Pre- Construction Wildlife Camera Trap Monitoring for the Wildlife Overpass in the Cascade-Siskiyou National Monument

Friends Research Fund 2025 Final Report

May 2026

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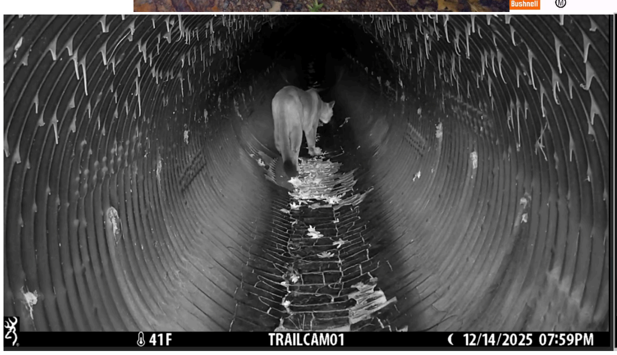

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SOUTHERN OREGON WILDLIFE CROSSING COALITION
WILDLABS.NET [The conservation technology network]
U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT
SUSTAINABILITY AT SOUTHERN OREGON UNIVERSITY

Introduction

Monitoring in the Cascade Siskiyou National Monument (CSNM) started in 2019 to identify suitable locations along Interstate 5 (I-5) for a wildlife crossing. Camera traps (also known as trail cameras or game cameras) are used to monitor and inventory wildlife species that inhabit the various habitats around I-5. Since 2021, SOU has taken over camera trap monitoring to get a full picture of how species move through this area along I-5, with the end goal of seeing how this activity changes with the wildlife overpass. Last year's Friends of the Cascade Sisyou National Monument (FCSNM) project worked to better define safety and efficiency in the field and streamline the data review process. The continuation and growth of this project is crucial in getting a full understanding of species and their movement as it is currently. Understanding how species use the area now will allow us to fully see how movement changed with the installation of the overpass.

This year's project contributed to the growth of the monitoring project. My project goals were to continue the monitoring of the wildlife crossing site and add additional cameras to different areas. The continuing monitoring of the crossing site this year allowed for another year's worth of data to be added to the wildlife seasonal analysis. With two full years' worth of data, this allowed more detail to be added to the wildlife seasonal analysis. The addition of cameras specifically for my project was focused on culverts and the fencelines. Fences will be added to two miles on each side of the overpass to create a makeshift funnel for wildlife. Putting cameras to monitor where the fencelines end without the fencelines will allow for an average of species movement to be taken. Having this average will help us understand if this average changes when the fenceline is put in. Due to mounting errors, the fenceline cameras' data is not used in this paper from these cameras. Culvert areas were also a focus in this project to monitor and understand the species' use in these areas. Culverts are a makeshift underpass for some animals, allowing species to cross safely under the I-5. With the addition of the overpass, it will be interesting to see if this movement changes.

Methods

Camera installation

Camera installation was split into two sections. Fencelines cameras and culvert cameras. Fence-line cameras were treated like any other camera with a little more scoping of the area. Since these areas are where the fencelines will end, it was important to make sure the cameras were facing areas where species activity was seen. Cameras were mounted in a lock box and locked to a tree. Two fencelines cameras were able to be placed only on the north side of the fence ends. One on the east side of the highway and one on the west. Data from these cameras will not be shown in this paper due to the data being unusable.

Culvert cameras were split into three different groups: inside culvert, entrance cameras, and reference cameras. This approach was to better understand what species were active around the culverts but not necessarily using them, and what species were using the culvert and the surrounding area. This method allows for research to fully dive into the difference in species using the area to those using the culvert as an underpass. A total of four new culvert cameras were added to two different already existing culvert monitoring areas. These two areas are known as Stienman and Siskiyou Pass. Stienman had three existing cameras, and an inside culvert camera was added to each end of the culvert. Siskiyou Pass had a total of two existing cameras and a reference, and an inside camera was added to this area.

