural Dynamics of Non-native Invasive Species. In Invasive Species in Forests and Rangelands of the United States: A Comprehensive Science Synthesis for the United States Forest Sector (pp. 267-291). Springer International Publishing. https://doi.org/10.1007/978-3-030-45367-1_12

Way, J. G. (2007). A Comparison of Body Mass of Canis latrans (Coyotes) between Eastern and Western North America. Northeastern Naturalist, 14(1), 111–124. http://www.jstor.org/stable/4499900

Weckel, M., Bogan, D. A., Burke, R. L., Nagy, C., Siemer, W. F., Green, T., & Mitchell, N. (2015). Coyotes Go “Bridge and Tunnel”: A Narrow Opportunity to Study the Socio-ecological Impacts of Coyote Range Expansion on Long Island, NY Pre- and Post-Arrival. Cities and the Environment (CATE), 8(1), Article 5.

Zepeda, E., Payne, E., Wurth, A., Sih, A., & Gehrt, S. (2021). Early life experience influences dispersal in coyotes (Canis latrans). Behavioral Ecology, 32(4), 728-737.

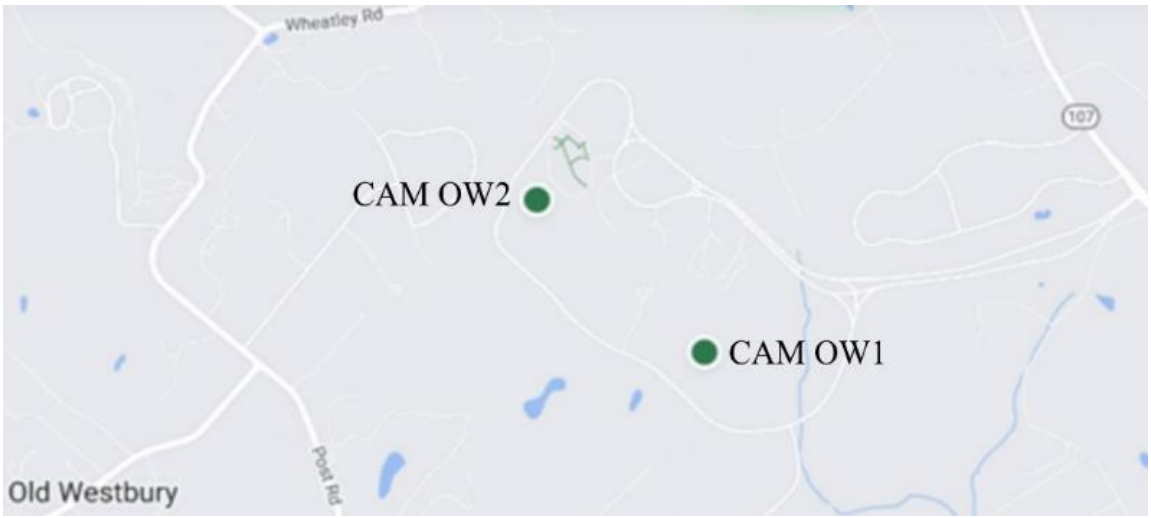
Appendix

This section presents a photo map displaying camera placements, including the first and last appearances of the eastern coyote and the last appearance of the red fox. Additionally, four graphs are provided, one for each camera, illustrating species appearances per camera and night/day periodicity for each species separated by camera.

In this section, the abbreviation [OW] are used to denote Old Westbury, [CAM OW1] indicates Camera Old Westbury 1, and [CAM OW2] is used for Camera Old Westbury 2. The first observed coyote is referred to as Coyote 1, and the second observed coyote is labeled as Coyote 2.

Figure 1

Camera locations for CAM OW1, and CAM OW2.



Note. CAM OW1 is located at latitude 40.793915, and longitude -73.57024, while CAM OW2 is located at latitude 40.799557, and longitude -73.578273.

Figure 2

The first appearance of the lone male Coyote 1 on CAM OW1.

