North Coyote Valley Road Ecology Study
2021-2022

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Pathways for Wildlife

For Peninsula Open Space Trust (POST),
Santa Clara Valley Habitat Agency
and the California Department of Fish and Wildlife

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Report Citation

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This report was prepared for the Peninsula Open Space Trust (POST), Santa Clara Valley Habitat Agency, and the California Department of Fish and Wildlife.

1.0 Executive Summary

This study builds on previous research within Coyote Valley to contribute to a baseline assessment of the region's current ecological connectivity and identify opportunities to improve regional connectivity, with a specific focus on North Coyote Valley. North Coyote Valley is recognized as having a particularly high conservation value, as it includes rare ecological features such as the Laguna Seca wetland complex, Tulare Hill, and valley floor habitat that connects the Santa Cruz Mountain Range to the Diablo Range (Conservation Biology Institute 2017).

The study area occurs within the Santa Clara Valley HCP/NCCP Habitat Plan Area and includes the North Coyote Valley Conservation Area (NCVCA), which was recently protected in 2019. The NCVCA comprises nearly 1,000 acres protected as open space at a purchase price of $93.5M. The properties used as study sites with the NCVCA included NCVCA Laguna Seca, NCVCA Tulare Meadows, and NCVCA Addition. Other protected properties located within the study area include Tulare Hill and Santa Teresa County Park.

There are several roads with high daily traffic volumes that bisect the NCVCA, including US 101, Monterey Rd, Santa Teresa Blvd, Bailey Ave, and McKean Rd. Previous wildlife connectivity studies in Coyote Valley conducted in 2016 and 2018 documented high numbers of wildlife species, varying from large to small mammals, hit on these roads by vehicles (Diamond and Snyder 2016, Diamond and Snyder 2018a).

Given the importance of Coyote Valley for regional connectivity and the threat of ongoing human population growth and development, this study sought to evaluate the region's baseline ecological connectivity and identify opportunities to improve regional connectivity by building on previous research within Coyote Valley. The goals of this project were to identify locations in which wildlife are: 1) crossing roads at grade (at-grade detections), 2) traveling under the roads through culverts and bridges (passages), (3) traveling through gates and fences (passages), and 4) identifying locations of wildlife mortality on roads between protected properties in the NCVCA and adjacent protected properties. We used these findings to provide data-driven recommendations to reduce wildlife-vehicle collisions and maintain or increase permeability of the landscape for wildlife.

The study, which ran from March 2021-June 2022, used several survey methods including camera monitoring of five existing undercrossings (four culverts and one bridge), four fence line locations and five gates, and at-grade locations along Santa Teresa Blvd (26 camera sites) and Bailey Ave (nine camera sites) as well as routine roadkill surveys of US 101, Monterey Rd, Santa Teresa Blvd, Bailey Ave, and McKean Rd. A 100-trap-night analysis was performed to standardize the camera trap data to enable comparison of each monitoring site, as cameras at various sites were stolen or malfunctioned, which resulted in data gaps. Along with the data that was collected during the study period, we include key findings and data results from previous wildlife studies we conducted in 2008-2009, 2015-2016 and 2017-2018 in Coyote Valley for the development of the proposed wildlife connectivity enhancements created for this report (Diamond, T. 2009, Diamond and Snyder 2016, Diamond and Snyder 2018a).

Key Findings

The following are key findings from the camera trap and roadkill data analysis:

- A total of 1,153.6 species standardized passages and at-grade detections were recorded during the twelve-month monitoring period across 48 camera sites.

- The species with the highest passage/at-grade detection rates when standardized included coyote (*Canis latrans*) (684.9, 59.4%), wild pig (*Sus scrofa*) (175.1, 15.2%), raccoon (*Procyon lotor*) (140.4 detections, 12.2%), mule deer (*Odocoileus hemionus californicus*) (77.8, 6.7%), and bobcat (*Lynx rufus*) (44.1, 3.8%).
- The vast majority of standardized wildlife detections (per 100 trap nights) occurred at at-grade sites along Bailey Ave (562) and Santa Teresa Blvd (337), followed by the fence line and gate cameras (176 passages) and culverts and bridge sites (73 passages). This indicates high rates of wildlife occurring at-grade on the roads adjacent to the NCVCA properties, especially along Bailey Ave, which had the highest rates of detections despite only having nine camera sites compared to twenty-six cameras along Santa Teresa Blvd.
- There were low passage rates for the culverts and bridge sites, perhaps because the monitored culverts tend to remain flooded for several months after rain events, which was correlated with a decline in passage rates. The Bailey Ave. Fisher Creek Bridge (the only bridge within the NCVCA), also experienced low passage rates, especially relative to previous studies. Since 2008, the bridge has become increasingly full of sediment and debris, which may be limiting wildlife movement.
- Restrictive fencing presents few options for large mammals to travel safely between the NCVCA properties. Fencing ranged from 6-strand barbed wire fence to chain link fencing on the east and west sides of the protected properties. The most restrictive fencing (barbed wire) spanned along Laguna Seca on the west side of Santa Teresa Blvd. This fencing was modified in February 2022 to close gaps, resulting in a further decline in passages by coyote and deer.
- Deer were recorded traveling along the fence line along Laguna Seca and were more likely to crawl under and/or step through openings in the fencing as short as one foot in height, rather than jump over five-strand, or six-strand barbed wire fencing.
- We recorded a total of 52 animals hit by vehicles during the study period. With the addition of the juvenile mountain lion that was hit on 8-8-2019 on McKean Rd, this resulted in 53 roadkill records.
- The species with the highest road mortalities include raccoon (16, 30.2%), coyote (14, 26.4%), and deer (9, 17%). Raccoon and coyote made up over half of all recorded WVCs throughout the study area, and, along with wild pig, were also the species detected at-grade the most frequently.
- The highest number of WVCs was detected on Monterey Rd (19, 35.8%), followed by US 101 (15, 28.3%) and McKean Rd (8, 15.1%). These roads were not monitored at-grade during this study. Roadkill data from this study resulted in identification of a stretch along US-101 where there was not previously recorded roadkill, between the Bailey Ave vehicle overpass to the Hwy 85 interchange.
- Monterey Rd had the highest rate of WVCs per mile of road surveyed in the study area (2.8 animals/mi), followed by US 101 (1.9 animals/mi), Bailey Ave (1.7 animals/mi), and McKean Rd (1.2 animals/mi). Santa Teresa Blvd had the lowest rate of WVCs per mile of road surveyed in the study area (0.9 animals/mi).

Recommendations

Based on the results from this and previous studies as well as best management practices for wildlife linkages, we developed a menu of potential wildlife connectivity enhancements for the NCVCA:

- Increase the permeability of the Bailey Ave. Fisher Creek Bridge for movement by large mammals and other species. Recommended actions include clearing sediment, modifying restrictive fencing, and/or restoring habitat upstream in a way that might help reduce sediment build-up.
- Retrofit existing culverts by increasing their dimensions and installing animal walkways to increase their permeability during periods when the culverts are flooded.
- Install new culverts and/or undercrossings (i.e., open span structure) along Santa Teresa Blvd that can facilitate wildlife movement on dry ground. If culverts and/or undercrossings are not a viable option, wildlife overpasses could be considered.
- Replace sections of the restrictive fencing and gates with wildlife friendly fencing designs that would also keep in cattle.
- Consider redesigning Santa Teresa Blvd so that there are two lanes of traffic rather than four lanes of traffic for the segment of the road north of Bailey Ave.
- Increase the permeability of Monterey Rd. by removing the anti-glare fence and installing lighting to reduce headlight glare, increasing the number and spacing of gaps in the median barrier to facilitate wildlife movement at-grade, and/or replacing sections of the median with an open median design (thrie-beam or cable barrier).
- Install directional fencing for US 101 from the Hwy 85 and US 101 interchange to the US 101 Coyote Creek Bridge to encourage wildlife use of existing undercrossings.
- Install wildlife-friendly fencing around Fisher Creek and the Fisher Creek bypass channel to exclude cattle. Fisher Creek has been identified as a critical component of the linkage and is a major throughfare for wildlife movement across the valley floor (Conservation Biology Institute 2017).
- Enhance vegetation to provide cover for wildlife movement along existing wildlife thoroughfares, and restore wildlife habitat in the NCVCA properties.
- Manage or limit recreation in the NCVCA properties to ensure the overall functionality of the linkage.

We recommend using a landscape-scale approach to increasing the permeability for multiple species wildlife movement between the North Coyote Valley protected properties. These recommendations should be further refined as part of the Coyote Valley Conservation Areas Master Plan planning effort and assessed for feasibility.

Future Research Needs

This and previous studies provide an important baseline of wildlife connectivity with Coyote Valley, and also highlight future research needs:

- Continue roadkill surveys to better understand and identify roadkill clusters/hotspots. McKean Rd should be prioritized for future surveys, as this was the first study to survey this road.

- Monitor Monterey Rd and McKean Rd at-grade and in combination with roadkill surveys to understand how animals are interacting with these roads.
- Identify and monitor any existing culverts along McKean Rd to assess wildlife use.
- Monitor "stepping stone" properties within and adjacent to Coyote Valley that serve as important core habitat to better understand wildlife use and movement within these properties.
- Complete wildlife surveys within the NCVCA properties. Key species to survey for include American badger and Western burrowing owls.

We also recommend ongoing monitoring and adaptive management to assess how wildlife respond to future management and restoration actions and refine and identify further wildlife connectivity enhancement recommendations.

2.0 Introduction

Coyote Valley is a 7,400-acre area between San José and Morgan Hill, consisting of primarily open space and agricultural lands, with some commercial and residential development throughout (Figure 1). Coyote Valley is a significant landscape for long-term ecosystem function and climate resilience in the San Francisco Bay Area and serves as an essential habitat connection between two core habitat areas of the Santa Cruz Mountains and the Diablo Range. Plant communities and wildlife depend on this linkage for migration, to find mates, and maintain genetic diversity – particularly in response to climate change (Corridor Ecology 2019, Conservation Biology Institute 2017).

The North Coyote Valley Conservation Area (NCVCA) was protected in fall 2019 and comprises nearly 1,000 acres protected as open space at a purchase price of $93.5M. Properties included as study sites within this area include NCVCA Laguna Seca, NCVCA Tulare Meadows, and NCVCA Addition (Figure 2). Other protected properties included as study sites within the study area include Tulare Hill and Santa Teresa County Park (Figure 2). The NCVCA has high conservation value, with rare ecological features such as the Laguna Seca wetland complex, serpentine features at Tulare Hill, and valley floor habitat (Conservation Biology Institute 2017).

However, there are several roads with high daily traffic volumes that bisect the NCVCA. These roads include US 101, Monterey Road, Santa Teresa Blvd., Bailey Ave., and McKean Road (Figure 1). Roads can be barriers to movement for animals and a significant source of mortality for wildlife populations due to high rates of animal-vehicle collisions (Urban Carnivores 2010). When roads are significant barriers to movement, this can also lead to negative genetic effects, such as genetic isolation between populations separated by roads (Safe Passages 2010). With reduced gene flow between populations, low genetic diversity often occurs, which reduces the health of wildlife populations and their ability to withstand disease (Road Ecology 2003).

There is evidence that roads are already impacting wildlife populations in Santa Clara County. For example, the mountain lion population in the Santa Cruz Mountains has been found to exhibit low genetic diversity, which may be attributed in part to habitat loss and highways creating a barrier to animal movement and genetic exchange among populations in the Santa Cruz Mountains, Gabilan Range, and Diablo Range (Ernest et al. 2003; Gustafson et al. 2018). Another local study found genetic differentiation between

California ground squirrels on either side of US Highway 101 (Gray 2017), suggesting that roads are acting as an effective barrier to gene flow between ground squirrels in Coyote Valley – and likely other taxa as well, such as American badgers (Diamond et al. 2022).

Previous wildlife connectivity studies conducted in Coyote Valley from 2015-2016 and 2017-2018 documented high numbers of wildlife species, varying from large to small mammals, hit on these roads by vehicles (Diamond and Snyder 2016, Diamond and Snyder 2018a). Monterey Road, which runs north-south through the entirety of Coyote Valley (Figure 2), is a well-documented barrier to wildlife movement in this ecologically significant region (Penrod et al. 2013; Diamond and Snyder 2018a). The existing physical characteristics of Monterey Road present challenges for wildlife attempting to cross (Diamond and Snyder 2016). With the exception of the Fisher Creek culvert, there are no entirely safe opportunities for wildlife to travel across the road. The existing median barrier, which includes an anti-glare fencing extension, impedes the ability of wildlife to successfully cross at-grade. This can lead to entrapment on the road and increased risk of wildlife-vehicle collisions.

Previous roadkill surveys conducted on US 101, Bailey Ave., Santa Teresa Blvd., and Monterey Road show that more than half of the documented roadkill in this region is along the section of Monterey Road between Bailey Ave. and Metcalf Road (Diamond and Snyder 2018a). The road itself reduces habitat available to wildlife and may contribute additional impacts due to street and vehicle lights, median barriers, changes in roadside vegetation, and garbage dumping. These habitat degradations can influence an animal's ability or interest in crossing the road. If successful crossing is possible at-grade, it comes with increased risk of mortality (Forman and Alexander 1998).

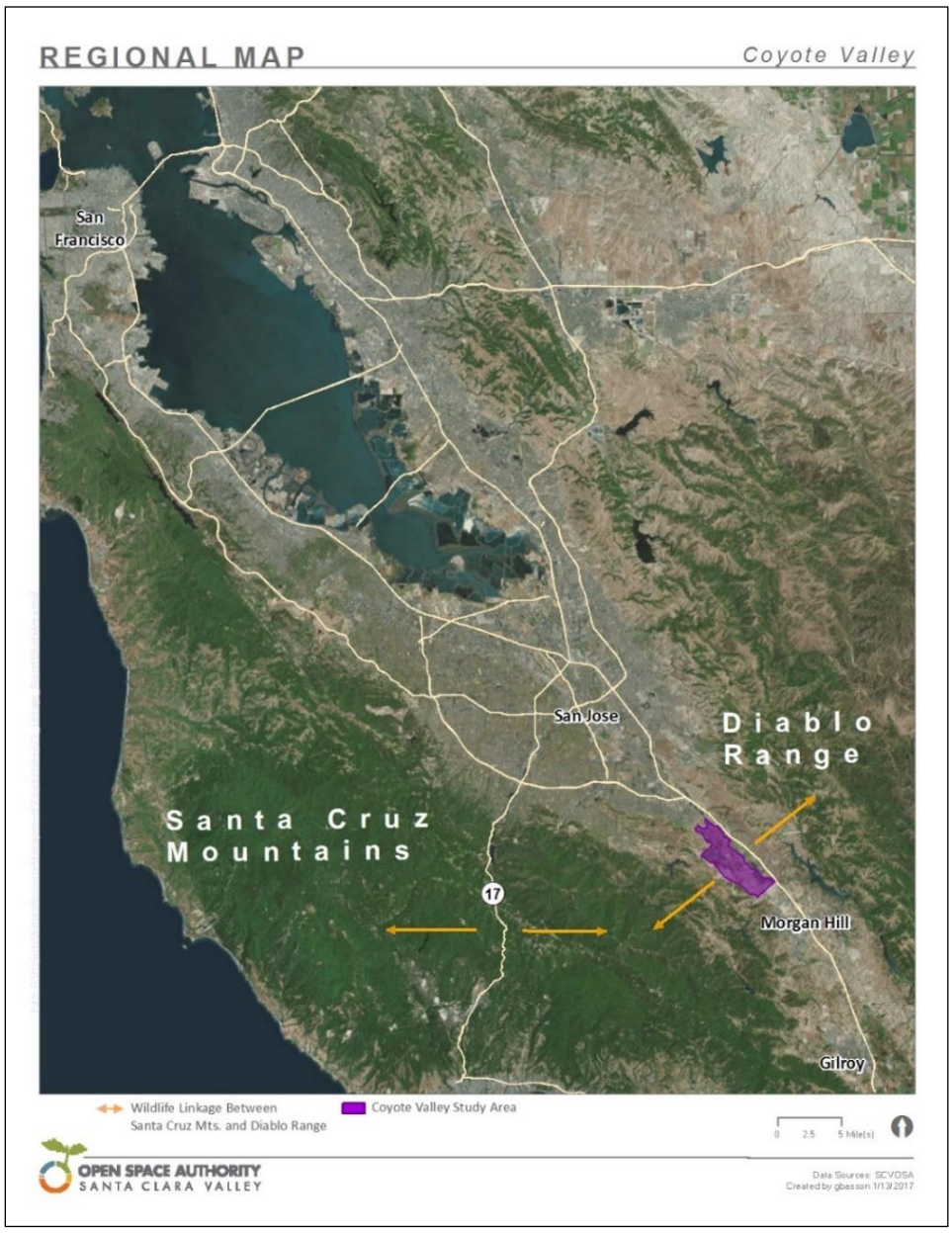

Figure 1. Coyote Valley in a regional landscape linkage context.

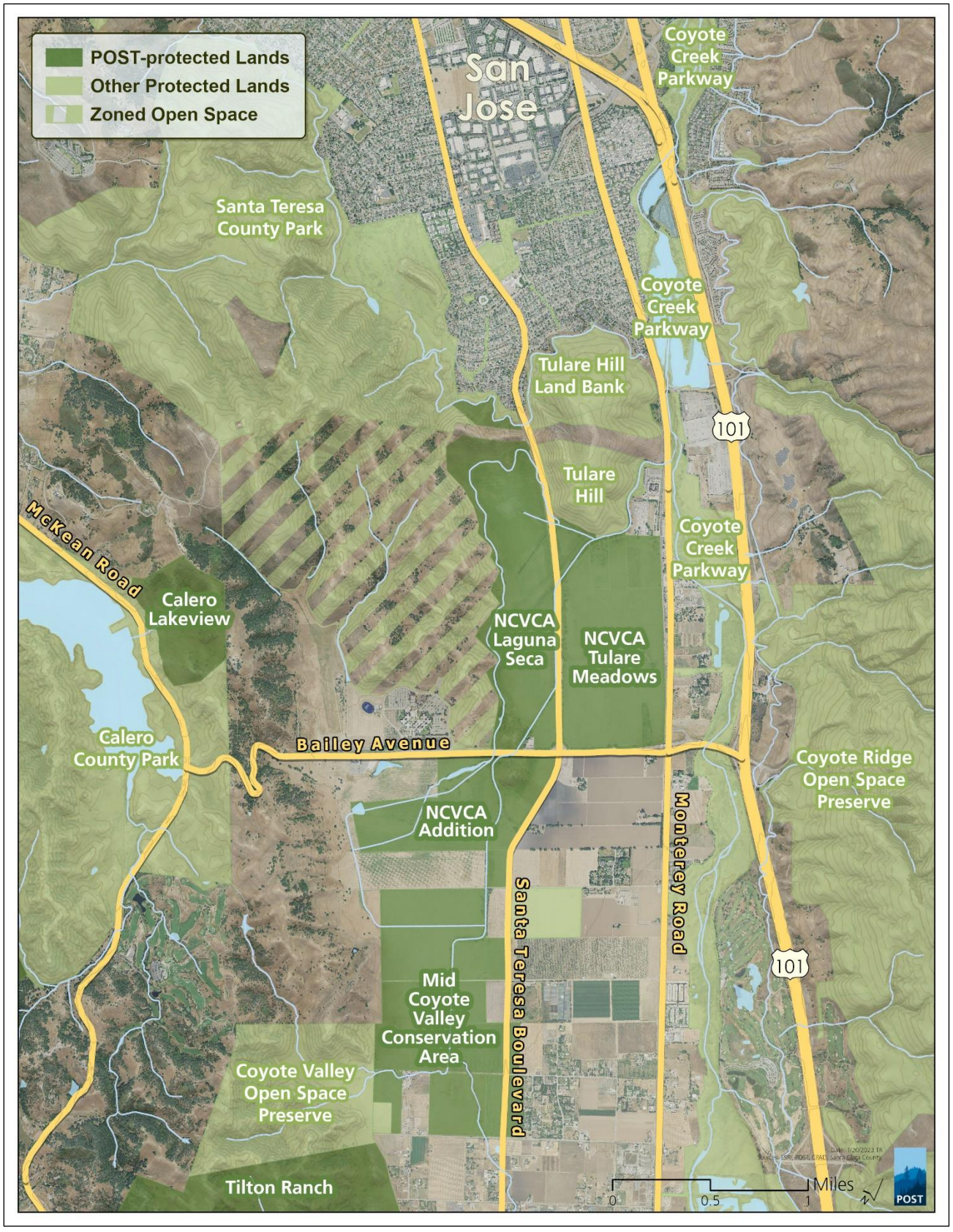

Figure 2. North Coyote Valley Conservation Area and other protected lands.

Previous studies in Coyote Valley have documented wildlife crossing and/or attempting to cross roadways both at road grade and below grade via existing infrastructure such as culverts and bridges, with the former posing a risk for wildlife-vehicle conflict. Studies from 2015-2016 and 2017-2018 found that several roads had high rates of roadkill of multiple species including deer, American badgers, bobcats, and coyotes (Diamond and Snyder, 2016, 2018a, 2018b). However, these studies also highlighted data gaps and research questions that we looked to address through the current study, including the need to survey roads not included in previous studies and the need to better understand at-grade wildlife movement.

One such road that has not been previously surveyed is McKean Road, located on the west side of Coyote Valley in the uplands. On August 8, 2019, a juvenile puma (*Puma concolor*) was found dead on McKean Road by Pathways for Wildlife (PFW). Don Rocha (Santa Clara County Parks) and several other staff members stated that they often see wildlife species such as deer, coyotes, and bobcats hit on McKean Road (Don Rocha pers comm. 10/23/2019). This suggested that this road might be serving as a barrier to wildlife that might otherwise move through Coyote Valley between the two adjacent mountain ranges.