Computer Work

All data collected from SD cards was uploaded to a dedicated GPU-enabled PC on campus. Along with this computer, all data was backed up to Box, a cloud service, and an external SSD drive. Image processing had a two-step system, first processed by MegaDetector, a machine learning tool used to reduce the time it takes to classify images by drawing bounding boxes around an animal, person, or vehicle. Then the images classified in MegaDetector were checked by myself to ensure that classification where correct. Due to many cameras being used to collect videos instead of images, MegaDetector was not useful for these classifications, and all classifications for these cameras were done by myself. Images were classified in Timelapse, a free open-source software application. After classification, data would be exported to CSV files and combined to form a large working dataset.

Analysis

The working data set of this project was around 5,000 unique events ranging from September 2023 to September 2025. An event refers to when one individual or individuals trigger the camera trap multiple times within a short time span. While there might be multiple captures of an individual or individuals in the span of 10 minutes, this would be classified as only one event for the data. For this study, capture rates for culverts and crossing site seasonal analyses were performed.

Capture Rate

Capture rate is calculated by dividing the sum of individuals for all events by the number of trap nights for each camera site location.

$$Capture\ Rate\ = \left(\frac{Sum\ \ of\ Individuals}{Trap\ Nights}\right) * 100$$

Trap nights are defined as the number of full days (24 hours) a camera is active. This calculation allows for a good indicator of species activity at the various camera locations. Each culvert camera's capture rate was calculated per 100 days and color-coded to match species. Due to high differences in camera capture rates, visual data is skewed to show a more squished bar for cameras with higher trap nights.

Crossing Site Seasonal Analysis

With this year's worth of data, there was two years' worth of data for the crossing site location. With this data, I performed a species seasonal analysis, adding to last year's data set. Seasons were classified using the meteorological season months, each month categorized into its respective season: fall, winter, spring, or summer. Capture rates from all species were labeled for there respected season. To prevent skewing, one category was removed from this analysis: all small mammals (rat and mouse species) from our final graph.

Outcomes

Crossing site seasonal analysis

This year's seasonal analysis shows two full years' worth of data for the crossing site. This year's worth of data allowed for more captures to be added and provided more information on species. Last year's data set found species only showing up in one season, but this year no species were found only in one season. The two major findings were that one species was only found in two seasons. This was cougar (*Puma concolor)* only being seen in the fall and spring(Fig. 1). The second finding was that three species were found in three seasons: black bear(*Ursus americanus)*, california grey squirrel (*Sciurus griseus*), and wild turkey (*Meleagris gallopavo*). These species, as well as the cougar, were found on both the east and west sides of the crossing site. Highlighting the abundance and range of these species.