Note. This image was captured on 12-28-2021 at 3:59 am.

Figure 3

The first sighting of Coyote 1 on CAM OW2, indicating a territory expansion from CAM OW1 to CAM OW2.

Note. This image was captured on May 31st, 2022, at 3:52 am.

Figure 4

Both Coyotes can be seen in frame on CAM OW2.

Note. This image was captured on September 5th, 2023.

Figure 5

Coyote 1 is in frame as part of the same sequence as Coyote 2.

Note. This photo was included to show the size difference between the two coyotes. Although Coyote 2 is not within the frame, it can be seen in figure 4.

Figure 6

Coyote 2, (which is slender in comparison to Coyote 1), as seen on CAM OW1.

Note. This photo was captured on September 5th, 2023. Although Coyote 1 is not in frame, Coyote 2 is in the same sequence as Coyote 1 and can be seen in figure 5.

Figure 7

Percent day/night activity for all mammalian species for CAM OW1.

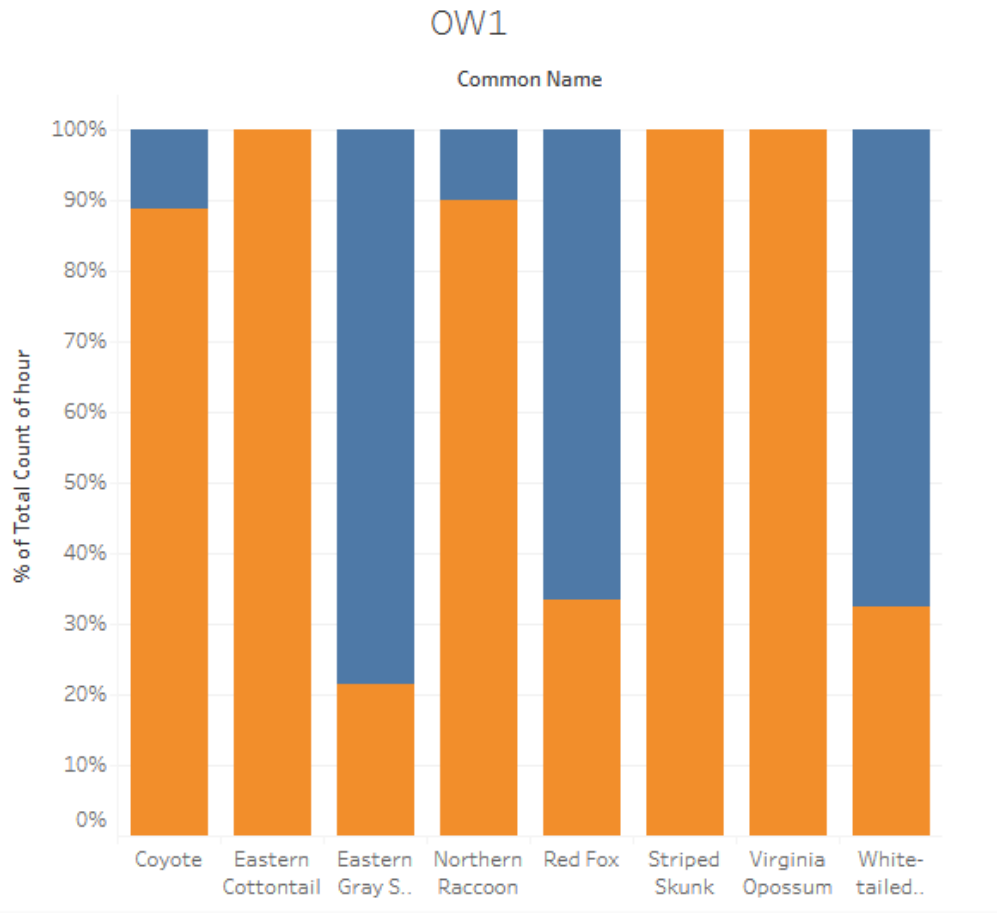


Figure 8

Day/Night activity for all mammalian species for CAM OW2.