Another research question that emerged from previous studies is the need to understand how wildlife are traveling between the newly acquired properties in the NCVCA, especially large mammals like deer. In 2019, PFW documented a deer carcass on Santa Teresa Blvd. at the median (Figure 3). This suggested the need for further study of the median to better understand if deer and other animals were using it for movement. This median is located in the northern section of Coyote Valley in the center of Santa Teresa Blvd. and is 50 feet (15 meters) in length. The median is densely vegetated with a variety of shrubs and trees, including several oak species (*Quercus* spp.).

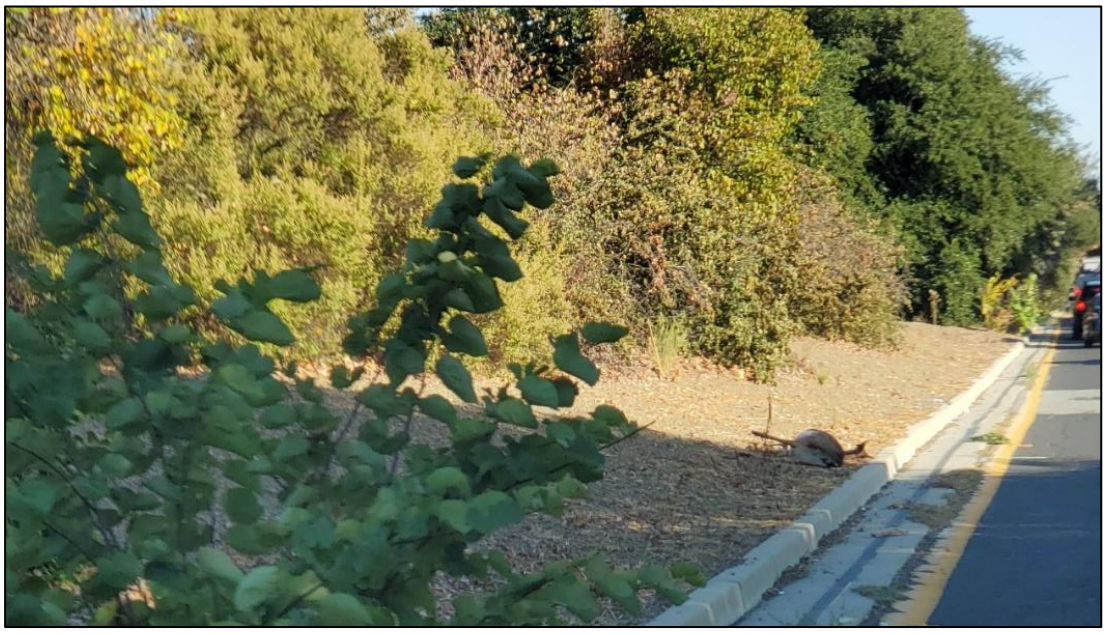

Figure 3. Deer was found dead on Santa Teresa Road at the median September 9, 2019.

During a field reconnaissance of the vegetated median on February 15, 2020, PFW documented several locations where there are separations in the vegetation, which closely resemble natural wildlife game trails in similar habitats devoid of roads. These breaks in the vegetation within the median are areas of interest for camera and track identification monitoring as they may serve as paths of least resistance in instances

where wildlife might attempt to cross Santa Teresa Blvd. at road grade. While investigating one of the breaks in the vegetation, we identified several deer tracks indicative of deer movement across Santa Teresa Blvd. (Figures 4 & 5).

Figure 4. Vegetation break and potential thoroughfare route within the Santa Teresa Blvd. median.

Figure 5. Deer tracks recorded at a break in the vegetation within the Santa Teresa Blvd. median.

3.0 Study Purpose and Goals

Given the importance of the study area for regional connectivity and ongoing human population growth and development, this study sought to evaluate the region's current ecological connectivity and identify opportunities to improve regional connectivity by building on previous research within Coyote Valley. The purposes of this project were to identify locations in which wildlife are: 1) crossing roads at grade (including potential use of the vegetated median for movement), 2) traveling under the roads through culverts and bridges, and 3) identifying locations of wildlife mortality on roads between protected properties in the NCVCA and adjacent protected properties. Based on the findings of the analysis, we provide data-driven recommendations to reduce wildlife-vehicle collisions and maintain or increase permeability of the landscape for wildlife, as appropriate.

Our specific goals for this study were as follows:

- Characterize wildlife use of culverts and bridges to travel under Santa Teresa Blvd. and Bailey Ave. adjacent to the NCVCA properties.
- Characterize wildlife crossings at-grade on Santa Teresa Blvd. and Bailey Ave adjacent to the NCVCA properties.
- Characterize wildlife mortality on roadways, including any wildlife-vehicle collision "hotspots" within the study area.
- To the extent possible, assess and compare successful and unsuccessful at-grade crossings, with "successful" defined as a crossing without mortality on the road. This aspect of the analysis applies to the stretches of Santa Teresa Blvd. and Bailey Ave. that are adjacent to the North Coyote Valley Conservations Areas.
- Provide recommendations to reduce wildlife-vehicles collisions and maintain or enhance habitat connectivity.
- Identify locations where maintenance and/or upgrades for existing transportation infrastructure could increase the permeability of the landscape and reduce wildlife–vehicle collisions.
- Identify locations where new wildlife passage infrastructure may be beneficial to increase the permeability of the landscape and reduce wildlife–vehicle conflict.

The findings of this study will contribute to and help inform the science and community-based planning process, the Coyote Valley Conservation Areas Master Plan (CVCAMP), which is being led by the Santa Clara Valley Open Space Authority (OSA) with key partners Peninsula Open Space Trust (POST) and the City of San José. The planning process will guide the future use and management of the NCVCA. This study addresses the need to develop wildlife connectivity enhancement strategies that will support near and long-term conservation efforts in Coyote Valley, which is particularly timely following recent land protection successes in the valley floor.

4.0 Methods

The methods used in this study to meet our goals included (a) camera monitoring of wildlife passage at undercrossing structures (bridge, culverts), (b) camera monitoring of wildlife detections along and on roads at-grade, (c) camera monitoring of wildlife passages through fences and gates, and (d) roadkill surveys via bicycle and car. This combination of camera monitoring and roadkill data allowed us to identify locations where animals are crossing roads successfully and also unsuccessfully, as well as where animals are being detected along roadways. The study period was from March 2021-June 2022. The combination of the roadkill data and camera analyses were used to develop recommendations for wildlife connectivity enhancements.

4.1 Culvert and Bridge Monitoring

Culverts and bridges are important locations that might allow animals to cross beneath roads safely. Using encroachment permits from the City of San José, we monitored wildlife passage through four existing undercrossings under Bailey Ave and Santa Teresa Blvd. Bailey Ave features two structures that were monitored for wildlife movement. The first is a bridge where Fisher Creek flows under Bailey Ave. This bridge consists of three sections with the center section being the largest to facilitate water flow from Fisher Creek. The second structure was a 3-foot round culvert to the west of the Bailey Bridge at Fisher Creek. This culvert facilitates the flow of a small canal under Bailey Ave.

We also monitored two culverts on Santa Teresa Blvd. The northernmost culvert is the Coyote Alamitos Canal where there is a 4-foot cement box culvert, that has been previously monitored. The second culvert is a three-foot box culvert at Laguna Seca that was not previously monitored.

Cameras were set up on one side of each structure to minimize impacts to wildlife. In our experience, setting up cameras on both sides of structures tends to spook animals. Even though the cameras are infrared non-flash cameras, they still emit a low red glow, which animals can see. Cameras were set up in the best manner possible to determine if an animal crossed through a structure in an unobtrusive manner.

We defined a successful passage as when an animal is documented crossing through the entire culvert or bridge. If the animal is recorded at the entrance of the culvert or bridge but does not travel through the structure, we record that as a detection.

4.2 At Grade Crossings

This study also sought to characterize wildlife crossings at-grade on Santa Teresa Blvd. and Bailey Ave adjacent to the NCVCA properties. This information, when combined with roadkill surveys, can provide important insights into whether animals are able to successfully cross these roads at-grade. The roads surveyed for at-grade crossings included Santa Teresa Blvd and Bailey Ave, along with frontage and access roads adjacent to Bailey Ave.

We monitored wildlife detections along Santa Teresa Blvd on both sides of the road and in the vegetated median across 26 camera sites. Southeast of the Fisher Creek Bridge, Santa Teresa Blvd features a vegetated median along 0.76 miles (1.23 km) of its length that measures 49 feet (15 m) wide not including the road (Figure 6). Along this section of Santa Teresa Blvd., the road changes from two lanes to four lanes and the total width measures 98 feet (30 m). Except for one break in the median for a U-turn, the vegetated median stays intact and Santa Teresa remains four lanes until the intersection with Bailey Ave. For the remaining 2.0 miles (3.3 km) southeast of the intersection with Bailey Ave., Santa Teresa Blvd. returns to a

two-lane road with no median, and alternates between 32 ft (10 m) and 42 ft (13 m) wide (including both shoulders).

We monitored wildlife at grade road crossings by setting up PIR (passive infrared) motion-activated cameras at the numerous breaks in vegetation within the median of Santa Teresa Blvd. to determine if wildlife was traveling through the median and across the road (Figure 6). We also set up cameras along the frontage of the protected properties closest to Santa Teresa Blvd on both sides of the road. The goal was to use the paired camera stations (east and west sides of the road and vegetated median) to see if animals successfully crossed the entire extent of the road, using time stamps and distinguishing features to identify individual animals. However, we encountered challenges determining whether detections on either side of the road and the median were actual successful at-grade passages. As a result, we defined these as at-grade detections, rather than passages. At-grade detections are defined as wildlife detected traveling towards or on the road surface or median, not including detections of wildlife captured adjacent to the road (such as on the sidewalk or on the edge of the NCVCA properties).

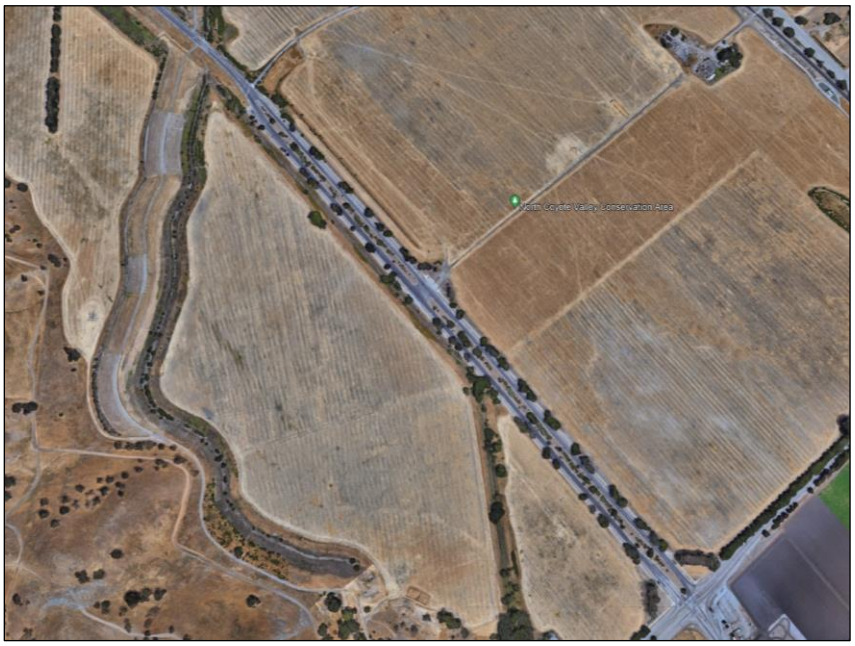

Figure 6. Santa Teresa Blvd.'s vegetated median by the intersection with Bailey Ave.

Figure 7. Bailey Ave.'s vegetated median by the intersection with Santa Teresa Blvd.

We also set up cameras to monitor wildlife detections along Bailey Ave, as well as the frontage road and access road that both run parallel to Bailey Ave near its intersection with Monterey Rd, for a total of nine camera sites. Between Bailey Ave. and Santa Teresa Blvd. intersection and a PG&E building, there is a vegetated median (Figure 7). This median was monitored with the same survey techniques as the Santa Teresa Blvd median as described above.

4.3 Santa Teresa Blvd. Fence Line and Gates

At the beginning of the study period, we added six additional camera sites beyond the original project proposal to try to document if wildlife were crossing through the fence line at Laguna Seca as they traveled between the NCVCA properties that border Santa Teresa Blvd. To answer this question, we set up wildlife cameras at the three different fencing types: 1) five strand barbed wire, 2) six strand barbed wire, and 3) chain link fencing.

Additionally, when we walked the entire length of fencing during the scouting phase, we documented areas with inconsistencies in the fencing structure. For example, we found areas with loose or missing strands of barbed wire, gaps, and openings in the fence line (Figures 8-10). Upon closer inspection of the areas around these openings, we also recorded hair caught on barbs, digs, and wildlife tracks leading to and from the property to Santa Teresa Blvd. and vice versa. Therefore, to gather a more comprehensive data set of how wildlife was navigating their way through the openings in the fence line, we set up camera stations at these areas as well. Figure 11 is a map showing the location and extent of fencing. We report on data from four fence line cameras and five gate cameras.

Figure 8. Five-strand barbed wire with a gap between the second and third strand from bottom.

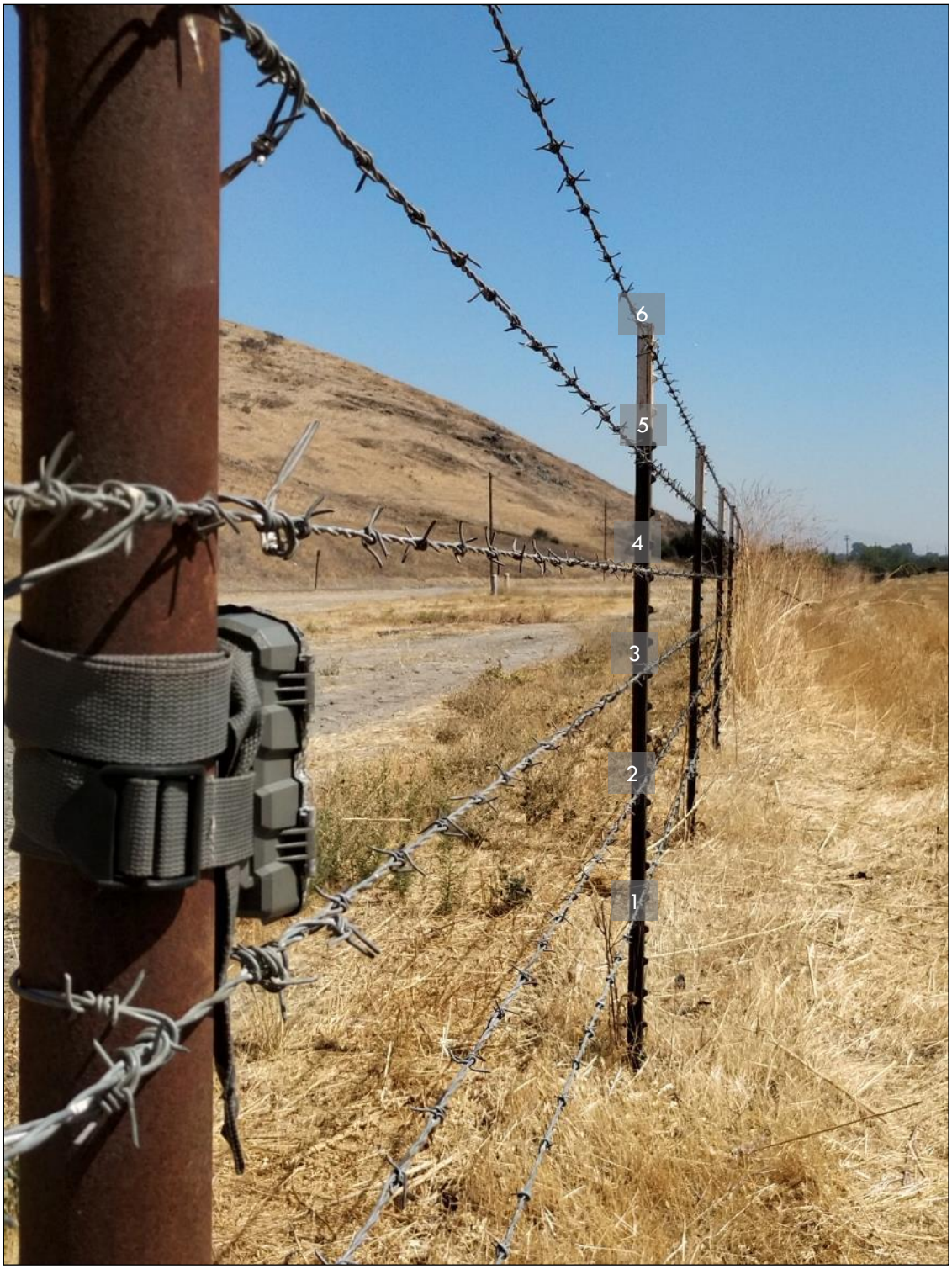

Figure 9. Six-strand barbed wire, fencing along the west side of Laguna Seca at Santa Teresa Blvd.

Figure 10. Gap in chain link fence near Fisher Creek Culvert.

Figure 11. Map showing location and extent of fencing.

4.4 Camera Monitoring and Data Analysis

Digital infrared ("no-glow") cameras were set up in a way that was non-invasive to animals at 52 sites between March 2021 and April 2021 across undercrossings, at-grade, fence, and gate sites as described above (Figure 12). The cameras were motion-activated and set up to record for 24-hour periods each day. When possible, cameras were also set up on video to record relevant animal behavior. Cameras were checked every three weeks when possible. We encountered several challenges with camera monitoring, which resulted in fewer sites being monitored than initially expected. We replaced malfunctioning or stolen cameras when possible, but ultimately resulted in a set of 48 sites out of the 52 monitored with adequate data for analysis, including three culverts, one bridge, four fence sites, five gates, nine at-grade cameras along Bailey Ave, and 26 at-grade cameras along Santa Teresa Blvd.

We experienced repeated theft at several of the camera stations and also lost cameras that were malfunctioning due to a defect in the model, resulting in a loss of 18 cameras. Additionally, the vegetated median was challenging to monitor as there was a homeless encampment with two people residing within the median. We also experienced camera theft within the median. After recording a person with a saw cutting down branches within the median and a close encounter with one of the residents, it was deemed too dangerous to continue trying to monitor this location.

We also experienced a defect in the Stealthcam model, G45 NGMax. The battery casing is not secure from moisture and water and often the batteries would corrode, along with several instances with the SD cards, resulting in data gaps. Due to the pandemic, Stealthcam had large orders of cameras back ordered and we did not receive replacements. After the NCVCA Laguna Seca fence line was worked on by maintenance crews, several of the fence line cameras were also found missing, and were unable to be replaced due to a camera shortage.

Within the camera database, we noted when there were data gaps due to battery corrosion, theft, or vandalism incidents to explain data gaps. For our data analysis, we totaled the frequency and type of use (detection, successful passage) of each undercrossing and at-grade detection by wildlife species. Successful passages were defined as passage of an animal through a culvert, bridge, fence, or gate. Though the intention was to capture animals crossing successfully at-grade across Santa Teresa Blvd by pairing time stamps at paired camera stations on both sides of the road and the median (where applicable), this proved difficult, and instead these data are characterized as at-grade detections of animals. Similarly, data captured of animals at the Bailey Ave at-grade sites were characterized as at-grade detections.

Records across the camera monitoring sites varied, and over the course of the year, there were data gaps due to issues such as camera theft and camera malfunctions. To correct for unequal sampling effort across sites due to camera theft or malfunction, we standardized the data to allow for comparison of data of successful passages from all sites. We standardized data for each site to represent 100 trap nights by summing all detections for each species over all days, dividing by the total number of days the camera was operational, and then multiplying by 100 (Jenks et al. 2011).

For each photo/video captured, we recorded the camera's date and time stamp, number of individual animals, sex of individuals when possible, number of juveniles, direction of travel, moon phase, temperature, and any notes or description pertinent to data collection, such as relevant ecological and behavioral information and species interactions. These data were integrated into a camera master database.

Upon completion of the project, special status species detected will be entered into the California Natural Diversity Database (CNDDB) maintained by CDFW.