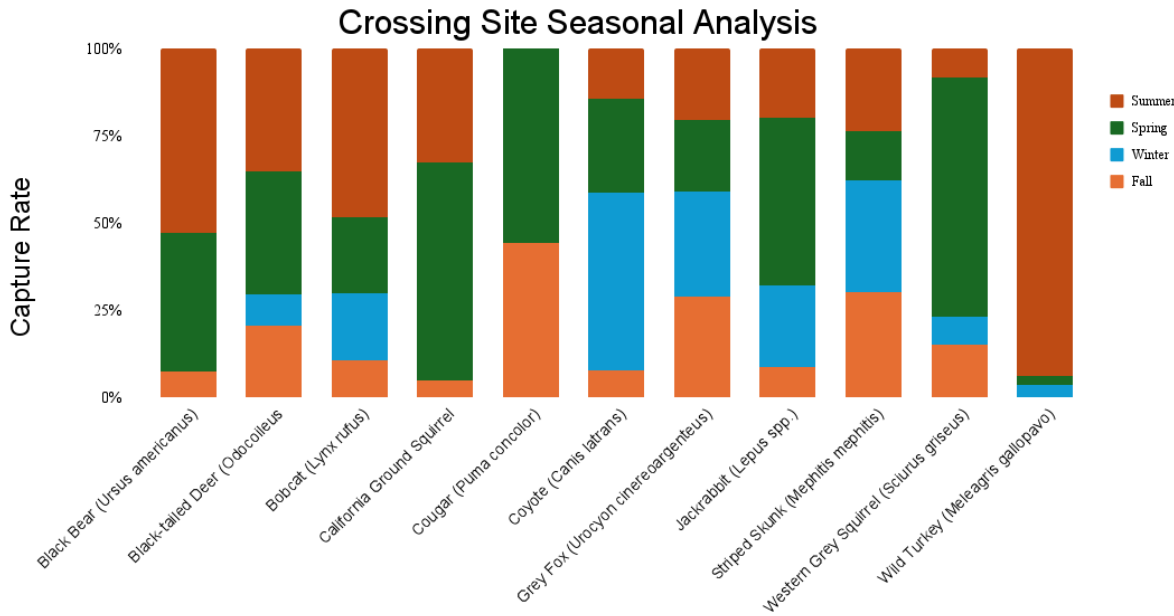

Figure 1: Seasonal analysis of the crossing site using two full years of data.
Species are located on the x-axis, and capture rate is located in percentages on the y-axis.
Each season is color-coded and identified in the key on the right side of the graphic.

Culvert Analysis

Data was taken from four culvert areas, two located within the Cascade Siskiyou National Monument(CSNM) and two located outside. This was done to look at activity within the monument as well as outside to get a full understanding of the species' movement within the whole area. The four culvert areas are identified as Stineman, Siskyou Pass, Bear Gulch, and Bear Gulch South West Arm (Fig. 2). Each culvert area's cameras are split into three categories: inside, entrance, and reference cameras to divide data for better analysis of species movement. Each data set shows all cameras located at each culvert location and the species seen at each camera. Graphics can be seen for each location below. It is important to note that since these areas have cameras with different activation dates, visual data is altered. If a camera has been active for a while, trap nights with captures can be seen more accurately. When a camera has been active for only a little while, its capture rate shows up at a high visual representation due to the low trap nights. When comparing cameras that have been active for a while to those that have only recently been activated, data from longer-active cameras can seem squished. The hope for each culvert area is to collect more data for recently activated cameras to show a data set like Bear Gulch (Fig. 5). All cameras at the Bear Gulch location were activated within a month of each other, and it shows with the even separation of each species at each location. The most extreme difference between two activation camera times can be seen in bear gulch southwest arm(fig.6) were west reference was activated as one of the first cameras in this study(2020-2021), and the east reference was only activated in 2024.

Stineman culvert area is located outside the CSNM, with a total of four cameras, one activated this year, which was the inside camera (Fig. 2). There was a total of eight species captured at this site. This site had the most active species, being the grey fox(*Urocyon cinereoargenteus*). It was also found that the ringtail (*Bassariscus astutus*) shows more activity inside the culvert than outside the culvert.

Siskyou Pass culvert area is located outside the CSNM, with a total of three cameras, two activated this year, which were inside and reference cameras (Fig. 3). There was a total of nine species captured at this site, one more species than Stinman, which was the Virginia opossum(*Didlephis viginiana*). This site had the most active species, being the grey fox (*Urocyon cinereoargenteus*), with the second most active species being the black bear (*Ursus americanus*). This site's black bear(*Ursus americanus*) and cougar (*Puma concolor)* were observed using the culvert as an underpass.

Bear Gulch culvert area is located inside the CSNM, with a total of four cameras. This location has no skew due to activation time and is the model for how future culvert data sets will look with reduced activation date skews. There is a total of ten different species seen at this site, with elk(*Cervus canadensis*) being seen for the first time at this site. Within this area, grey fox (*Urocyon cinereoargenteus*) and bobcat (*Lynx rufus*) were the two most active species. This culvert has also been observed to have black bears (*Ursus americanus*) use this culvert as an underpass.

Bear Gulch Southwest Arm culvert area is located inside the CSNM, with a total of two cameras. This location has the most extremely skewed data set, with the west reference camera being activated in 2020 or 2021 and the east entrance being activated in 2024. A total of 3 years' difference in activation dates creates a major visual skew in the data. This area has a total of ten different species seen with the most active being coyote (*Canis latrans)* and the black bear (*Ursus americanus*).