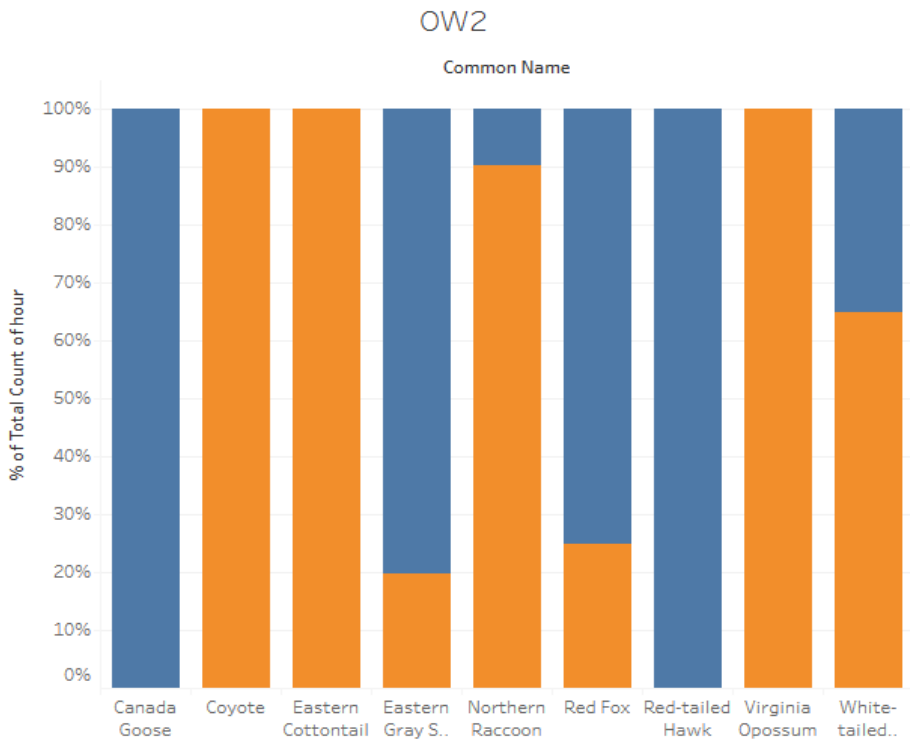


Figure 9

Total appearances by species for CAM OW1.

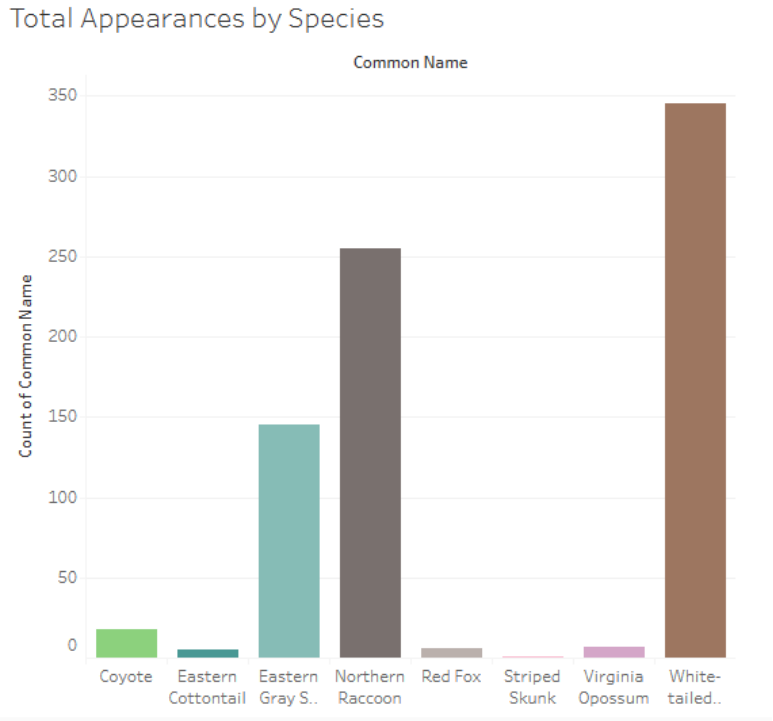


Figure 10

Total appearances for each mammalian species as seen on CAM OW2.