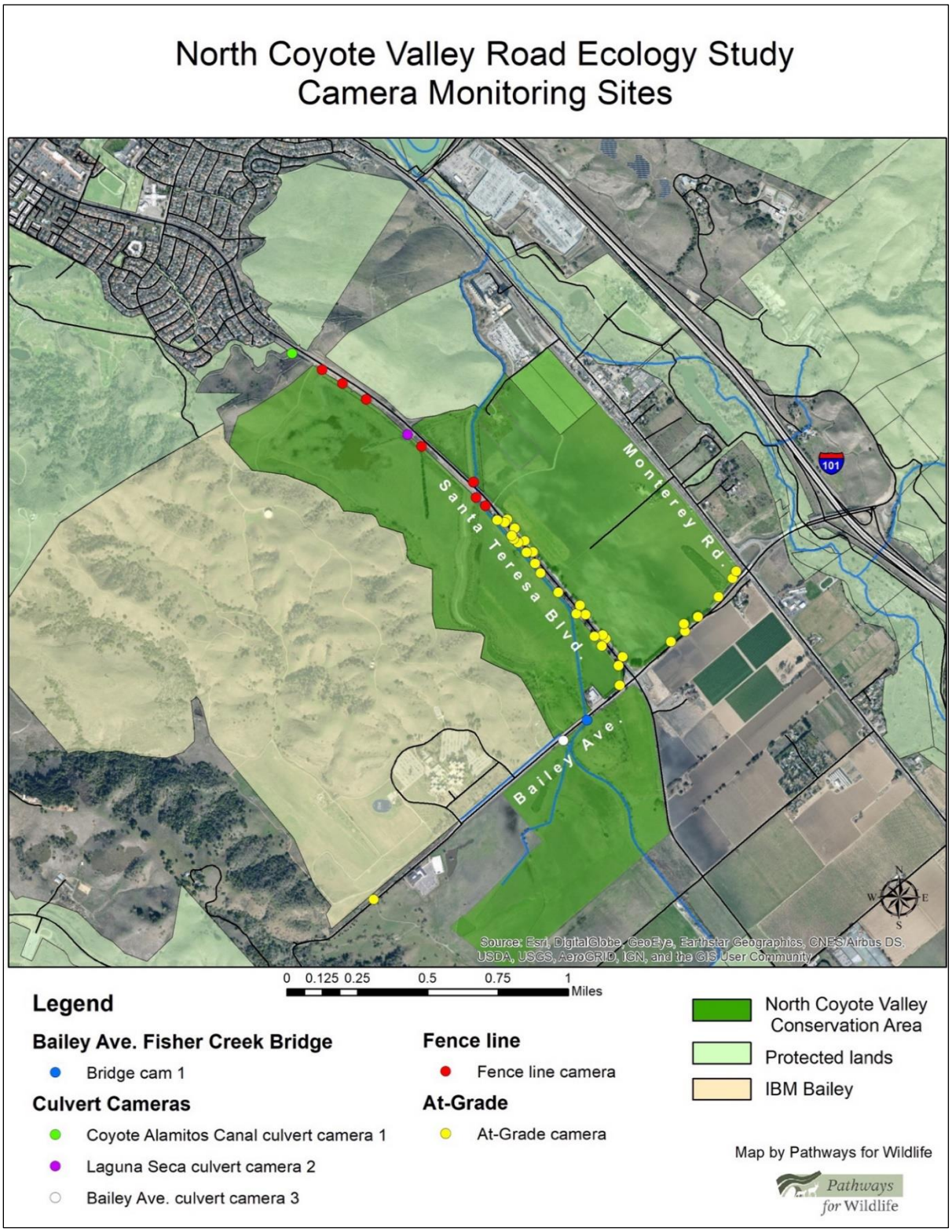

Figure 12. North Coyote Valley 48 camera monitoring sites.

4.5 Roadkill Surveys

Roadkill data represent wildlife–vehicle collisions (WVCs) and can indicate unsuccessful passages where wildlife attempt to cross roads at-grade and are hit and killed by vehicles. WVC data together with camera monitoring data of undercrossings and at-grade roadside detections can help inform where new or improved wildlife crossing structures could facilitate safe passages under or over roads. Data on where animals are killed on roads can also inform placement and extent of directional fencing to guide wildlife to crossing structures or culverts and bridges where wildlife have been recorded traveling safely under the road.

We conducted weekly routine roadkill surveys each month of the study period. We conducted both the driving surveys and bike surveys on the same day of field work. Field work days varied each week. We conducted the roadkill surveys in the morning in an attempt to collect data before the carcass was collected by Caltrans or dragged away by a scavenger. Data collected in these surveys included geographic coordinates, species, number of individuals, and photographs, when possible. Some locations were too dangerous to pull over to take photos.

A total of five roads were included in the study area (Figure 9). The start and stopping points for each segment of the road monitored is included in Figure 9. These roads included:

1. US-101: US-101 is a six-lane highway, oriented northwest by southeast. It is a commuter highway with high volumes of traffic on a daily basis. US-101 connects the cities of Morgan Hill and Gilroy to the City of San Jose along with the rest of the Peninsula. The northbound and southbound lanes each consist of three lanes for the entire stretch of the study area. The roadkill vehicle survey length for US 101 was 7.8 mi.
2. Monterey Road: Monterey Road is a four-lane road, oriented northwest by southeast. It is a commuter highway with high volumes of traffic on a daily basis. Monterey Road bisects Coyote Creek County Park and NCVCA Tulare Meadows in the study area. The northbound and southbound lanes each consist of two lanes for the entire stretch of the study area. The road also features a concrete median with an anti-glare fence extension for much of its length, resulting in a nearly 5' high barrier. The roadkill vehicle survey length for Monterey Rd was 6.7 mi.
3. Santa Teresa Boulevard: Santa Teresa Blvd. is oriented northwest by southeast. Where it passes over the Coyote Alamitos Canal, it turns into a two-lane commuter road that is 45 ft (14m) wide including the shoulders, with no median, and remains this way for the next 0.91 miles (1.47 km). The road turns into four lanes at the vegetated median approximately halfway through the surveyed section. The roadkill vehicle survey length for Santa Teresa Blvd was 6.4 mi, of which 3.2 mi were also surveyed via bicycle.
4. Bailey Avenue: Bailey Ave. is oriented northeast by southwest and is linear from the intersection with Monterey to the southwestern border of the IBM property. From the southwestern border of IBM to McKean Road (westward), Bailey Ave. ascends and becomes winding. Most of Bailey Ave. is 4 lanes with sections consisting of vegetation, including a vegetated median to the west of Santa Teresa Blvd. However, it does alternate to two lanes with no median, especially as it heads toward McKean Road. The roadkill vehicle survey length for Bailey Ave was 3.0 mi, of which 1.9 mi were also surveyed via bicycle.

5. McKean Road: McKean Road is a curved route which starts off in a west by east orientation, then curves down in a north by south orientation. McKean Road bisects Coyote Valley to the east and a large expanse of protected lands to the west in the Sierra Azul, including Calero County Park, which is directly adjacent to McKean Road. The roadkill vehicle survey length for McKean Rd was 6.7 mi.

4.7 Roadkill Data Collection and Data Analysis

We employed two methods of roadkill data collection in this study. The first was a standard "windshield survey" or roadkill survey conducted via vehicle. This method is safe for the surveyor and allows vast areas to be covered in a relatively short amount of time. This method involves recording which species of wildlife is found dead on the road, taking photos, collecting GPS locations, and documenting date and time of occurrence. This method is ideal for windy roads with no shoulder where caution is required, such as the western portion of Bailey Ave. toward McKean Road. Driving survey routes and length for this study included Bailey Ave (3.0 mi), McKean Road (6.7 mi), Monterey Rd (6.7 mi), Santa Teresa Blvd (6.4 mi), and US 101 (7.8 mi). The start/stop points for these routes are displayed in Figure 13.

We included bicycle surveys where we had access to safely ride bikes (Figure 13). Bicycle surveys allowed us to collect the same data as vehicle surveys, but also allowed for a more thorough inspection and more precise identification. Roadkill surveys via bicycle are ideal for roads with wide shoulders, slower moving traffic, and at the frontage of the NCVCA properties. Bicycle surveys are not safe for windy roads like those of the western portion of Bailey Ave. toward McKean Road. Bicycle survey routes and length for this study included Bailey Ave (1.9 mi) and Santa Teresa Blvd (3.2 mi). Bicycle survey routes overlapped with the vehicle survey routes along these two roads. The start/stop points for these routes are displayed in Figure 13.

The results from the roadkill surveys were used to identify roadkill locations where wildlife was attempting to cross roads and hit by vehicles along with cluster locations where wildlife was routinely being hit. These data were used to identify locations as potential candidates for wildlife connectivity enhancements, such as directional fencing to guide wildlife to bridges and culverts that wildlife was recorded traveling through by the camera survey or locations where the installation of a wildlife crossing would be beneficial.

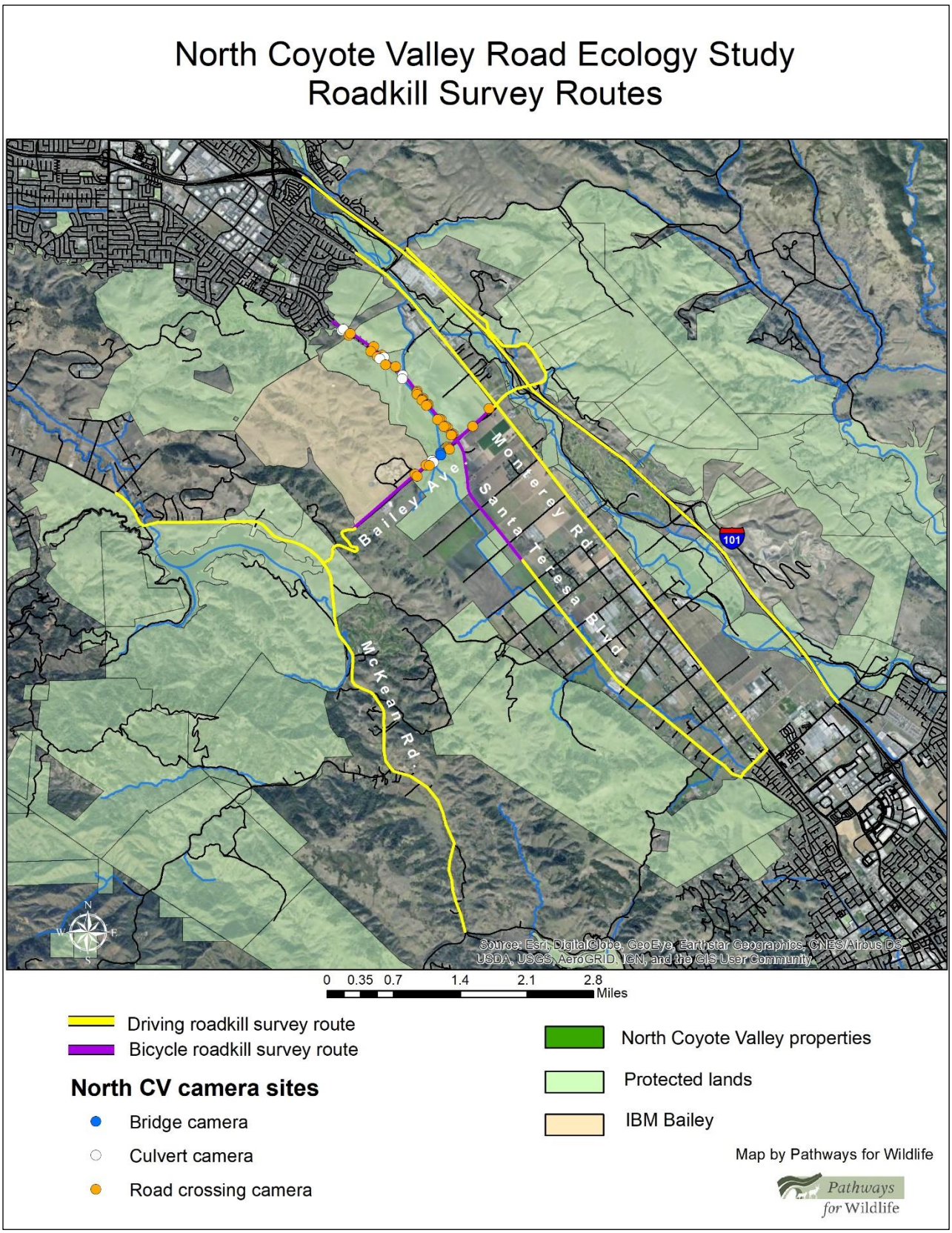

Figure 13. North Coyote Valley roadkill survey routes. Note that bicycle survey routes (in purple) were also surveyed via vehicle.

5.0 Camera Data Results

This section describes the results of camera monitoring at at-grade sites along Santa Teresa Blvd and Bailey Ave, culverts and bridge undercrossings, and fence and gates. We present standardized data across 100 trap nights for ease of comparison across sites and to address issues with data gaps from camera theft and malfunction.

5.1 100 Trap Night Analysis

We recorded a total of 1,153.6 standardized detections (inclusive of passages/at-grade detections across 100 trap nights) during the twelve-month monitoring period across all sites (at-grade, undercrossings, and fences/gates) (Table 14). Species detected included American badger, bobcat, coyote, deer, domestic cat, domestic dog, gray fox, opossum, raccoon, striped skunk, and wild pig. Smaller mammals like long-tailed weasel were not detected, nor were mountain lions.

The species with the highest passage/at-grade detection rates for the entire study area include coyote (*Canis latrans*) (684.9, 59.4%), wild pig (*Sus scrofa*) (175.1, 15.2%), and raccoon (*Procyon lotor*) (140.4, 12.2%). This was followed by mule deer (*Odocoileus hemionus californicus*) (77.8, 6.7%) and bobcat (*Lynx rufus*) (44.1, 3.8%). The Supplemental Information for this report includes a spreadsheet of the total and standardized passage and at-grade detections for each site.

The monitoring sites with the highest rates of standardized detections included four of the Bailey Ave at-grade sites, the Bailey Ave culvert, two of the Santa Teresa at-grade sites, and one of the Santa Teresa fence line cameras. These sites included Bailey Ave. IBM N (187.1), Bailey Ave. Access Road Cam 1 (133.9), Bailey Ave. Access Road Cam 2 (132.7), Santa Teresa At-Grade Site 13 Median (120.8), Santa Teresa Fence line Cam 6 (88.9), Santa Teresa At-Grade Site 13W (77.3), Bailey Ave. Culvert (75.7), and Bailey Ave. Access Road Cam 3 (65.3).

North Coyote Valley Camera Monitoring Sites (June 2021-July 2022)	Total Detections (All Species)	Standardized Passages and At-Grade Detections (All Species)	Standardized Passages and At-Grade Detections (No Domestic Animals)
Bailey Ave at-grade cameras	1162	562.2	554.4
Culvert and bridge cameras	233	74.2	74.2
Fence line and gate cameras	354	176.8	176.3
Santa Teresa Blvd at-grade cameras	864	340.4	327.1
Totals	**2613.0**	**1153.6**	**1132.0**

Figure 14. Total and standardized native species passages and at-grade detections, inclusive of wild pig.

The vast majority of detections occurred at at-grade sites along Bailey Ave and Santa Teresa Blvd. The Bailey Ave. at-grade cameras had the highest standardized passage/at-grade detection rate (562 at-grade detections), followed by the Santa Teresa Blvd. At-Grade cameras (337 at-grade detections). This was followed by the fence line and gate cameras (176 passages). The culverts and bridge sites recorded the lowest rate of standardized passages (73 passages) (Figure 15). These data indicate that there are high rates of wildlife occurring at-grade on the roads adjacent to the NCVCA properties, with limited use of existing undercrossings for safe passage beneath roads. Bailey Ave had the highest rates of detections despite only having nine camera sites compared to twenty-six cameras along Santa Teresa Blvd. The differences in number of detections and passages might also be explained in part by differing sampling effort across site types (e.g., four cameras at undercrossings compared to twenty-six cameras along Santa Teresa Blvd).

Of the culverts and bridge monitored, the Bailey Ave. culvert camera had the highest standardized passage rate (65), which made up 89% of the overall detections recorded at all three culverts and the Bailey Bridge (Figure 15). The other culverts and the bridge recorded very low rates of wildlife passages, suggesting they are not currently effective at moving wildlife safely beneath Bailey Ave and Santa Teresa Blvd. Of the fence line and gate camera sites, the Santa Teresa Fence Line Site 6 had the highest standardized passage rate (71), which made up 40% of the overall detections recorded for these sites (Figure 16).

Bailey Ave and its associated frontage and access roads had more standardized at-grade detections relative to Santa Teresa Blvd, despite having fewer at-grade cameras. Of the Santa Teresa Blvd at-grade camera sites, Site 13 Median had the highest standardized at-grade detection rate (115), which made up 34% of the overall at-grade detections recorded at these sites (Figure 17). Of the Bailey Ave at-grade camera sites, Site IBM N had the highest standardized at-grade detection rate (172), which made up 31% of the overall at-grade detections recorded at these sites (Figure 18).

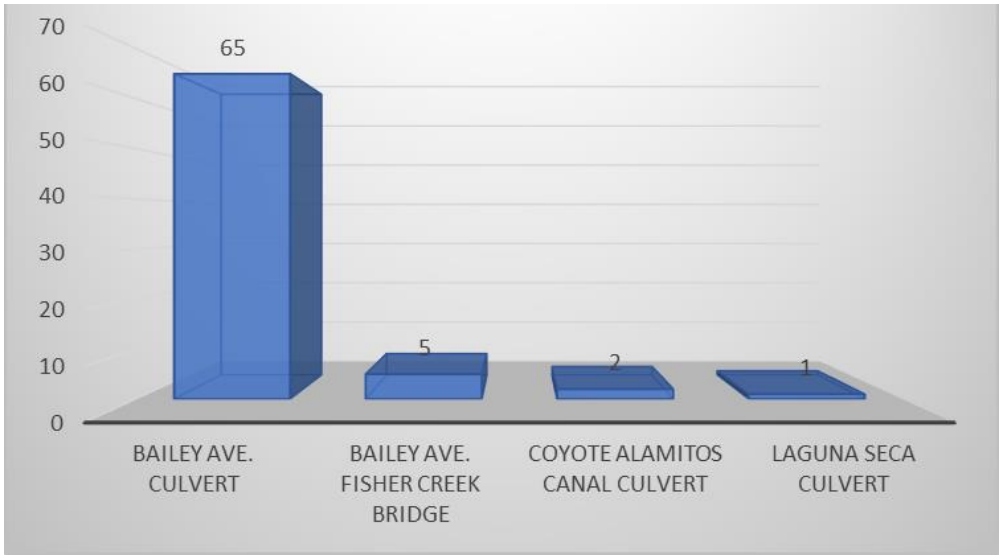

Figure 15. Standardized culvert and bridge passages.

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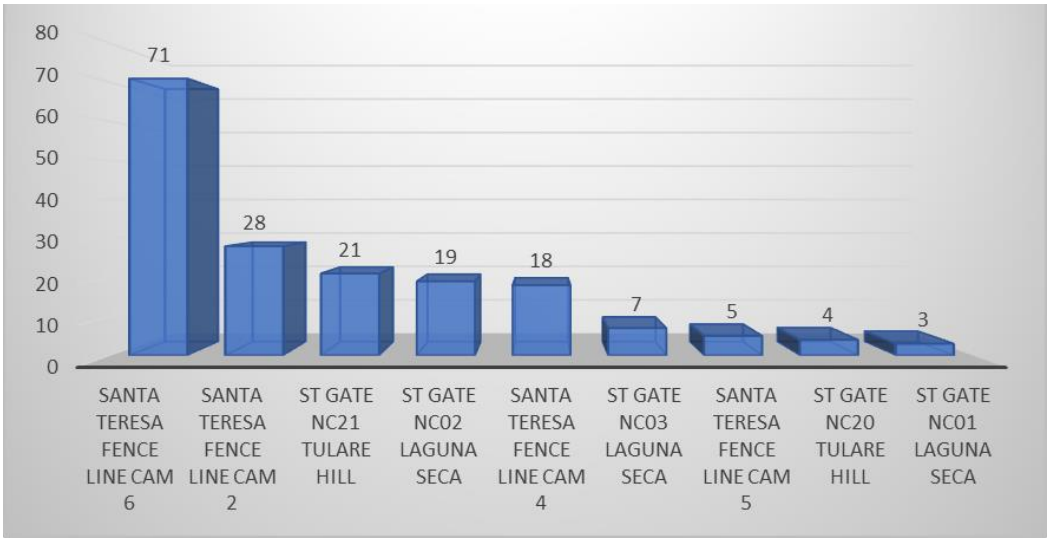


Figure 16. Standardized fence line and gate passages.

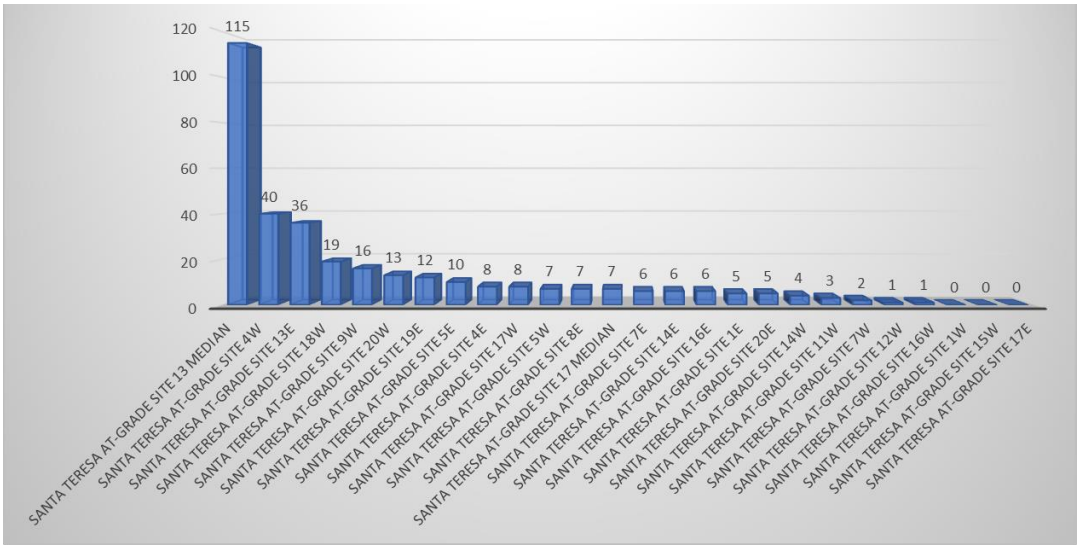


Figure 17. Standardized Santa Teresa Blvd. at-grade detections.