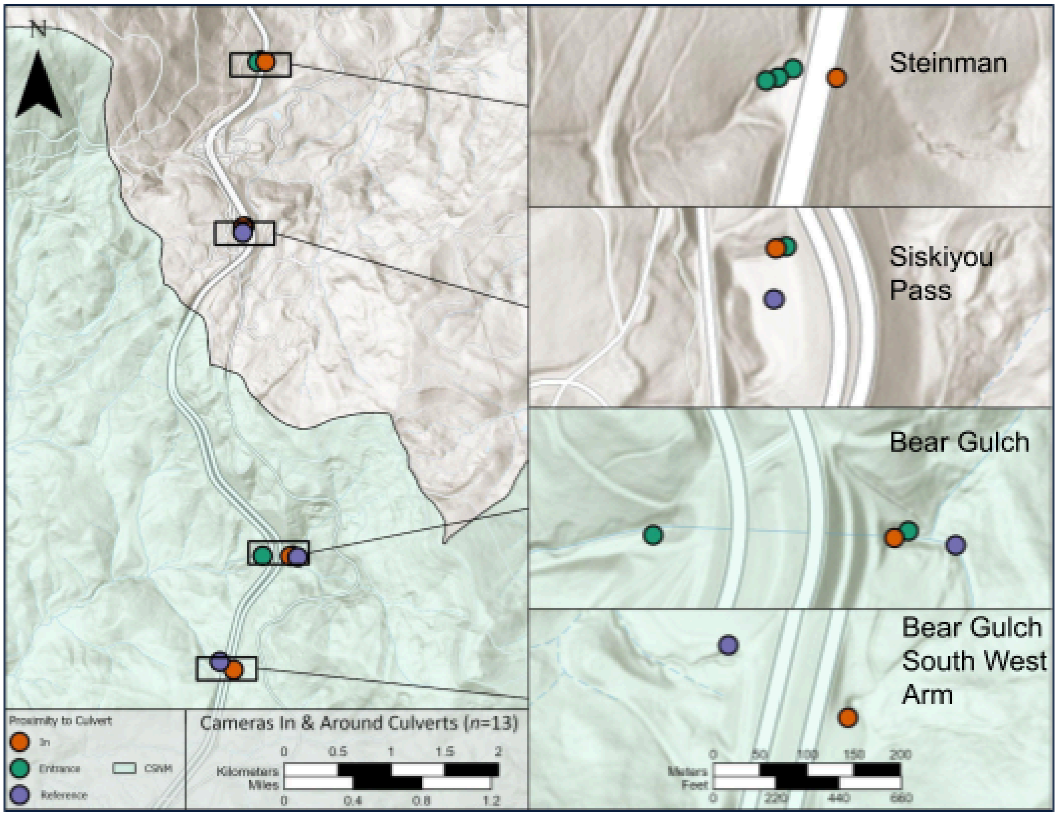

Table 1: Culvert areas are shown on the left map in reference to the CSNM, which is shown in the teal area. Each culvert is color coded to identify if it is inside, entrance, or reference camera. The right shows a zoomed-in reference map of each culvert area in reference to where they are located on the west or east side of the highway.