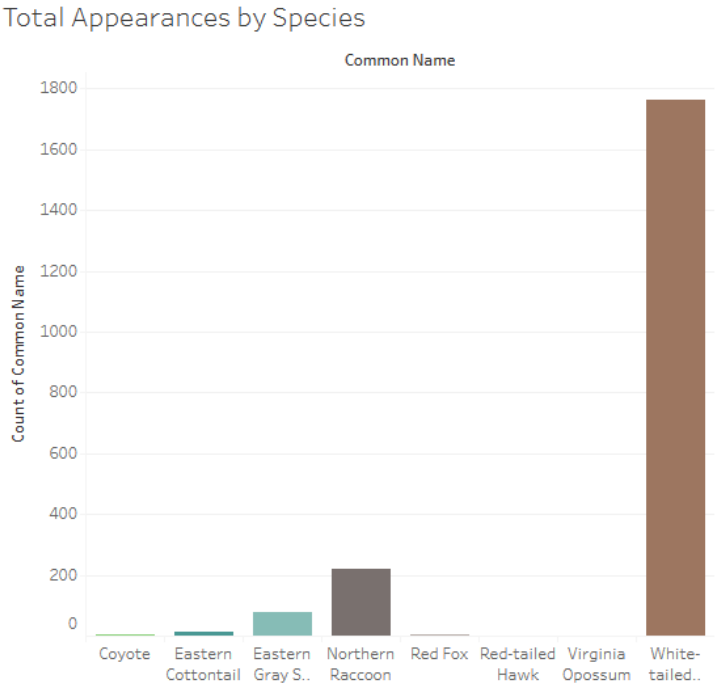
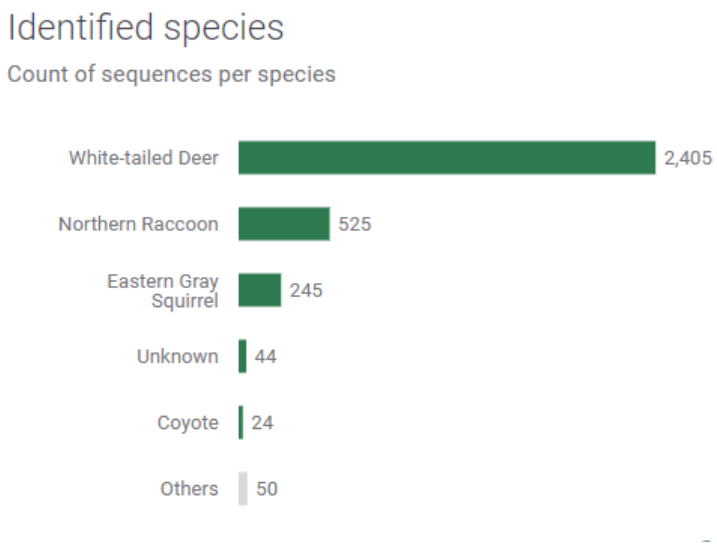


Figure 11

The total identified species indicated by Wildlife Insights for all camera zones.



Note. One photo initially classified as a fox was later identified as a raccoon, resulting in the adjustment of the raccoon sequence number to 526. Additionally, a photo initially identified as a group of two coyotes was later recognized as a group of two deer, leading to adjustments in the coyote sequence number to reflect 23 sequences, and the white-tailed deer sequence number to indicate 2,406.