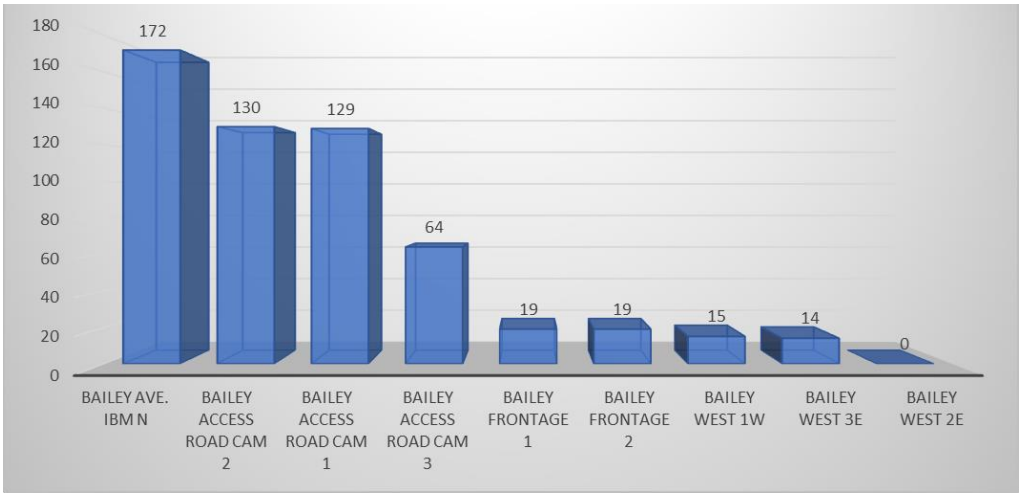


Figure 18. Standardized Bailey Ave. at-grade detections.

5.2 100 Trap Night Analysis by Species

The standardized passages and at-grade detections for species at at-grade cameras, fence and gate cameras, culverts and bridge cameras are displayed in Figures 19-21. The species with the highest standardized passages at the combined fence and gate sites were deer (71.4) and coyote (47.2) (Figure 19). The species with the highest standardized passages at the combined culverts and bridge was raccoon (66.1), with few passages by other species (Figure 20). The species with the highest standardized detections at the combined at-grade cameras along Santa Teresa Blvd and Bailey Ave were coyote (637.0), wild pig (153.5), and raccoon (58.5), with few detections of other species (Figure 21).

Overall, the sites with the highest use by bobcats and deer were the fences and gates, while the sites with the highest use by coyotes were at-grade sites along Bailey Ave and Santa Teresa Blvd. Deer were detected primarily passing through and walking along the fence line at NCVCA Laguna Seca. Coyote, wild pig, and raccoon had the most at-grade detections, though coyotes were recorded more often at Bailey Ave sites than Santa Teresa Blvd sites. Bailey Ave had more standardized at-grade detections relative to Santa Teresa Blvd. Notable species detections included a badger passing through the ST Gate NC01 Laguna Seca and a gray fox passing through the Bailey Ave Fisher Creek Bridge. Bobcat, deer, opossum, and striped skunk had lower rates of standardized passages and at-grade detections relative to other species, most notably coyote, wild pig, and raccoon.

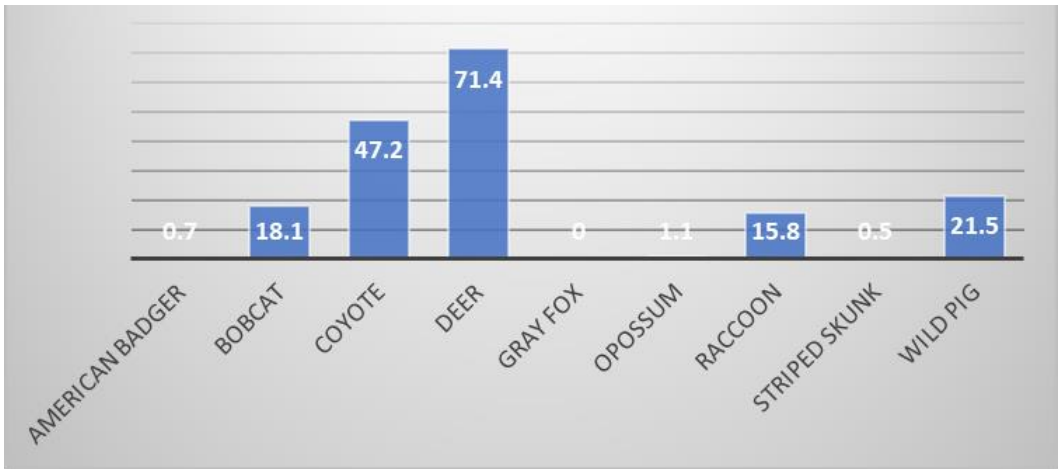


Figure 19. Standardized species passages at combined fence & gate sites along Santa Teresa Blvd.

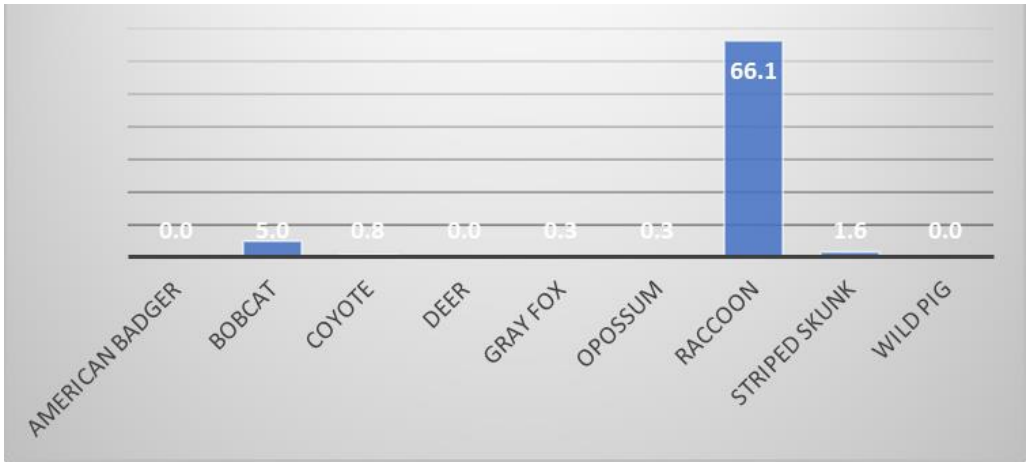


Figure 20. Standardized species passages at combined culvert and bridge sites.

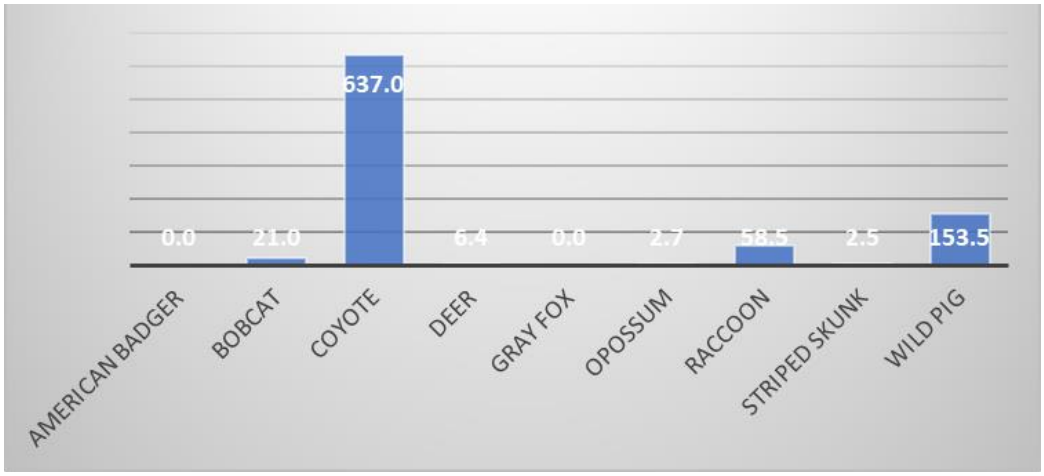


Figure 21. Standardized species at-grade detections at combined at-grade sites along Bailey Ave and Santa Teresa Blvd.

5.3 Paired Camera Data Analysis and At-Grade Crossings

The study was set up with paired at-grade sites along Santa Teresa Blvd with the intention to record if an animal traveled from one side of the road to the other side. Cameras were set up on both sides of the road and the median (where applicable) along transects. We set up the camera at the median with the objective to record if the animal crossed at the median between the two cameras set up on either side of the road.

We conducted a paired analysis with eleven paired camera sites for which data were available to determine if there were any series of pictures of animals traveling from one side of the road to the other side within the paired cameras. Unfortunately, we did not record any confirmed passages with the pair of cameras. This was due to several reasons. First, the majority of detections recorded on the same day or time period were at the same camera, for example, a family of coyotes traveling together minutes apart or wild pigs foraging on the sidewalks. Second, for many of the detections on the same day across paired camera sites, there was too long of a time period between crosses to be a paired cross.

There were only four potential paired crossings by pigs at Site 13. For example, between two paired cameras, we recorded pigs 17 minutes apart, which could be a potential paired crossing. However, it could be other pigs crossing from the median to join larger groups on the east side though as many of the camera records included large pig families foraging acorns under the oak trees along the sidewalks. Therefore, we can't be certain these are paired crossings. There was one potential paired crossing at Site 17 in which we recorded a bobcat 19 minutes apart. The bobcat could have been exploring the median or hunting in the median within the 19-minute period.

The camera data suggest that animals may not be crossing the road in a straight line. We recorded animals traveling north and south in the vegetated median. It seems that once an animal crosses either the north or south bound lanes, they could then travel different directions within the median. We also recorded coyotes crossing from the median but then heading south along the southbound lane instead of traveling directly across the road.

We did record images of animals that suggested successful passage across Santa Teresa Blvd. For example, Santa Teresa At-Grade Site 4 East recorded a coyote traveling east and west at the Tulare Meadows on the same day, 6/1/2022 (Figures 22-23). The coyote looks like it is the same individual in both pictures because of the thin tail.

Figure 22. Santa Teresa Blvd. Site 4 E, coyote heading east into the Tulare Meadows property on 6/1/2022 at 10:23 am.

Figure 23. Santa Teresa Blvd. Site 4 E, coyote heading west out of the Tulare Meadows property on 6/1/2022 at 2:50 pm.

This same coyote was also recorded on the other side of Santa Teresa Blvd approximately one year prior, suggesting it had successfully crossed the road before. The coyote was recorded heading east towards oncoming traffic to cross the road at Santa Teresa At-Grade Site 5 West on 5/7/2021 (Figures 24-25). It was then recorded on the opposite side of the road on 5/18/2021 at Santa Teresa At-Grade Site 5 East (Figure 26). Though camera traps didn't pick up this coyote on both sides of the road on the same day, this

sequence of photos across time and camera stations suggested that this coyote has successfully crossed Santa Teresa Blvd.

Figure 24. Coyote crossing at Santa Teresa Blvd. on 5/7/21at Site 5 west.

Figure 25. Coyote crossing at Santa Teresa Blvd. on 5/7/21 at Site 5 west.

Figure 26. Coyote crossing at Santa Teresa Blvd. on 5/18/21 at Site 5 east.

5.4 Challenges

We did encounter some challenges with the at-grade cameras. Unlike cameras that are aimed at recording wildlife traveling through a bridge or culvert, the at-grade cameras were set up along fence lines and high up on trees to document wildlife interactions with the fence line and wildlife traveling across the road at-grade. Unfortunately, the fence line cameras recorded blowing grass and vegetation, which quickly filled the SD card in a matter of days, resulting in significant data gaps.

The cameras set up on trees along Santa Teresa Blvd. and Bailey Ave. encountered a similar problem, as they also recorded blowing vegetation as well as movement in the surrounding trees and branches. We also found that there is a high amount of daily human activity, both during the day and in the evenings, of people walking and biking along the sidewalks. This made it extremely challenging as this footage also quickly filled up the SD cards. Compounded with typical reasons for data gaps such as theft issues and camera malfunctions, it resulted in large data gaps for some cameras.

The 100-Trap Night calculation allowed us to compare camera stations. Even with the data gaps, we had a large enough camera array and data results to meet the objectives of the study. For future at-grade camera surveys, we recommend having large enough camera arrays along each road so that enough data is collected to compensate for anticipated data gaps. For example, we had six or more cameras set up for each fence line and road segment, instead of relying on just a few cameras to document a particular stretch of fence or road.

6.0 Detailed Camera Data Findings and Discussion

This section describes more detailed camera findings by site type (fence line and gates, at-grade sites, and culverts/bridge) and findings for individual sites.

6.1 Santa Teresa Blvd. Fence Line and Gates

The species with the highest standardized passages along the Santa Teresa Blvd fences and gates included bobcat (18.1), coyote (47.2), and deer (71.4). We recorded animals like deer walking along the fence line at Laguna Seca and crossing through gaps in the fences and gates to travel in and out of the conserved properties.

Santa Teresa Blvd. fence line at Laguna Seca

We recorded multiple instances of individual deer walking along Santa Teresa Blvd. adjacent to the Laguna Seca fence line (Figures 27-28). The deer were walking both north and south along the fence line, with northbound being towards oncoming traffic. We also recorded individual deer walking within Laguna Seca along the fence line adjacent Santa Teresa Blvd. (Figures 29-30).

Figure 27. Deer walking south Santa Teresa Blvd. along the Santa Teresa Blvd. fence line, Site 2 on 10/24/2021 at 1:20 am.

Figure 28. Deer walking north Santa Teresa Blvd. along the Santa Teresa Blvd. fence line, Site 2 on 10/24/2021 at 2:06 am.

Figure 29. Deer walking within Laguna Seca along the fence line.

Figure 30. Two deer at Santa Teresa Blvd., walking alongside the Laguna Seca fence line on 8/14/2021.

Site 2 Santa Teresa Blvd. fence line at Laguna Seca

We recorded a higher rate of passages through more permeable locations along the fence line, where there were raises in the fencing and the fencing was not so restrictive. We recorded both coyote and deer traveling through gaps in the fence line (Figures 31-32).

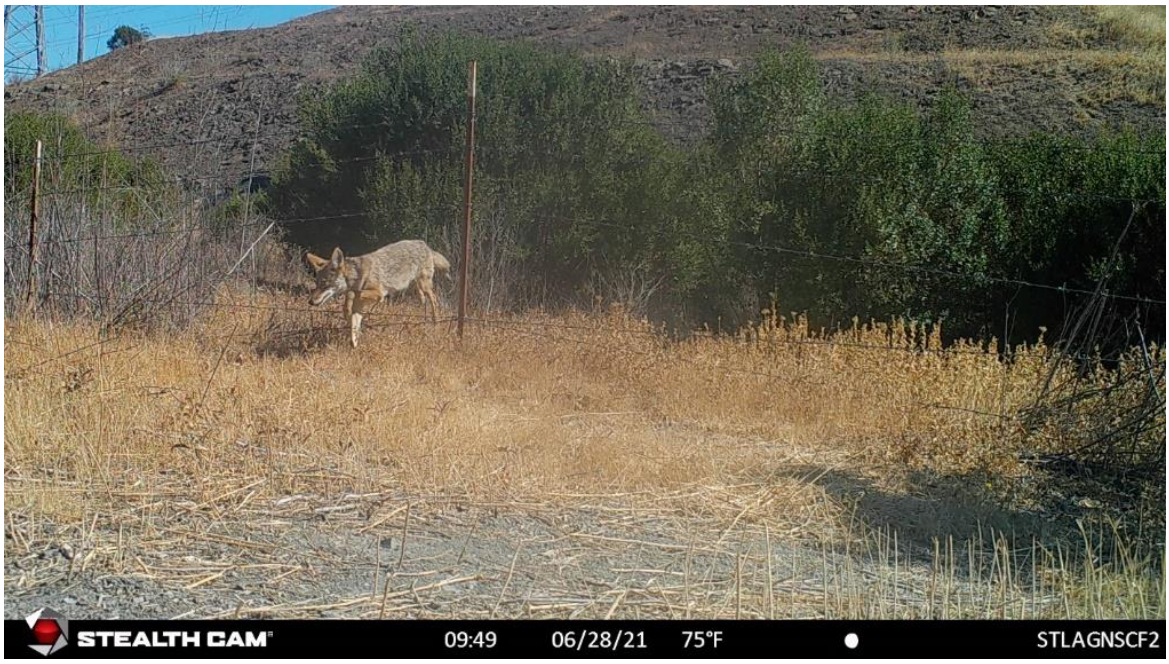


Figure 31. Coyote traveling from Santa Teresa Blvd. into Laguna Seca.

Figure 32. Coyote traveling from Santa Teresa Blvd. into Laguna Sec on 8/18/21 at 20:50.

However, after nine months of data collection, in February 2022, a fence repair crew began fixing the sections of fencing which were in disrepair in order to keep cattle on the property and prevent them from accessing Santa Teresa Blvd.(Figure 33). In doing so, however, wildlife ceased to successfully cross through via the newly repaired sections. Instead, we recorded wildlife approaching the formerly open sections and then turning away (Figure 34).

Figure 33. Two fence repair crewmembers fixing gap in five-strand barbed wire fence on 02/02/2022 at Santa Teresa Laguna Seca fence line camera site 2.

Figure 34. Sequence of captures showing coyote approaching fence, then turning away on 02/02/2022.

After the fence repair in February, we recorded deer traveling along the fence line along with deer investigating the fence line and then walking along the fence line towards oncoming traffic. We only record one successful crossing by deer at the repaired areas in the fencing (Figure 35).

Figure 35. Two deer at Santa Teresa Blvd., walking alongside the Laguna Seca fence line on 3/1/2022. One deer crossed through the fence line, while the other walked away.

We documented similar behavior with coyotes. Coyotes will cross through, as pictured below, but on other occasions, they walk to the fence and do not cross through and instead walk along the roadside (Figure 38). Therefore, these data could be useful for future fence management as the gap between the separated strands of the five-strand barbed wire section was more permeable, allowing for deer movement through the fence line, compared to after the fence was modified to become more restrictive. After the study was concluded, the fencing was retrofitted by the grazing tenant at the end of May-early June 2022 to make it more wildlife-friendly. The bottom strand was removed and the new bottom strand was replaced with smooth wire at 18". The top strand was also replaced with smooth wire.

Figure 36. Coyote crossing through second and third strands of barbed wire at the Santa Teresa/Laguna fence line.

Santa Teresa Blvd. fence line at the north side of Fisher Creek

There was a small 1 ft gap in the chain link fence on the north side of the Santa Teresa Blvd. Fisher Creek dual box culverts. This gap in the fence line had the highest number of crosses from a multitude of wildlife species even though it is one of the smallest openings in entire fence line (Figures 37-40).

Figure 37. Deer traveling through a hole in the Laguna Seca fence line by Fisher Creek, west side of Santa Teresa Blvd.

Figure 38. Deer traveling through a hole in the Laguna Seca fence line by Fisher Creek. west side of Santa Teresa Blvd.

Figure 39. Coyote traveling through a hole in the Laguna Seca fence line by Fisher Creek.

Figure 40. Wild pig crawling through gap at bottom of chain link fence near Fisher Creek.

One the east side of Santa Teresa Blvd. by Fisher Creek on the north side of the creek, there was another hole in the fence in which we recorded small to medium-sized mammals squeezing through to access Tulare Hill (Figure 41). The hole, however, was too small for deer. We recorded deer approaching the hole, investigating it, and then walking away (Figure 42).

Figure 41. Bobcat traveling through a hole in at the Tulare Hill fence line by Fisher Creek on the east side Santa Teresa Blvd.

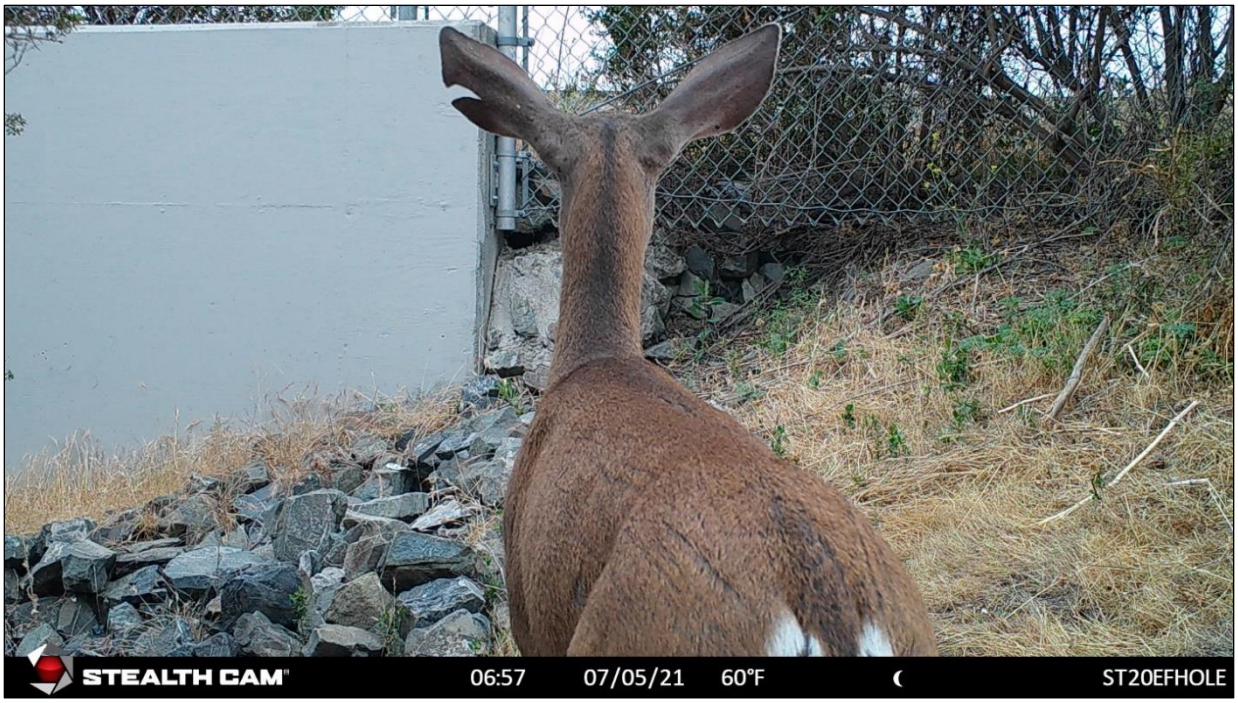


Figure 42. Deer looking at the hole in in the Tulare Hill fence line by Fisher Creek on the east side Santa Teresa Blvd.