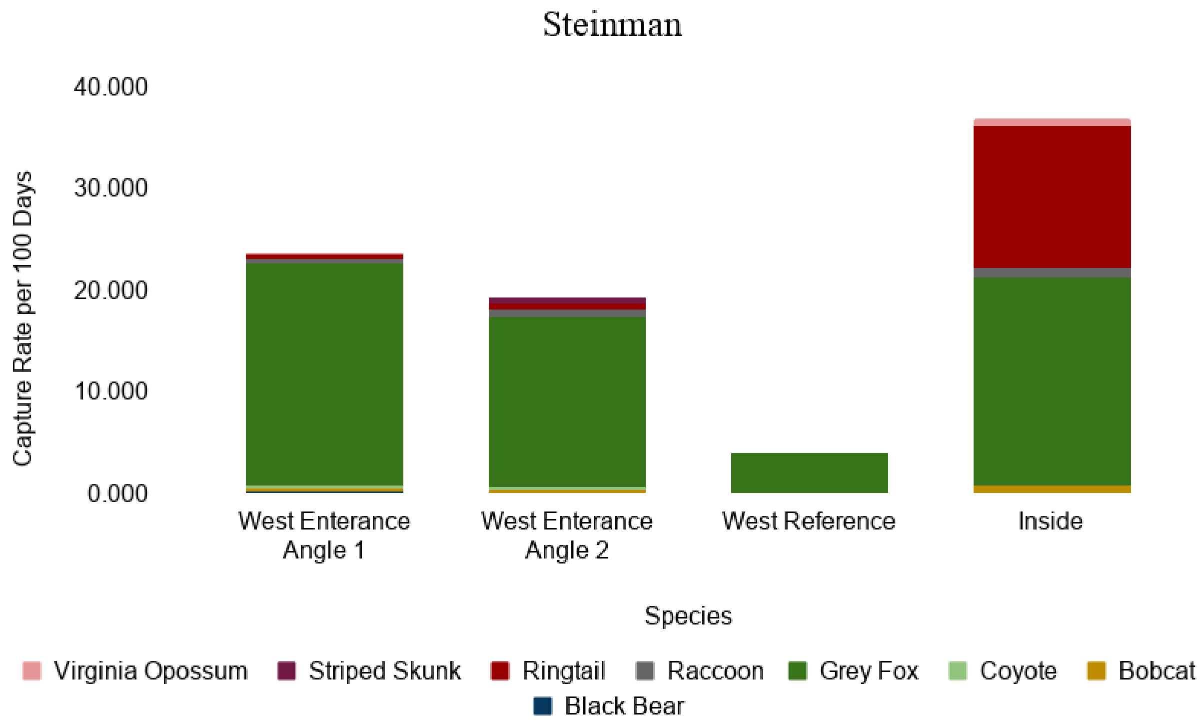

Figure 2: Camera identification is seen on the x-axis, and capture rate per 100 days is shown on the y-axis. Each species is color-coded, and abundance is shown by how thick the color section is. This data set is skewed due to activation dates being different, with the newest activated camera in this set being the inside camera.