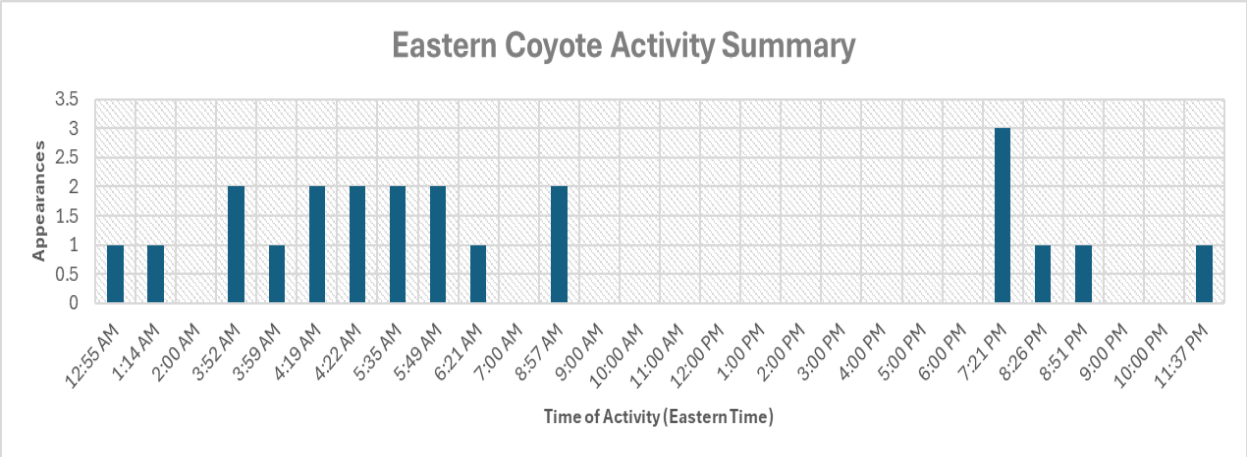
Figure 12

The final appearance of the red fox.

Note. This was captured on September 26th, 2021, at 6:15 am.

Figure 12

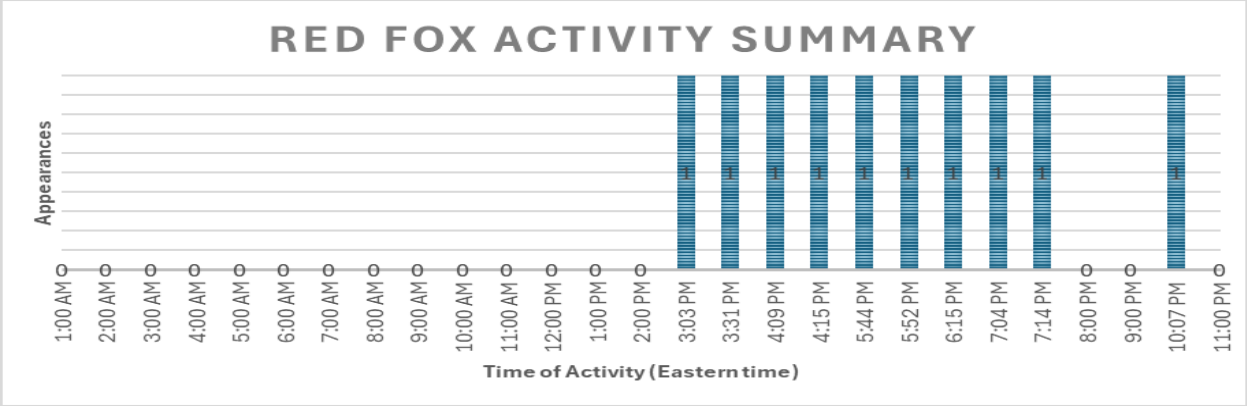
Hours that the Eastern Coyote, Canis Latrans, is active.



Note. This graph is based on appearances on both camera OW1 and camera OW2.

Figure 13

The hours that the Red Fox, Vulpes vulpes, is active.



Note. The graph is based on appearances on camera OW1 and camera OW2.