Santa Teresa Boulevard Site 18W

Further south of Fisher Creek, there was another small hole in the fence line in which we recorded multiple species squeezing through the fence line (Santa Teresa At-Grade Site 18W). These species included bobcat, coyote, raccoon, and rabbit (*Sylvilagus bachmani*) (Figures 43-46).

Figure 43. Rabbit walking through the hole in the fence on the west side of Santa Teresa Blvd., south of Fisher Creek.

Figure 44. Bobcat walking through the hole in the fence on the west side of Santa Teresa Blvd., south of Fisher Creek.

Figure 45. Raccoons walking through the hole in the fence on the west side of Santa Teresa Blvd., south of Fisher Creek.

Figure 46. Coyote walking through the hole in the fence on the west side of Santa Teresa Blvd., south of Fisher Creek.

Increased Fence Line Permeability at Site 18W

On 3/10/2022, an OSA technician increased the hole by cutting out a 3-ft high, 4-ft-wide section of fencing (Figure 47). This was an effective measure as we recorded a coyote and other species traveling through the hole in the fence (Figure 48). This was a great way to increase the permeability of the Santa Teresa fence line for wildlife movement between the newly protected properties.

Figure 47. Santa Teresa Blvd. Site 18W, fence modification on 3/10/2022.

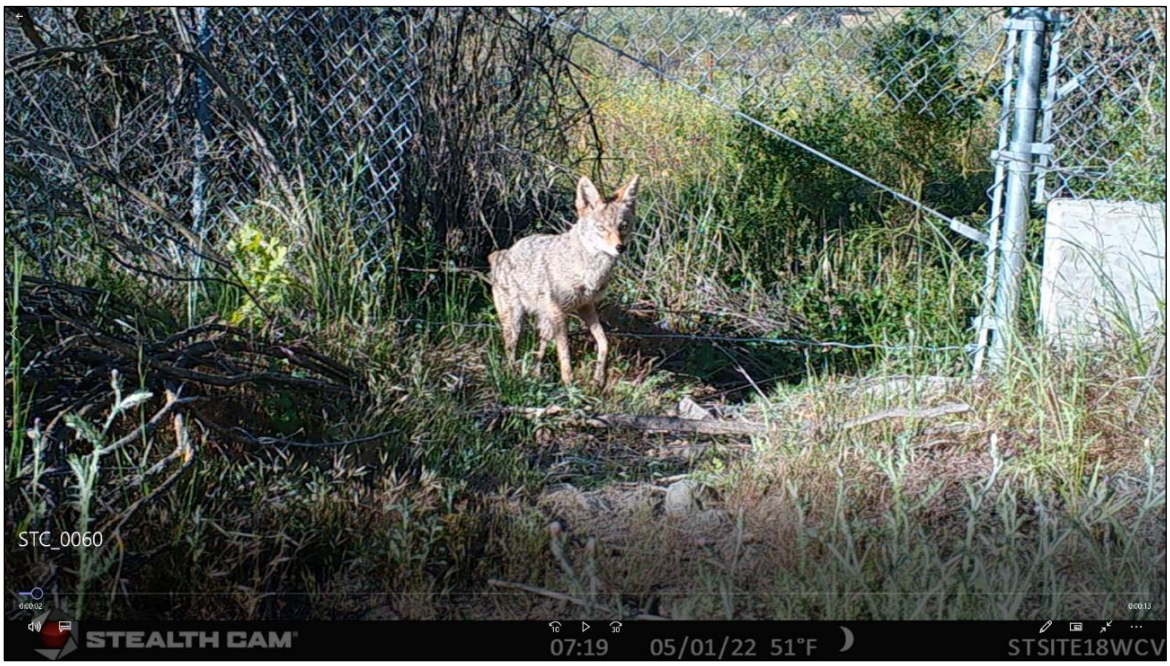


Figure 48. Santa Teresa Blvd. Site 18W, coyote, traveling through the fence modification on 5/1/2022.

Laguna Seca and Tulare Hill Gates

The Laguna Seca gates NC01 and NC03 on the main access roads restricted wildlife movement through them compared to the NC21 gates at Tulare Hill (Figures 49-52). The gates on the Laguna Seca side had square wire mesh, while the Tulare Hill gates did not.

Figure 49. Deer walking by the Laguna Seca gate NC03 on the west side of Santa Teresa Blvd.

Figure 50. Coyote squeezing under the by the Laguna Seca gate NC03 on the west side of Santa Teresa Blvd..

Figure 51. Bobcat walking through the Tulare gate NC21 on the east side of Santa Teresa Blvd.

Figure 52. Bobcat walking by the Tulare gate NC21 on the east side of Santa Teresa Blvd.

We recorded a few wildlife passages through the Laguna Seca Gate NC01, across from Tulare Hill (Figure 53). Of importance, we recorded an American badger traveling under this gate (Figure 54). We did not record any detection of American badgers during the 2018-2019 bobcat radio collar study. During T. Diamond's thesis work, a natal badger burrow den was recorded at Tulare Hill and badger burrows were recorded at the IBM property in the vicinity of this badger passage at the NC01 gate. American badgers are listed as a Species of Special Concern by the CA Department of Fish and Wildlife (https://wildlife.ca.gov/Conservation/Mammals/Badger).


Figure 53. Gate NC01 at Laguna Seca across from Tulare Hill.

Figure 54. American badger at Santa Teresa Blvd. Laguna Seca Gate STNC01 on 5-27-2021.

Santa Teresa Gate NC02 at Laguna Seca

This gate was the most permeable gate, consisting of several horizontal bars without mesh wire between them. This gate had the highest rate of passage, with multiple species traveling through the gate each month (Figure 55). Though cows are also present at this site, we did not record any calves traveling through the gate. However, we did not record deer traveling through any of the gates along Santa Teresa Blvd., only smaller to medium-sized mammals through the gates at Tulare Hill, on the west side of Santa Teresa Blvd.

Figure 55. Bobcat walking through the Laguna Seca gate on the west side of Santa Teresa Blvd.

6.2 Santa Teresa Blvd. At-Grade Cameras

The Santa Teresa Blvd at-grade cameras detected 340.4 standardized at-grade detections. As noted in the methods section, we were unable to confirm a full passage of the entire span of the road as we could not detect one individual crossing from one side to the other. However, we did detect animals at-grade along Santa Teresa Blvd in the southbound lane, northbound lane, and the vegetated median. The species with the highest rates of standardized at-grade detections included wild pig (135.6), coyote (137.0), and raccoon (32.9). Other species detected included bobcat, deer, opossum, and striped skunk, albeit at much lower rates.

Like the at-grade sites on the east and west side of the road, the Santa Teresa Blvd median had frequent detections of wild pig and coyote. Wild pigs in numbers ranging from five to twelve individuals were recorded traveling both east and west between the protected properties along Santa Teresa Blvd consistently throughout the study period (Figures 56-57).

Figure 56. Wild pigs heading west towards Santa Teresa Blvd at Santa Teresa At-Grade Site 12W.

Figure 57. Wild pig heading east into the Laguna Seca property at Santa Teresa At-Grade Site 12W.

Deer were only detected at-grade along Santa Teresa Blvd at two sites: Santa Teresa Blvd Site 20W and Site 8E. In both cases, there was only one detection of deer at these sites. At Santa Teresa Blvd Site 8E, we recorded a male deer crossing the road heading east into Tulare Meadows on 10/18/2021 at 5:04 am (Figure 58). Within the same minute that the deer had crossed the road, we recorded a car heading northbound, where the deer had just crossed (Figure 59). This indicates an unsafe road crossing occurring and risk-taking by wildlife trying to cross the Santa Teresa Blvd. between the newly protected properties.

Figure 58. A male deer crossing at Santa Teresa Blvd. on 10/18/21 at 5:04 am.

Figure 59. A car heading towards where the deer had just crossed Santa Teresa Blvd. on 10/18/21 at 5:04 am.

Over half of all at-grade detections along Santa Teresa Blvd occurred at just three sites: Santa Teresa At-Grade Site 13 Median, Site 13W, and Site 4W. The Santa Teresa Site 13 Median camera was set up at an opening between vegetation at the median of Santa Teresa Boulevard. The northbound lanes were visible in the camera's field of view along with a portion of the vegetation and substrate of the median. Both wild pigs and coyotes were recorded crossing the road at this section (Figures 60-61). This site had the highest rates of standardized at-grade passages (114.6) of all the at-grade sites along Santa Teresa Blvd. There were several instances where a coyote or wild pig crossed the road with on-coming car headlights approaching them (Figures 62-63), indicating unsafe crossings with oncoming traffic.

Figure 60. Coyote at median before successfully crossing northbound lanes of Santa Teresa Blvd.

Figure 61. Two wild pigs crossing the northbound lanes of Santa Teresa Blvd.

Figure 62. Coyote crossing Santa Teresa Blvd. into the median on 3-29-2022 heading east.

Figure 63. Wild pig crossing Santa Teresa Blvd. into the median on 3-17-2022.

6.3 Bailey Ave At-Grade Cameras

Cameras were set up at-grade along Bailey Ave at the IBM campus, the Bailey Ave access road, and the Bailey Ave frontage road. These Bailey Ave cameras recorded more at-grade detections of species when standardized (554.4) compared to Santa Teresa Blvd (327.1). The vast majority of these at-grade detections were coyote (499.9 when standardized). Other species detected at-grade included bobcat, opossum, raccoon, striped skunk, and wild pig, though with much lower detection rates.

Bailey Ave and Santa Teresa Blvd.

We recorded coyotes crossing Bailey Ave. at grade between the Santa Teresa Blvd. intersection and the Bailey Ave. Fisher Creek Bridge (Figure 64). The coyotes were traveling into the fields that are south of Laguna Seca from Spreckels Hill. The radio collared bobcat B01, Serpentine, also crossed Bailey Ave within this stretch of Bailey Ave. Interestingly, B01 followed the tree line spanning across the field to Bailey Ave. and also crossed where the median is vegetated.

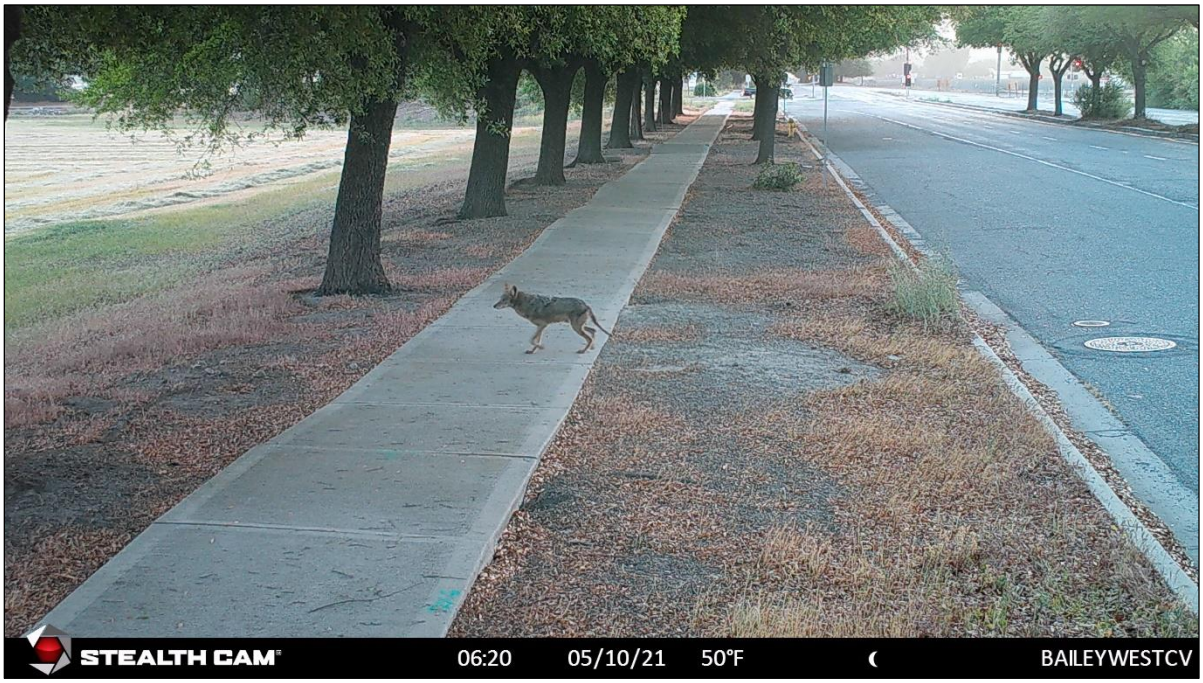


Figure 64. Coyote crossing Bailey Ave. west of the Santa Teresa Blvd.

Bailey Ave Access Road

This access road leads to Monterey Rd and includes Bailey Access Road Sites 1, 2, and 3. This section of the access road is very well lit by the streetlamps along the Bailey Ave. vehicle overpass (Figure 65). We recorded wildlife traveling along each of the three access road cameras. However, we recorded the highest number of detections at Site 1, which is the farthest away from the Bailey Ave vehicle overpass (Figure 66). There was more wildlife movement away from the overpass, which may be because of light pollution from the large array of streetlamps spanning across the overpass.

There was low biodiversity recorded along Bailey Access Road sites, with only one bobcat record. The majority of the detections were a family of three coyotes traveling along the access road (Figure 66). The coyotes were traveling south from Fisher Flats area to Monterey Rd. where the Bailey vehicle overpass crosses over it and then traveled back north into Tulare Meadows on a consistent basis each month. We also recorded a lot of jackrabbit activity along the access roads and would record coyotes with rabbit prey items.

Figure 65. Bailey Ave. Access Road Site 2 on 5-13-2022 at 12:41 am.

Figure 66. Bailey Ave. Access Road Site 3, a coyote on 6/24/2022.

Bailey Ave at the IBM Parcourse

We had high rates of detections of wildlife at-grade at the IBM Parcourse. The Bailey Ave IBM North site had the highest rate of wildlife movement along the Bailey Ave at-grade sites and also within the study area, with 172 standardized at-grade detections. This site was located at the IBM parcourse facility across from the ranch driveway on Bailey Ave. Similar rates of high detections were recorded with coyotes and

deer traveling both north and south into the IBM property (Figures 67-68). We also recorded bobcat passages (Figure 69). During the bobcat radio collar study, during 2017-2018, three of the radio collared bobcats, B03 Sage, B05 Savannah, and B06 Tiburon were recorded successfully traveling across Bailey Road in this vicinity on multiple occasions.

Figure 67. Coyote traveling at Bailey Ave IBM N heading into the IBM property.

Figure 68. Male deer traveling at Bailey Ave IBM N heading into the IBM property.

Figure 69. Bobcat traveling at Bailey Ave IBM N heading east within the IBM property.

We also had a camera set up at Bailey Ave Site 5S, which is located at the ranch driveway across from the IBM parcourse facility on Bailey Ave. This ranch land is north of the police academy school. The site was included in the camera array because this is where the collared bobcat, B03 Sage, was hit on Bailey Ave on the westbound lane. Unfortunately, camera vandalism and issues with the SD card filling up with images of vehicles using the driveway made this site unsuitable for inclusion in the 100 trap nights analysis. Nevertheless, we include a description of this site in the narrative since it was one of only a few sites at-grade where deer were recorded.

At the end of May and June, female and male deer were recorded traveling between the properties (Figures 70-71). A pair of coyotes were also recorded traveling north and south between this ranch property and the IBM parcourse every month during the study period. We also detected individual coyotes at this site (Figures 72-73).

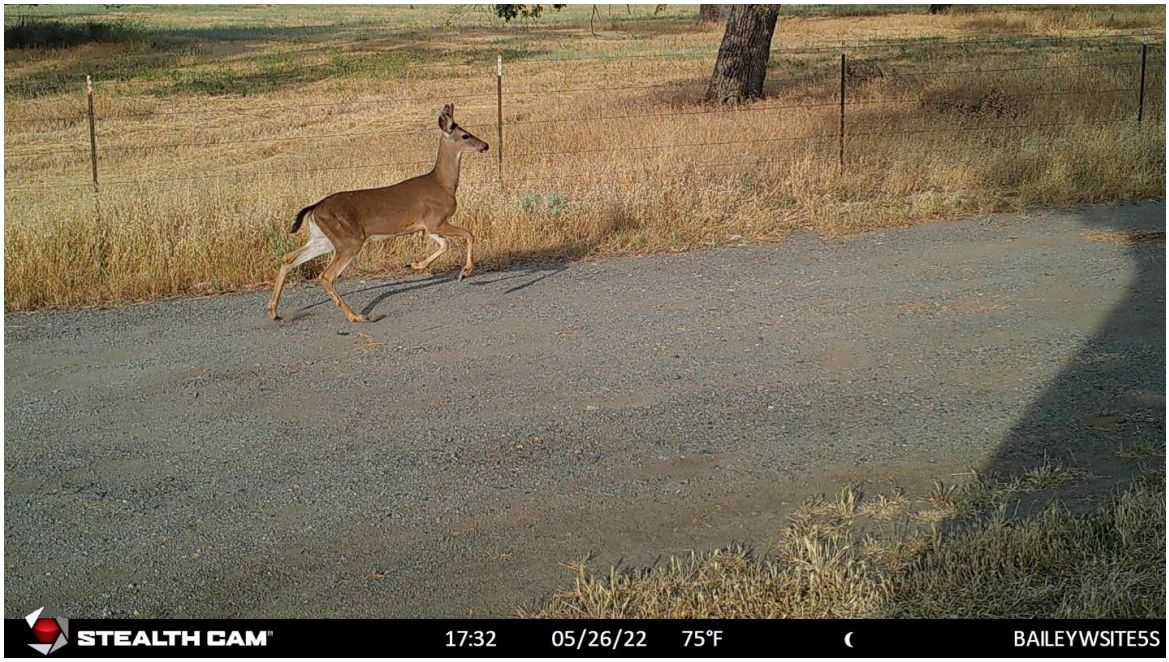


Figure 70. Female deer traveling at Bailey Ave Site 5S heading south into the ranchland.

Figure 71. Male deer traveling at Bailey Ave Site 5S heading south into the ranchland.

Figure 72. Coyote pair traveling at Bailey Ave Site 5S heading north towards the IBM parcourse.

Figure 73. Coyote pair traveling at Bailey Ave Site 5S heading south into the ranchland.

6.4 Culverts and Bridge

Culverts and bridge sites had the lowest rate of detections compared to the fence line/ gates and the at-grade sites. We did not record any large mammals traveling through the culverts or bridge. The species with the highest standardized passages at the combined culverts and bridge was raccoon (66.1).

Santa Teresa Blvd Fisher Creek Dual Box Culvert

The Santa Teresa Fisher Creek culverts are large dual box culverts (Figure 74). However, these culverts typically remain flooded for the majority of the year unless there is a severe drought condition. In 2021, this region experienced a severe drought, resulting in the Fisher Creek culverts becoming dry (Figure 75).

We took advantage of this situation and set up cameras mid-study on September 3, 2021, during a site visit with POST, to record if animals would use the culvert to travel through under dry conditions (Figure 75). While setting up the camera, we recorded bobcat and racoon tracks within the entrance of the west side of the culvert.

Figure 74. Santa Teresa Blvd. Fisher Creek culvert on 1/14/2022.

On the west side of the dual box culverts, there is a concrete washboard that creates poor visibility through the culvert (Figure 75). There is a small opening at the culvert, which would give wildlife the opportunity to access the culvert. However, wildlife typically requires high visibility through culverts to be willing to travel through them (Safe Passages 2012).

We also set up a camera on the east side of the dual box culvert. We did not record any wildlife passages through the culvert before it became inundated with water again. We recorded several deer on the east side of the culvert investigating the culvert but then walking away from it (Figure 76). Because this site did not record any passages by wildlife, it was not included in the 100 trap nights analysis.

Figure 75. Camera set up with POST and PFW on 9-3-21 at the Santa Teresa Fisher Creek culverts.

Figure 76. Deer on the west side of the Santa Teresa Blvd. Fisher Creek dual box culvert.

Santa Teresa Culvert at Laguna Seca (across from Tulare Hill)

This culvert is located at Santa Teresa Blvd. at Laguna Seca, north of Fisher Creek. There is a wire mesh gate set up on the west side of the culvert at Laguna Seca. We only recorded raccoons traveling through this culvert (Figure 77).

Figure 77. Raccoon family traveling through the Santa Teresa Blvd. Laguna Seca culvert.