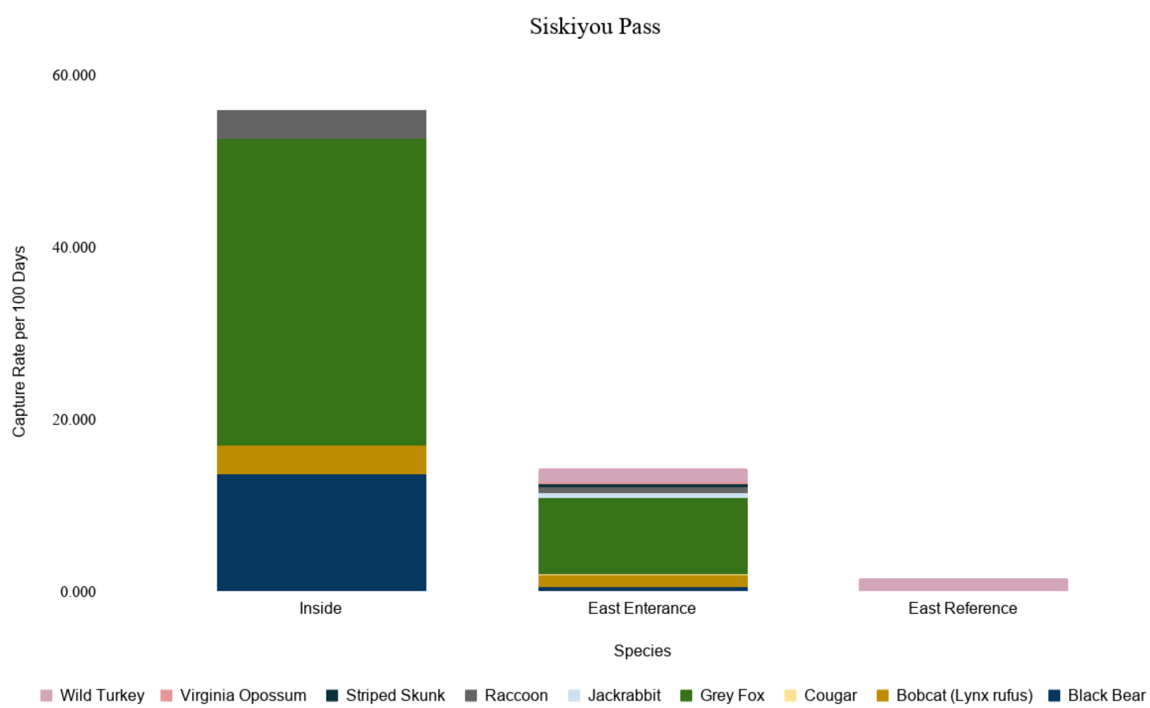

Figure 3: Camera identification is seen on the x-axis, and capture rate per 100 days is shown on the y-axis. Each species is color-coded, and abundance is shown by how thick the color section is. This data set is skewed due to activation dates being different, east reference, and the inside camera, were both activated during this study.

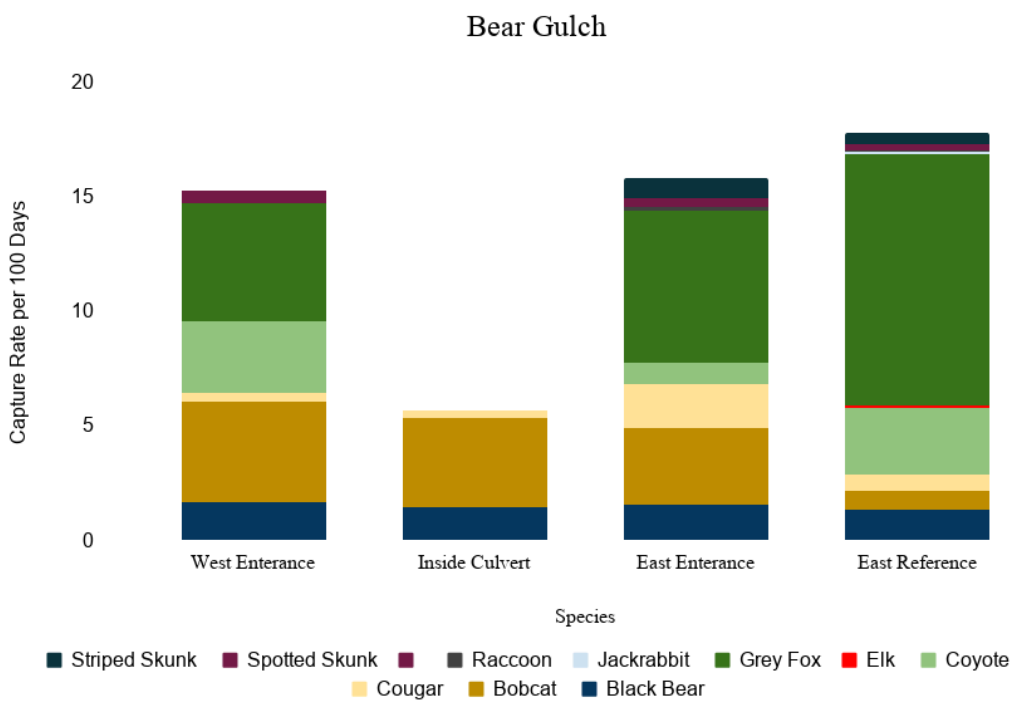

Figure 4: Camera identification is seen on the x-axis, and capture rate per 100 days is shown on the y-axis. Each species is color-coded, and abundance is shown by how thick the color section is. This data set is the only culvert set where all cameras were activated within the same time period and has no skew due to activation times.