Coyote Alamitos Canal Culvert at Santa Teresa Blvd.

The Coyote Alamitos Canal is a three-foot box culvert facilitating an overflow canal under Santa Teresa Blvd. (Figure 78). We only recorded six raccoons traveling through this culvert. However, during the 2019 Coyote Valley Bobcat & Gray Fox Connectivity Study, B01 Serpentine, used this culvert several times to travel both west and south through the culvert along with crossing at-grade in the vicinity of the culvert (Figures 79).

Figure 78. Coyote Alamitos Canal, northbound, on the west side of Tulare Hill.

Figure 79. B01 Serpentine traveling west through the Coyote Alamitos Canal.

Bailey Ave Culvert

We recorded multiple species using the Bailey Ave culvert including bobcat, coyote, and raccoons, with a standardized passage rate of 74.2 (Figures 80-82). Since this is the only culvert on Bailey Ave. within the study area, it is an important location for providing safe passage under the road as a coyote puppy was

recorded hit just east of the culvert on Bailey Ave on 6-23-2021. This culvert was the most-used undercrossing in the study area.

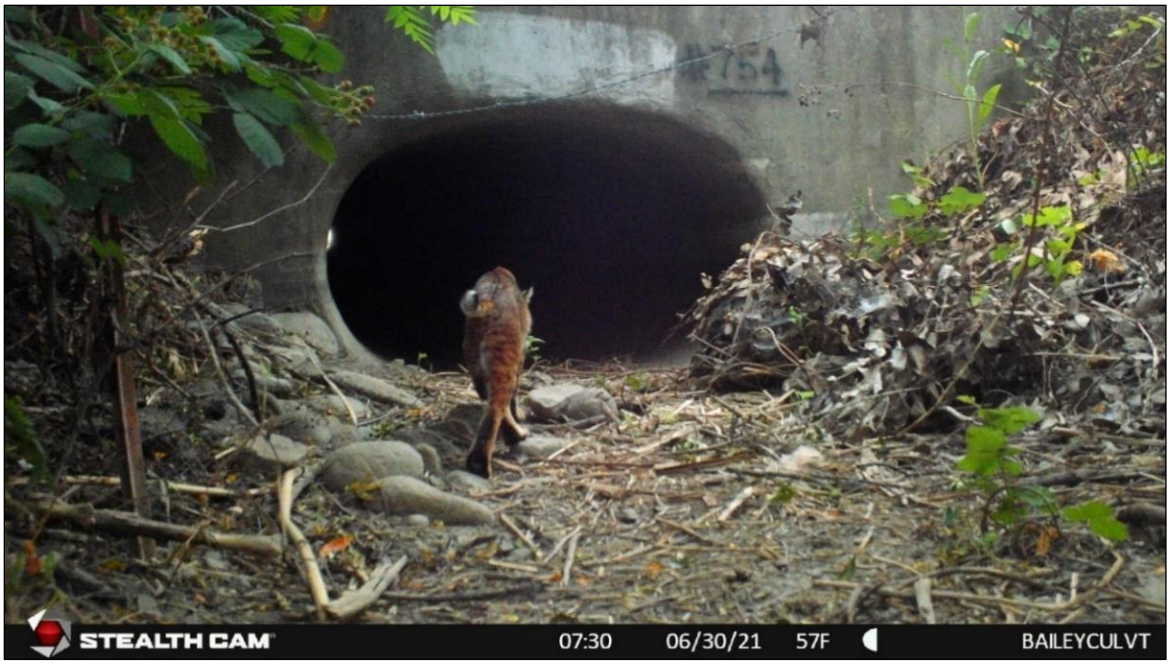


Figure 80. Bobcat recorded at the Bailey Ave. Culvert on 6/30/2021.

Figure 81. Coyote subadult recorded at the Bailey Ave. Culvert on 7/19/2021.

Figure 82. Raccoon family recorded at the Bailey Ave. Culvert on 8/23/2021.

Bailey Ave Fisher Creek Bridge

We recorded very few passages through the Bailey Ave. Fisher Creek Bridge (16). The passages at this bridge were primarily by raccoon (12 total passages). There were lower rates of passage by bobcat, gray fox, and opossum. We did not detect passages by large mammals through this bridge. Notably, we recorded a gray fox traveling north through the bridge on 2/1/2022 (Figure 83). This is an important finding because during the 2019 Coyote Valley Bobcat & Gray Fox Connectivity Study, we were not able to find any gray foxes during the two-year study period. Gray foxes tend to travel along riparian habitats, so restoration of Fisher Creek and other riparian habitats may benefit gray foxes and enhance the ability for gray fox to travel within the valley floor.

Figure 83. Gray fox traveling north under the Bailey Ave. Fisher Creek Bridge on 2/1/2022.

In 2008, deer, coyote, and bobcats were recorded traveling under the bridge, including two different male deer traveling both north and south under the bridge (Figures 84-85). During the 2015-2016 study, we recorded six bobcats and two deer passages (Figure 84, Diamond, T. and A. Snyder 2016). During the current study period, we only recorded two bobcat passages (Figure 87). The area beneath the bridge has filled up with sediment over the years compared to the conditions we documented in 2008. There is also restrictive fencing on the south side of the bridge. The sediment and fencing might be limiting wildlife passages, especially by larger mammals.

Figure 84. Deer crossing through Bailey Ave. Fisher Creek Bridge on 5/14/ 2008.

Figure 85. Male deer successfully crossing through the Bailey bridge at Fisher Creek in 2008.

Figure 86. Deer crossing though the Bailey Ave. Fisher Creek bridge on 6/28/2015.

Figure 87. Bobcat at the Bailey Ave Fisher Creek Bridge on 1-18-2022.

7.0 Seasonal Variation

There are four culverts and one bridge within the study area. The culverts tend to flood during rain events and then remain flooded for long periods of time. In December 2021, there was a significant storm event, resulting in Coyote Valley receiving approximately 10.6 inches of rain. The culverts remained flooded until the end of the study period in June. This resulted in seasonal variation in passages.

Bailey Ave. Culvert

The Bailey Ave. culvert was flooded by water on both the south and north sides (Figure 88). We previously recorded multiple species such as bobcat, coyote, skunk, and a raccoon family traveling both south and north through the culvert prior to flooding. However, after the culvert flooded, we recorded a decline in passage rates (Figure 89).

Figure 88. Bailey Ave. culvert south side on 1/14/2021.

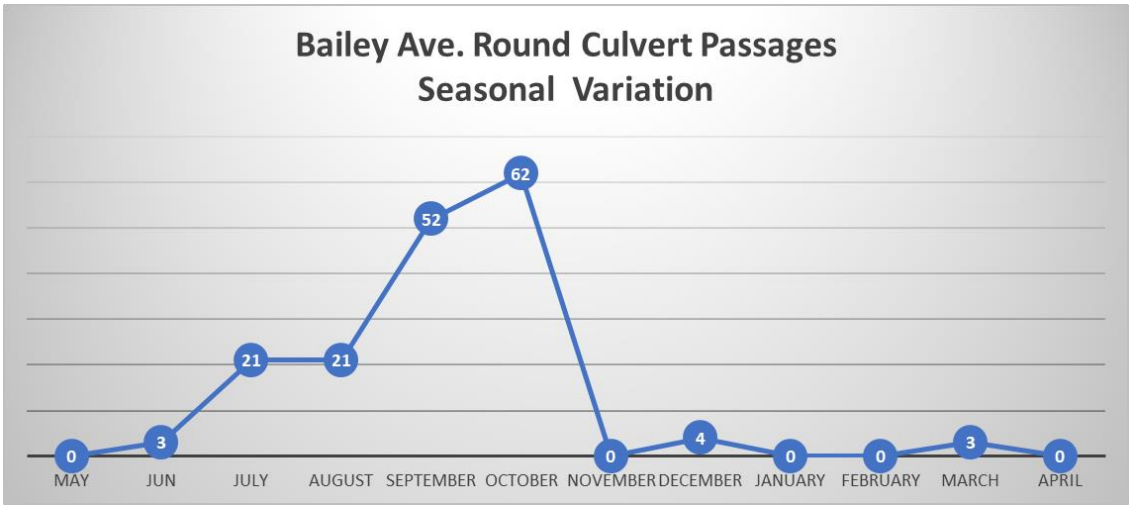


Figure 89. Bailey Ave. culvert seasonal variation and wildlife passage rates, May 2021-April 2022.

Bailey Ave. Fisher Creek Bridge

After the first storm event, the middle of the bridge sections of the Bailey Ave Fisher Creek bridge became inundated with water (Figure 90). With the debris and sediment built up on the outer sections, there was very little bank available for wildlife to travel along under the bridge. There was a decrease in passage rates until the banks became available for wildlife to travel along (Figure 91).

Figure 90. Bailey Ave. Fisher Creek Bridge north side on 1/14/2021.

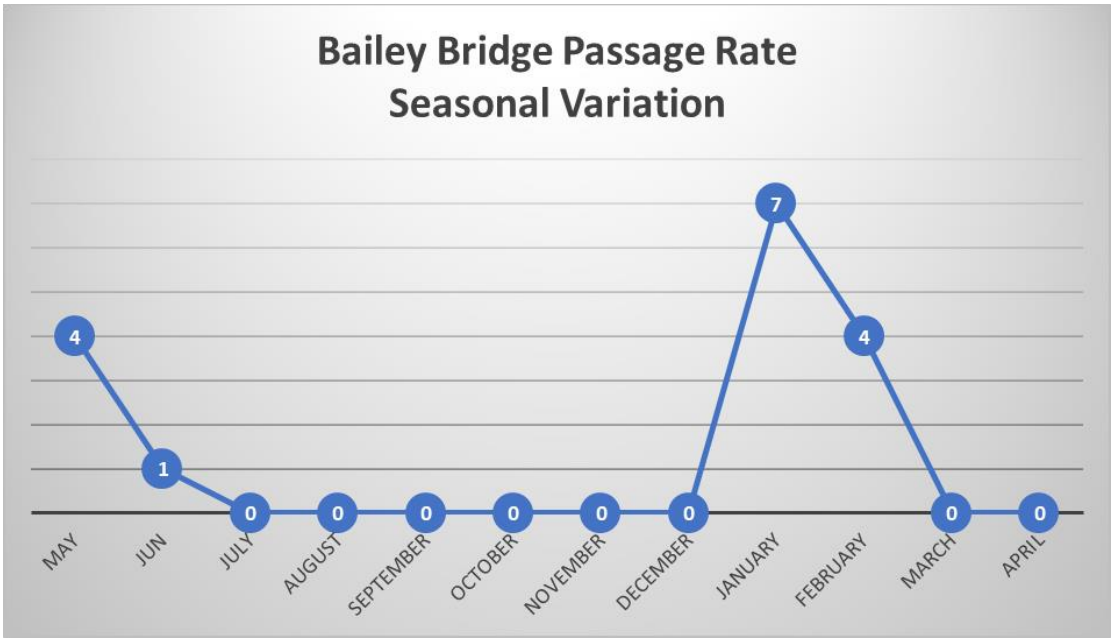


Figure 91. Bailey Ave. culvert seasonal variation and wildlife passage rates, May 2021-April 2022.

Santa Teresa Blvd. Fisher Creek Dual Box Culvert

The Fisher Creek culvert at Santa Teresa Boulevard is a large dual box culvert that typically remains flooded throughout the year, as Valley Water pumps water through Fisher Creek to supply water to east San Jose (Figure 92). We did not document any wildlife movement through these culverts. We did not include a seasonal passage rate chart as this culvert was monitored opportunistically for a short period time when it was dry due to drought conditions but then filled up with water after the first storm event.

Figure 92. Santa Teresa Boulevard culvert, west side on 1/14/2021.

Santa Teresa Blvd. Laguna Seca Culvert

The Laguna Seca culvert at Santa Teresa Blvd. became flooded by water after the first storm event in 2021 (Figure 93). This culvert was dry during the summer months, however, there was restrictive mesh wire fencing set up on the west side of the culvert. We only recorded a family of raccoons traveling through a small opening in the mesh fencing (Figure 77). In June 2022, after the study concluded, the mesh was removed and replaced with a few strands of barbed wire.

Figure 93. Laguna Seca culvert at Santa Teresa Boulevard culvert, west side on 1/14/2021.

Coyote Alamitos Canal Culvert

After the first storm event, a pool of water formed on the east side of the culvert and remained throughout the spring months (Figure 94). However, we only recorded one raccoon traveling through the culvert before the storm events.

Figure 94. Coyote Alamitos Canal culvert, west side on 1/13/2021.

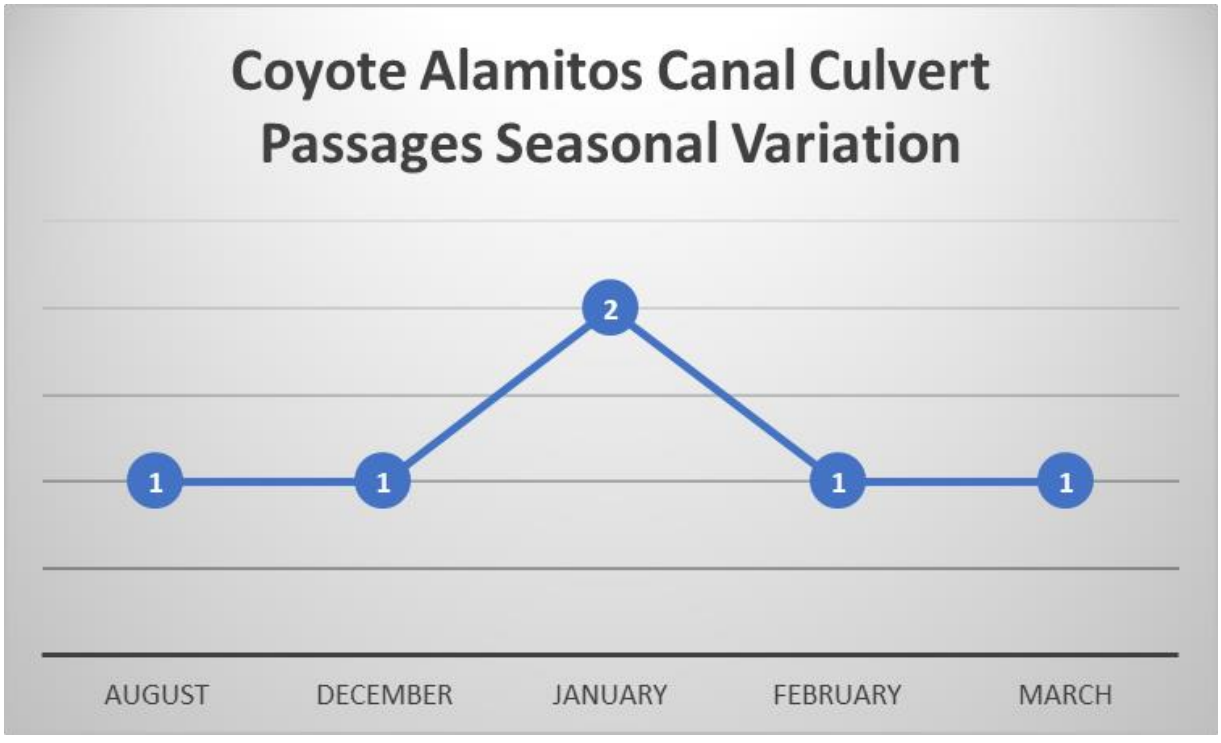


Figure 95. Coyote Alamitos Canal culvert seasonal variation and wildlife passage rates, August 2021-March 2022.

8.0 Wildlife-Vehicle Collision Data Results

This section describes findings from the roadkill surveys and also discusses these data alongside the at-grade camera data for Bailey Ave and Santa Teresa Blvd.

8.1 Wildlife-Vehicle Collision Results

During the study period, we recorded a total of 52 animals hit by vehicles (Figure 96). We also included the juvenile mountain lion that was hit on 8-8-2019 on McKean Rd into this dataset as it is an important species to include, and it has not been documented in any other reporting, resulting in 53 roadkill records.

The species with the highest mortalities included raccoon (16, 30.2%), coyote (14, 26.4%), and deer (9, 17%) (Figure 96). Raccoon and coyote made up over half of all recorded WVCs throughout the study area, and, along with wild pig, were also the species detected at-grade the most frequently. There were no recorded deer WVCs along Bailey Ave or Santa Teresa Blvd. Deer were rarely captured at-grade along these roads, though they were recorded along the fence line and gates on Santa Teresa Blvd.

Species (common name)	Total Animals hit by Species
Bobcat	1
Coyote	14
Deer	9
Gray fox	1
Mountain lion	1
Opossum	4
Rabbit	1
Raccoon	16
Striped skunk	3
Wild pig	3
Grand Total	**53**

Figure 96. Roadkill data results from 2021-2022, including mountain lion detection from 8-8-2019.

The highest numbers of wildlife-vehicle collisions (WVCs) were detected on Monterey Rd (19, 35.8%), followed by US 101 (15, 28.3%) and McKean Rd (8, 15.1%) (Figure 97). Monterey Rd had the highest rate of WVCs per mile surveyed (2.8 animals/mi). This was followed by US 101 (1.9 animals/mi), Bailey Ave (1.7 animals/mi), McKean Rd (1.2 animals/mi), and Santa Teresa Blvd (0.9 animals/mi). Despite high rates of at-grade wildlife detections along Santa Teresa Blvd, this road had the lowest rates of WVCs relative to the other roads monitored. Bailey Ave and US 101 had similar rates of WVCs per mile surveyed (1.7 animals/mi for Bailey Ave and 1.9 animals/mi for US 101), though this may be because of increased sampling effort along Bailey Ave relative to US 101 because of the inclusion of bicycle surveys.

Road	Total Animals Hit	Miles of Road Surveyed	Total Animals Hit Per Mile
Bailey Ave	5	3.0	1.7
Santa Teresa Blvd	6	6.4	0.9
McKean Rd	8	6.7	1.2
US 101	15	7.8	1.9
Monterey Rd	19	6.7	2.8
Grand Total	**53**		

Figure 97. Roadkill data results from 2021-2022 by road segment.
This also includes the juvenile mountain lion hit on McKean Road in 2019.

Figure 98 displays a map of recorded WVCs. The juvenile mountain lion was hit on McKean Road near the reservoir at Calero County Park (Figures 99-100). This is an important finding, as it indicates there was a female mountain lion with a juvenile traveling in this area and attempting to cross McKean Rd.

We also recorded deer, coyote, and striped skunk hit in the vicinity of the mountain lion WVC (Figure 98). This could indicate a potential roadkill cluster site where animals are attempting to cross the road and are being hit. In the hillside across from the reservoir, there is a ravine that leads down to McKean Road (Figure 100). This could be an important wildlife thoroughfare location for wildlife movement between Calero County Park and IBM. The 2017-2018 bobcat radio collar study recorded B03 Sage and B06 Tiburon traveling from the reservoir over into the IBM parcourse through the adjacent hillsides in this area.

With the camera surveys from this study, we also recorded multiple species traveling within the protected lands of IBM on a daily basis. Furthermore, the camera station at the IBM parcourse recorded the highest species richness of wildlife traveling at-grade.

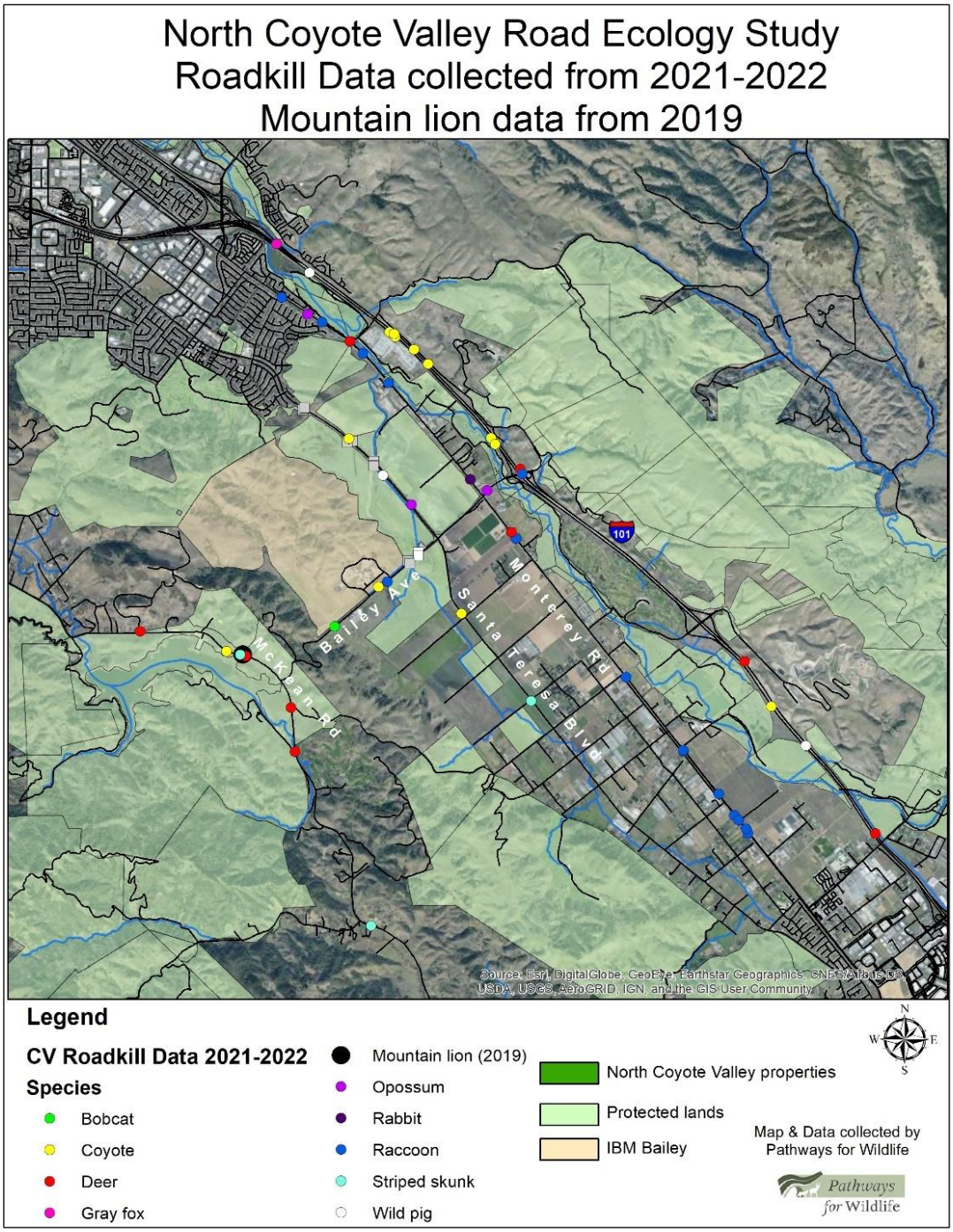


Figure 98. Wildlife-vehicle collision map: fifty-three roadkill records collection from 2021-2022, including a mountain lion hit in 2019.

Figure 99. Juvenile puma found dead on McKean Road on 8/18/2019.

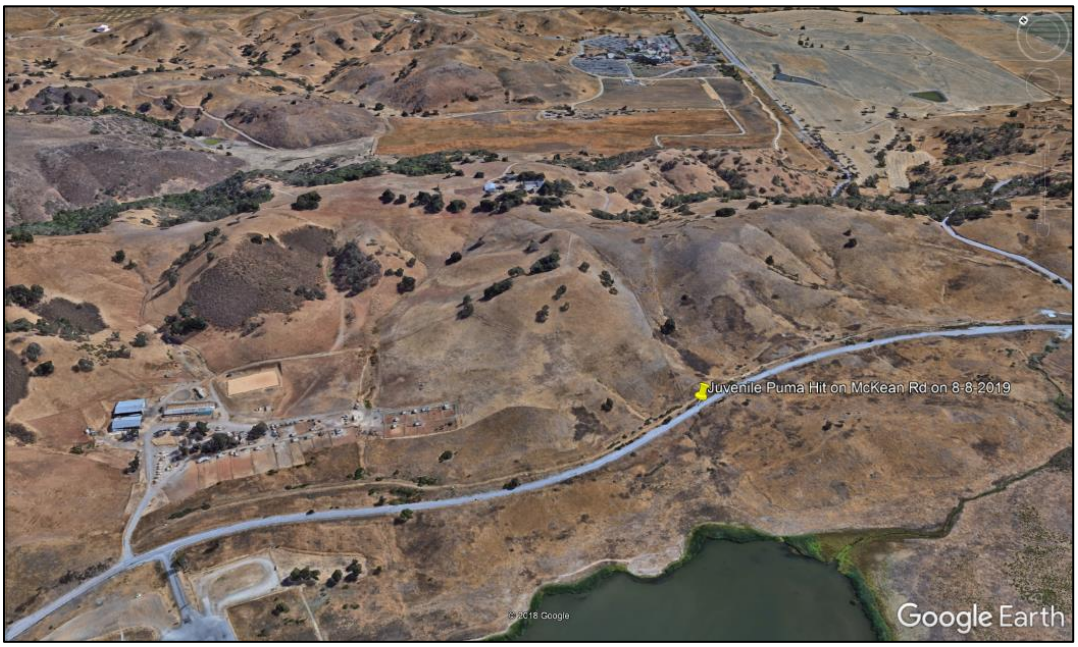


Figure 100. Location where the juvenile puma was found on McKean Road on 8/18/2019.

8.2 Roadkill Clusters

We identified two cluster locations where wildlife was found hit. One of the cluster locations included Monterey Rd by Tulare Hill and where US 101 runs adjacent to this location by the Metcalf energy building (Figure 98). The other cluster included Monterey Rd and US 101 by the Bailey Ave. overpass (Figure 98). These clusters coincide with previous roadkill data collected from 2006-2008 and 2014-2018 (Figure 101). The data we have collected from this study further documents the importance of these roadkill cluster locations and the need for improving the ability for wildlife to safely travel across Monterey Rd and US 101 in North Coyote Valley.

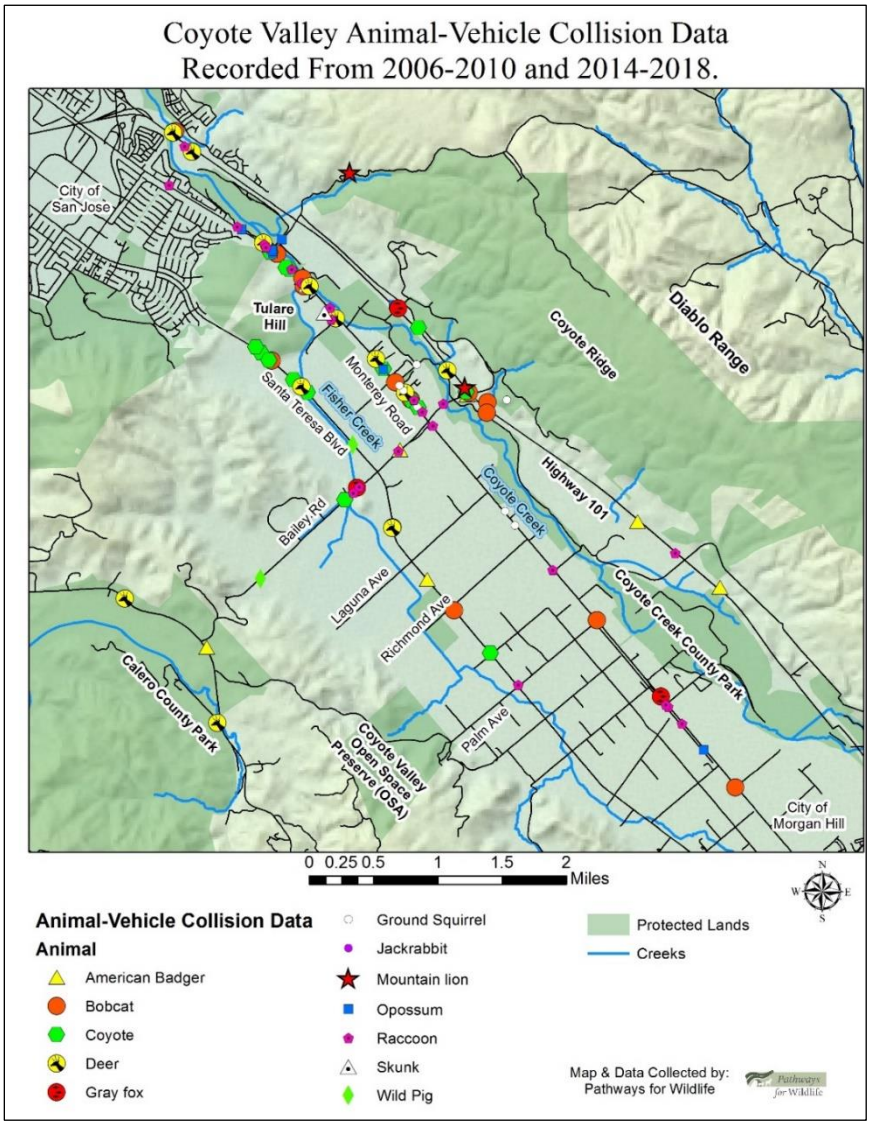


Figure 101. Wildlife-vehicle collision map: roadkill data collection from 2006-2010 & 2014-2018.

8.3 Comparison of At-Grade Detections and Roadkill Data

We found a higher rate of standardized at-grade detections than recorded mortalities for all species on both Santa Teresa Blvd. and Bailey Ave, with a combined total of 881.5 standardized at-grade detections and 11 roadkill records across both roads (Figures 102-103).

There were frequent at-grade detections of coyote along Bailey Ave and Santa Teresa Blvd sites, but only one coyote detected as roadkill along Bailey Ave and only two coyotes detected as roadkill along Santa Teresa Blvd. Similarly, although there were frequent at-grade detections of wild pig along Santa Teresa Blvd, there was only one wild pig detected as roadkill along Santa Teresa Blvd.

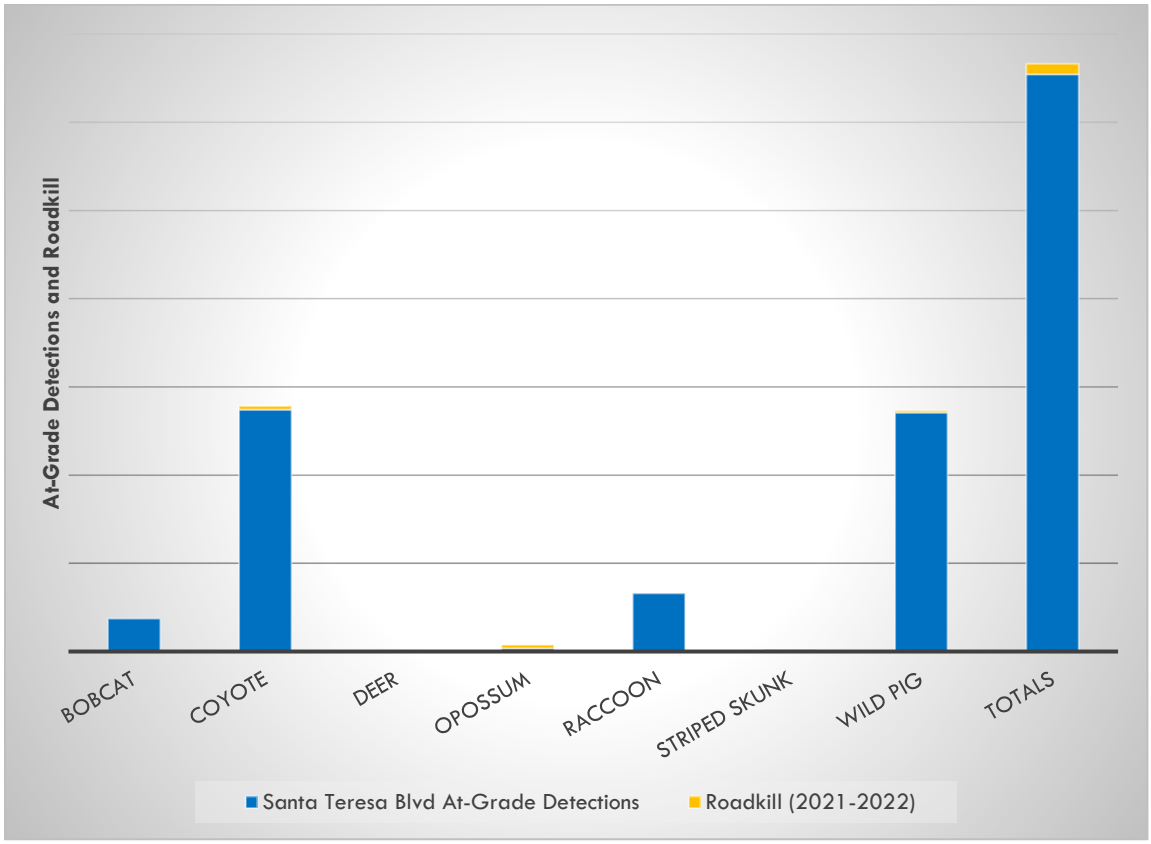


Figure 102. Standardized at-grade detections and roadkill along Santa Teresa Blvd.

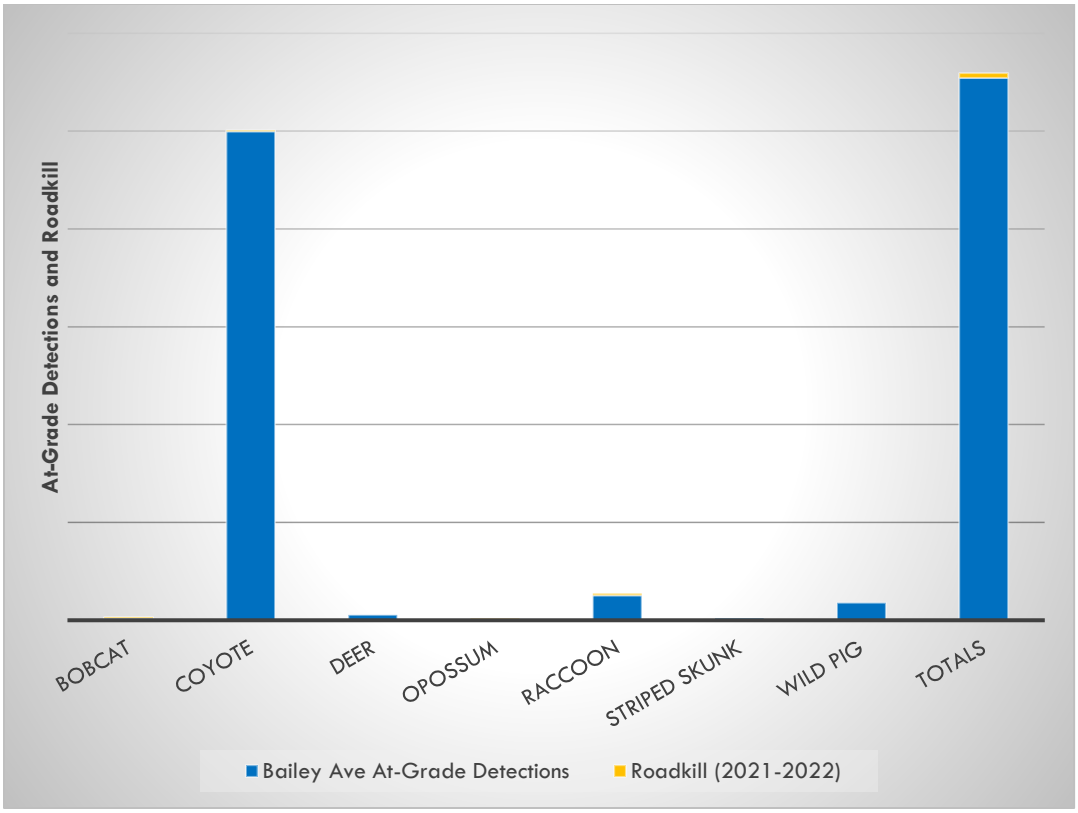


Figure 103. Standardized at-grade detections and roadkill along Bailey Ave.

8.4 Wildlife-Vehicle Collisions Results by Road Segment

The following section provides detailed WVC results by road segment surveyed.

McKean Rd

A total of seven animals were found hit on McKean Road during the course of this study, including one coyote, four deer, and two skunks, with a rate of 1.2 animals/mi. Over half of the WVCs along this road were deer. As previously noted, several other species were found hit by the reservoir at Calero County Park where the juvenile mountain lion was detected as roadkill in 2019. Three deer were also found hit along McKean Rd at the Calero Reservoir. Staff from County Parks have also noted that this is a problem area for wildlife movement and have seen animals hit along McKean where it runs adjunct to the reservoir (Don Rocha, Director of Santa Clara County Parks, pers. comm. 10/23/2019).

Bailey Ave

A total of five animals were found hit on Bailey Ave over the course of the study, including one bobcat, one coyote, two racoons, and one opossum. This road had a rate of 1.7 animals/mi, which is similar to US 101 (1.9 animals/mi). A coyote puppy was found hit on Bailey Ave. at the median on the westbound lane on 6-23-2021 (Figure 104). As noted in the camera discussion, we also recorded several radio-collared bobcats traveling across Bailey Road from IBM at multiple locations across the road. B03, B05, and B06 were traveling across Bailey Road on a monthly basis. Despite high rates of at-grade detections of coyotes along Bailey Ave and its frontage and access roads, the coyote puppy was the only coyote WVC detected along Bailey Ave in this study.

Figure 104. Coyote puppy hit on Bailey Ave. on the westbound lane on 6-23-2021.

An adult female bobcat that was collared during the Coyote Valley Bobcat Radio Collar Study 2018, was found hit on Bailey Ave., on the westbound lane (Figure 105). This bobcat was given the identification name of B03 Sage and was collared four years prior to finding her hit on the road. She was recorded routinely crossing Bailey Ave. at IBM during the collaring study period and is estimated to have been approximately 10 years old before being found hit on the road.

Figure 105. Adult bobcat, BO3 Sage, hit on Bailey Ave. on the westbound lane on 6-23-2021.

The roadkill data, camera data, and bobcat collar data combined document that there are high rates of at-grade crossings across Bailey Ave. However, the combination of these data also document that multiple species of wildlife are also being hit on this road. During the 2015-2016 Coyote Valley Linkage Assessment study, we recorded both gray fox and a coyote hit on the east side of the Bailey Ave. Fisher Creek Bridge (Figure 106).

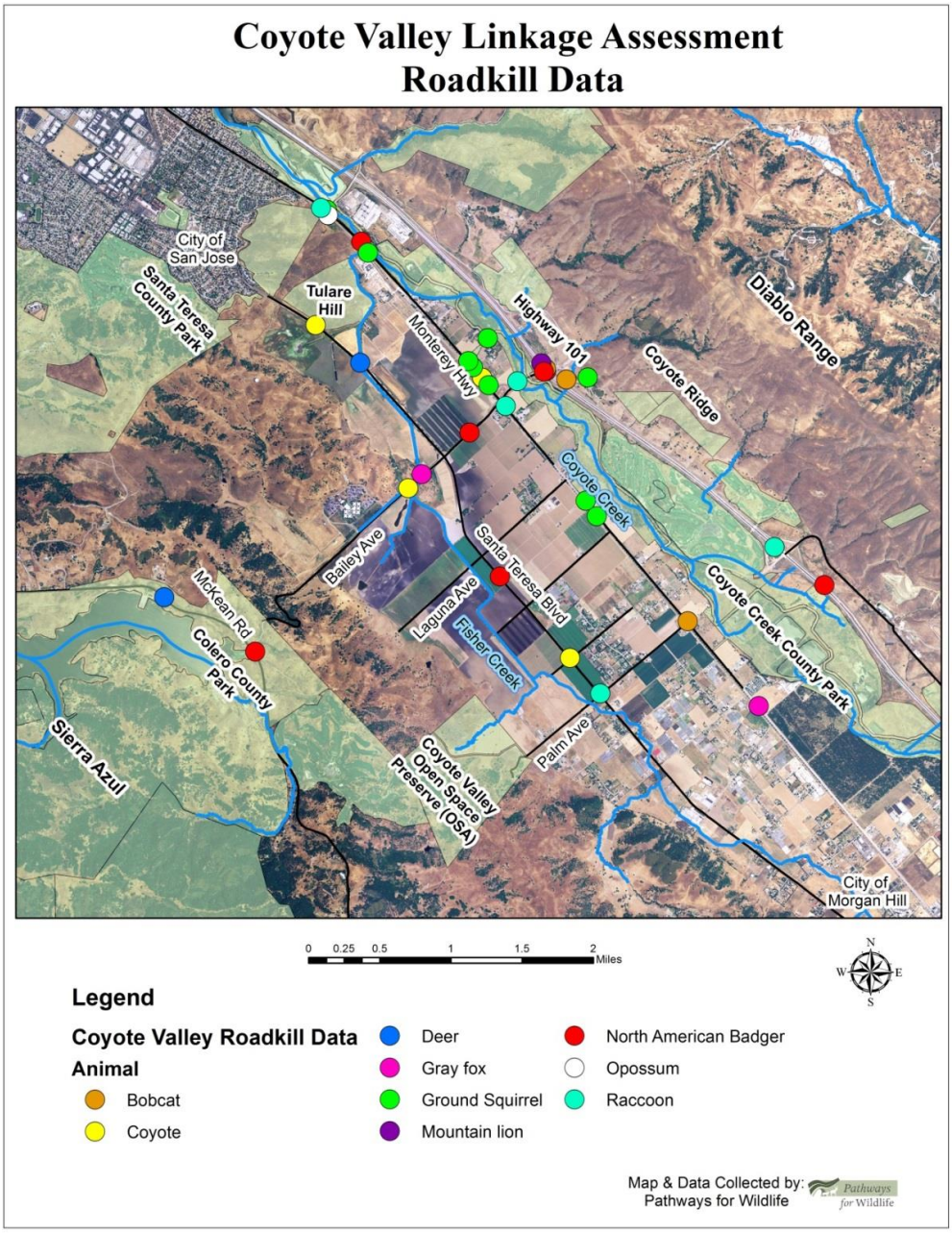


Figure 106. Wildlife-vehicle collision map: 2015-2016.

Santa Teresa Blvd

A total of six animals were found hit on Santa Teresa Blvd, including two coyotes, two opossums, one striped skunk, and one wild pig. This road had the lowest rate of WVCs per mile surveyed relative to other roads surveyed (0.9 animals/mi). On Santa Teresa Blvd., a coyote was found hit by the Laguna Seca culvert next to the most northern Tulare Hill gate, NC20 (Figure 107). This culvert had a meshed gate fence set up on the east side of Laguna Seca during the study period, though it has since been replaced. The roadkill data, camera data, and bobcat collar data combined document that there are high rates of at-grade passages across Santa Teresa Blvd relative to other site types within the study area (fence line/gate, culverts and bridge), along with wildlife also being hit by vehicles on the road.

Figure 107. Coyote remains found Santa Teresa Blvd. by Tulare Gate NC20 on 7-21-2021.