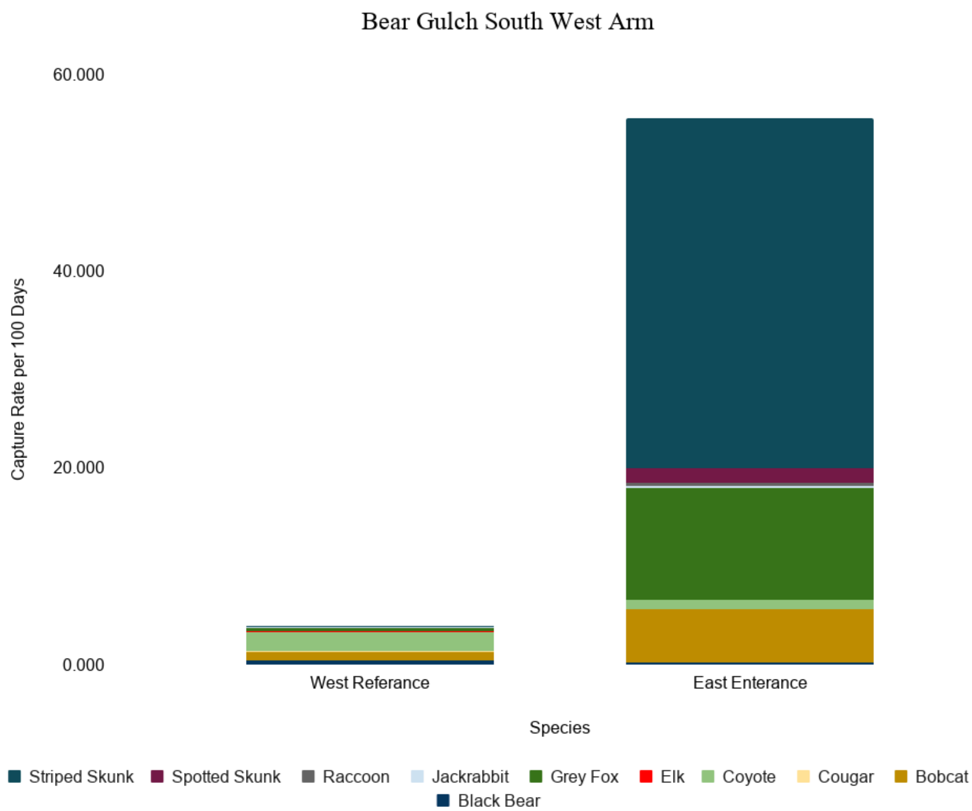

Figure 5: Camera identification is seen on the x-axis, and capture rate per 100 days is shown on the y-axis. Each species is color-coded, and abundance is shown by how thick the color section is. This data set has the highest skew due to activation dates. West reference camera was activated in 2020-2021, and East entrance camera was activated in 2024.

Promoting Understanding, Appreciation, Preservation, and Protection of the CSNM

This study directly aligned with the CSNM goals of preserving and protecting the CSNM to ensure the monument remains an area of conservation. The monument documents some of the highest levels of mammal biodiversity at the Mariposa Preserve compared to the other sites along I-5 that are outside the monument. Documenting the species that live within the monument adds to the understanding and appreciation of the complex ecosystem and biodiversity that the monument was designed for. Adding cameras to culverts allows for monitoring to extend to areas that species are already using as underpasses before the crossing site goes in. Adding culvert cameras inside and outside the monument allowed for a full understanding of species movement inside the monument in reference to outside before the overpass goes in. This monitoring helps to see how species movement will change and affect the movements of species inside the monument. All this pre-construction monitoring allows for a better ability to advocate for the monument protection and improvement of wildlife connectivity. Finally, images and videos capturing the great biodiversity of the monument can be shared with a broad collection of stakeholders as well as the media and the public.

Funds

Materials		
Item	Quantity	Total
Cameras	5	749.95
Camera boxes	5	124.95
Locks	2	51.98
Mounting materials	2	73.12
	Total	1,000

Figure 7: Budget for materials section for the grant. This second paid for new camera trap materials as well as mounting materials for culvert mounts

Stipen			
Dates	Hours	Hourly Rate	Total
June 9th- Sep 19th	118	$17	2,000
		Total	2,000

Figure 8: Budget for stipend section for grant. A total of 118 hours were taken this summer to do this research at an hourly rate of $17. Allowed for my time to be allocated specifically for this research.