Monterey Rd

A total of 19 animals were found hit on Monterey Rd, including one coyote, two deer, one opossum, one rabbit, and 14 raccoons. Raccoon made up the vast majority of roadkill records along Monterey Rd (73.7%), and more than half of these raccoon roadkill detections were south of Bailey Ave. The majority (42.1%) of roadkill records along Monterey Rd occurred north of Blanchard Rd near the NCVCA.

Monterey Rd had the highest number of WVCs and the highest rate of WVCs per mile surveyed (2.8 animals/mi) within the study area, which coincides with previous roadkill studies. On Monterey Road at the Metcalf intersection, a female deer was found hit on 5/17/2022 in the northbound lane by the median

(Figure 108). This is an important data point as the swale area at Tulare Hill has been identified as a potentially important location to install a wildlife crossing structure.

Figure 108. Female deer hit on Monterey Road on the northbound lane on 5/17/2022.

During the bobcat radio collar study, we recorded several un-collared and collard bobcats hit on Monterey Rd (Figure 109). We also recorded several collared bobcats successfully crossing Monterey Rd during the 2018-2019 study. B10F Thistle crossed Monterey Rd successfully five times between Fisher Creek and the Metcalf intersection, as evidenced by bobcat telemetry data (which recorded GPS locations every 5 min when collars were in motion).

Figure 109. Bobcat hit on Monterey Rd at Tulare Swale 9-22-18.

US 101

A total of 15 animals were found hit on US 101 during the study, including nine coyotes, three deer, one gray fox, and two wild pigs. This road had the second-highest number of WVCs and second-highest rate of WVCs per mile surveyed relative to other roads (1.9 animals/mi). We recorded multiple species hit between the Bailey overpass and where Coyote Creek runs underneath the US 101 and Hwy 85 interchange. Seven of the nine coyotes that were hit during this study were hit in this stretch, along with a deer, a wild pig, and opossum.

There are other roadkill data we collected from different studies along US 101 in the past several years. On 3/30/2020, we recorded an American badger hit on US-101, just north of the Bailey overpass on the side of the highway by the northbound lanes (Figure 110). This location is across from the US 101 Coyote Valley Culvert PM 24.27.

Figure 110. American badger hit on US-101 on 3/30/2020, data courtesy of the American Badger and Burrowing Owl Habitat Suitability Assessment Report 2019-2022 conducted by Pathways for Wildlife and SFBBO for the Midpeninsula Regional Open Space District. The sample collected from the badger resulted in successful DNA amplification.

The data from this current study and contributed data identified an area where there was not previously recorded roadkill between the Bailey Overpass up to the Hwy 85 interchange. This gives us a better understanding of wildlife movement in the north section of Coyote Valley and for formulating wildlife connectivity enhancements along this stretch of US 101.

8.5 Bicycle Roadkill Surveys

The bicycle surveys were highly beneficial to include as we found animals hit that were not visible from the vehicle driving surveys. For example, B06 Sage, one of the collared bobcats, was found several feet from Bailey Ave. behind vegetation that obscured B06's very decomposed body from the car (Figure 109). We also found animals hit on Santa Teresa Blvd. that we would not have seen from the car during vehicle surveys. The bicycle surveys generally were most beneficial in finding decomposed bodies that consisted mainly of bones and fur, making them less visible, such as the coyote found near the Tulare Hill Gate NC20 at Santa Teresa Blvd. (Figure 107).

9.0 Wildlife Connectivity Enhancement Recommendations

Based on the findings from this study and from previous studies in the NCVCA area, we provide a broad suite of recommendations to enhance wildlife connectivity and increase the functionality of North Coyote

Valley as a wildlife linkage. These recommendations are based on current conditions within the study area, and should be revisited and refined as site conditions change with planned ecological restoration, which may lead to changes in species interactions with the NCVCA properties and roads. These recommendations represent a menu of options and a starting point for future refinement based on feasibility and other considerations.

9.1 Bailey Ave. Fisher Creek Bridge: Sediment Removal

We recommend exploring options to increase the permeability of the Bailey Ave. Fisher Creek Bridge for wildlife movement, such as sediment removal, fence modifications, and/or habitat restoration upstream of this site. This study recorded low rates of wildlife passage through this bridge (16 total passages), without any passages by large mammals. However, baseline data from monitoring efforts in 2008 at this bridge documented deer, coyote, bobcat, and raccoon routinely crossing through each month (Figures 111-112, Safe Passages for Coyote Valley 2012).

Since 2008, two exclusionary barbed wire fences were set up at the southern opening of the bridge. In addition to the two fences, there is also sediment buildup, which has resulted in a decrease in height throughout the structure compared to the bridge's conditions in 2008 (Figure 113). During the Coyote Valley Linkage Assessment Study from 2015-2016, there were only 11 successful wildlife crossings recorded at this bridge compared to a much higher rate of passages by multiple species recorded from 2008-2010 (Safe Passages for Coyote Valley 2012, Diamond, T. and A. Snyder. 2016)

Figure 111. Male deer successfully crossing through the Bailey bridge at Fisher Creek in 2008.

Figure 112. Coyote and raccoon tracks at the Bailey Ave. bridge at Fisher Creek in 2008.

Figure 113. Bailey Ave. bridge at Fisher Creek in 2008, north side of Bailey Ave looking south towards Spreckels Hill.

Given flooding issues associated with the Santa Teresa Boulevard Fisher Creek culvert, the Bailey Ave. Fisher Creek Bridge is the only undercrossing in the NCVCA large enough to facilitate large mammal movement, making modifications to this site important for overall connectivity.

We suggest exploring the feasibility of clearing out the sediment build-up under the Bailey Ave. bridge to make it more permeable for large mammal movement, such as mountain lions and deer. The bridge still had banks available on the east and west sections of the bridge for large mammal wildlife movement during flooding and storm events in 2008, suggesting sediment clearing could help facilitate passage even during the wet season. The bridge is owned by Santa Clara County, and thus coordination with the county would be required to address this issue. The sediment clearing would require Clean Water Act Sections 404 and 401 permits, a Lake and Streambed Alteration permit, and a Valley Habitat Plan permit.

Habitat restoration actions upstream in the Fisher Creek watershed could also be explored to help reduce sediment build-up in the bridge moving forward. Restoration of the Fisher Creek floodplain in a way that allows for the slowing and spreading of water and sediment might help reduce sediment inputs. Discussions with hydrologists, engineers, restoration ecologists, and other experts would be beneficial to determine all possible options to make this bridge more functional for large mammal movement and to determine the costs and benefits of various options.

There is also restrictive fencing on the south side of the bridge at Spreckels Hill (Figure 115). It would be highly beneficial to create a wildlife friendly fencing design to guide wildlife to the bridge as we recorded multiple at-grade wildlife crossings and wildlife-vehicle mortalities in the vicinity of the bridge.

Figure 114. Bailey Bridge at Fisher Creek on 1/13/2022, eastern section of the bridge.

Figure 115. Bailey Bridge at Fisher Creek on 1/14/2022, south side of the bridge, eastern section.

9.2 Culvert Modifications, Retrofits, and New Undercrossings

The culverts within the NCVCA have little functionality for wildlife movement under current conditions because the majority of the culverts remain inundated with water throughout most of the year. We recommend exploring the feasibility of installing culverts and/or undercrossings (i.e., open span structure) next to the existing culverts that can serve as designated wildlife passages, provided such structures could be designed to include dry ground for wildlife movement, with limited or no flooding. This would require understanding the hydrology and hydroperiods of the Laguna Seca system under current and projected future conditions with habitat restoration to ensure any newly installed structures remain dry enough to facilitate wildlife passage year-round. We suggest that when the CVCAMP team is assessing improvements to various culverts for restoration purposes, they should consult with a wildlife movement expert to incorporate passage concepts into their designs.

Another option is to retrofit the existing culverts. This could involve increasing the dimensions of the existing culverts and/or installing animal walkways as designed by Ken Russo, Senior Environmental Planner, Branch Chief Unit M5 (Acting), Resource Biologist, Caltrans, District 3. The culvert retrofit in Figure 116 was a modified culvert located along a segment of SR 89 that had documented roadkill. Ken Russo and his team retrofitted the culvert by installing an elevated walkway to provide a pathway for wildlife movement while allowing the culvert to still drain water during storm events. The culvert was monitored and proven successful, as wildlife used the culvert during storm season while water was flowing through it.

If new or retrofitted culverts or underpasses are not viable solutions based on hydrology, groundwater elevations, engineering feasibility, cost, and/or other factors, wildlife overpasses that span Santa Teresa

Blvd may be important alternatives to explore. Across all scenarios, minimizing the impacts from street light and noise will be important.

Figure 116. Culvert retrofit on SR-89 by Ken Russo, Senior Environmental Planner, Branch Chief Unit M5, Resource Biologist, Caltrans, District 3.

9.3 Santa Teresa Blvd. Fencing Modifications

Most of the fencing along Santa Teresa Blvd. at Laguna Seca restricted wildlife movement during the study period (Figure 120). We detected higher species richness at IBM compared to Laguna Seca, which might be because of the less restrictive fencing at IBM. We recommend increasing the permeability of fencing at Laguna Seca to increase wildlife passage.

Specific fencing recommendations are dependent on whether livestock grazing is planned as a continued use at Laguna Seca. If livestock grazing is removed, publications and guides such as The Landowner's Guide to Wildlife Friendly Fences, Second Edition 2012 can be used to design wildlife-friendly fencing with a maximum fence height of 42" (Figure 121). If livestock grazing is a continued use, these wildlife-friendly fence designs should be modified to meet lawful fence requirements in California, which require a fence height of 48". To prevent livestock calves from escaping through the fence and getting out onto Santa Teresa Blvd, the bottom strand should be at a height of 12", as recommended in The Landowner's Guide to

Wildlife Friendly Fences (Figure 126). These livestock fencing recommendations are particularly pertinent for the perimeter fence along Santa Teresa Blvd. Interior fences within the NCVCA properties (if any) can follow the recommendations in The Landowner's Guide for livestock.

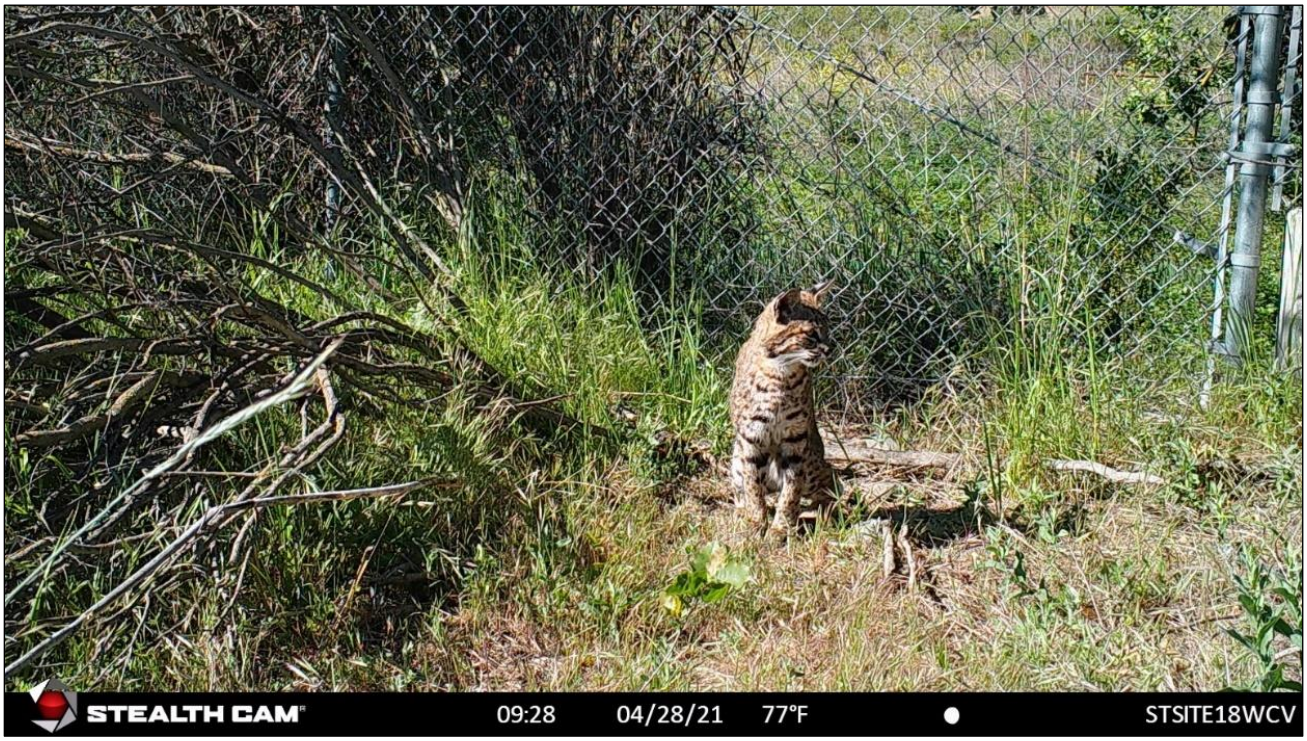


Figure 120. Bobcat at Santa Teresa Blvd. chain link fence line at Fisher Creek.

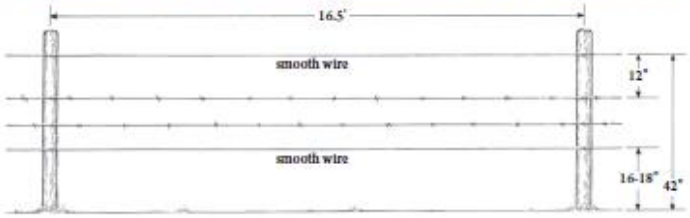
MDT Options for Wildlife Friendly Highway Right-of-Way Fence

An elk crossing with plastic-coated top and bottom wires allows quick passage out of the right-of-way, while center barbed wires still hold cattle.

In some situations, the highway department may install wildlife jumps, which are one-way ramps that allow animals to escape the highway ROW.

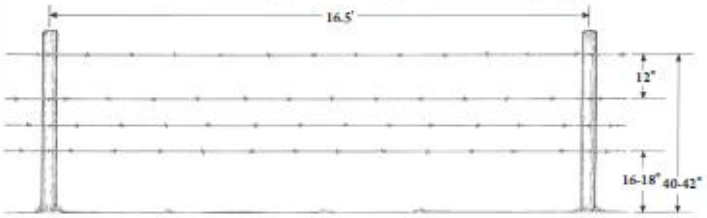
Preferred Fence

Top and bottom smooth wires allow the easiest passage for wildlife. The standard wire heights are 16" - 18" bottom wire, 40" - 42" top wire, and 12" between the top two wires to minimize entanglements.



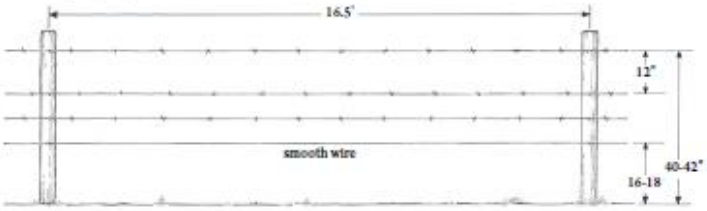
Basic All-Barbed Wire

In cases where all-barbed wire is needed, adjusted wire heights can make wildlife passage easier.



Pronghorn Fence

A smooth bottom wire at 16" - 18" minimum above the ground is recommended for pronghorn country, or where young ungulates are common.



Fence for Sheep and New Calves

A 12" bottom wire should only be used in areas without pronghorn, or for operations where a low wire is necessary, such as for sheep and very young calves.

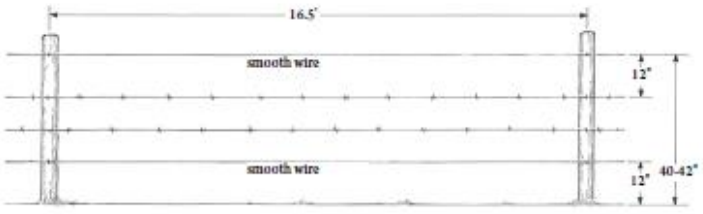


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Figure 121. Landowner's Guide to Wildlife Friendly Fences, Second Edition 2012.

9.4 Santa Teresa Blvd Gate Modifications

We recommend modifying all gates to a similar structure as Gate NC02 at Laguna Seca to increase the permeability of the landscape between the newly protected properties. We recorded bobcats traveling through the Laguna Seca Gate NC02 and the Tulare Hill Gate NC21 (Figure 127). However, we did not record any bobcats traveling through the gates with restrictive mesh fencing at Laguna Seca Gates NC01 and NC03. We recommend replacing gates with restrictive mesh fencing to a similar design as Gate NC02. This should be compatible with livestock grazing, as we did not record cattle or calves crossing through this gate (Figure 123).

Figure 122. Bobcat walking through the Laguna Seca Gate NC02, on the west side of Santa Teresa Blvd.

Figure 123. Laguna Seca Gate NC02.

9.5 Santa Teresa Blvd Modifications

Santa Teresa Blvd transitions from two lanes to four lanes north of the intersection with Bailey Ave. This is also where the vegetated median occurs. This road design with four lanes was meant to accommodate traffic associated with projected development in Coyote Valley, such as large office campuses at NCVCA Laguna Seca and NCVCA Tulare Meadows. Given that these and other properties are now protected and the zoning has changed to open space and agriculture, there may be an opportunity to redesign Santa Teresa Blvd from four lanes to two lanes. This could potentially help reduce WVCs by reducing the length of roadway that wildlife have to traverse.

9.6 Monterey Rd Permeability Modifications

This and previous studies have consistently found that Monterey Rd has the highest rates of WVCs among roads monitored in Coyote Valley. Thus, we recommend modifying the Monterey Rd median from Bailey Ave to Metcalf Rd to increase permeability for wildlife movement and reduce WVCs. The current cement median and glare screen make it difficult for wildlife to cross the road, as the median reduces visibility to the other side and the height is difficult for species like American badger to jump or climb over.

The Caltrans Standards Plan includes guidance on the use of glare screens, median selection, and wildlife passageway improvements to medians to meet safety goals while addressing other goals, such as facilitating animal movement. Based on Caltrans guidance and expert opinion, the following options could be explored to modify the median to increase permeability:

- Remove the median barrier's anti-glare fencing for a portion or entire length of the road. Caltrans recommends using median lighting or high mast lighting to reduce headlight glare in locations where glare screens create impacts. However, this should be weighed against the negative impacts of increased lighting on wildlife along roadsides.

- Increase the number and spacing of gaps in the median barrier. The Caltrans Standards Plan recommends adding 5' wide gaps in concrete median barriers to allow for movement of large mammals in areas where WVCs are a concern. Smaller gaps (2') can facilitate movement of medium-sized mammals, while including 9" diameter semi-circle cut-outs at the median base can be used to facilitate movement of smaller mammals.

- Replace sections of the cement median as an open median from the Bailey Ave intersection to the Metcalf intersection to increase the permeability for wildlife movement through the median. A large section of SR-152 Pacheco Pass, a major commuter highway, was replaced with an open median to increase the safety of the highway for wildlife and drivers (Lindsay Vivian, Caltrans Biological Branch Chief pers. comm, 1-10-2023). Open medians include thrie-beam and cable barrier designs (Figure 124).

Figure 124. Example of an open median.

9.7 Monterey Rd. Wildlife Crossings

The Monterey Road Report (Santa Clara Valley Wildlife Corridor Working Group 2019) identifies potential wildlife crossings along Monterey Rd to enhance permeability and reduce WVCs. One of the recommendations is to install a wildlife overpass at Monterey Road near Bailey Ave. However, the nearby existing Bailey Ave vehicle overpass is well-lit at night by streetlamps. The lighting would have to be modified in order for an overpass to be functional near this location, as there were substantially more wildlife detections further away on the Bailey access road where there is no lighting. We suggest further investigation into the location of a potential wildlife overpass at locations where multiple species of wildlife have been recorded attempting to cross Monterey Road and were killed by vehicles. If an overpass is deemed needed and feasible, we recommend including measures to minimize light impacts.

9.8 US 101 Directional Fencing

This study found that US 101 had the second-highest rates of WVCs within the study area after Monterey Rd. However, previous studies have documented wildlife using existing culverts and underpasses beneath US 101, suggesting that directional fencing is needed to guide wildlife to these undercrossings, which could help reduce WVCs.

The US 101 Coyote Creek bridge has documented passage by multiple species in numerous studies and is an important wildlife thoroughfare (Diamond, T. and A. Snyder. 2016). It is also the only location with a documented record of a mountain lion and American badger crossing under US 101 (Safe Passage for Coyote Valley, 2012). There have also been documented passages by deer at the Coyote Creek Golf Drive

underpass and high passages rates by mesocarnivores at many of the culverts (Diamond, T. and A. Snyder. 2016 and Safe Passage for Coyote Valley 2012).

Furthermore, in 2016 and 2022, Caltrans cleared out several culverts within this stretch of highway to increase permeability for wildlife. In the section of US 101 that runs through Coyote Valley, there are three culverts that have the appropriate dimensions to facilitate movement by medium to large mammals: Culvert PM 20.98, Culvert PM 23.2, and Culvert PM 24.27 (Figure 117). From a previous monitoring study, these culverts were documented to have consistent wildlife movement through them (Diamond & Johnston unpublished data 2007-2008). However, over the course of approximately six years (from 2008 to 2014), the culverts became completely obstructed by debris at their western openings. After these culverts were cleared out in 2016, we documented successful wildlife passages through them (Diamond, T. and A. Snyder. 2018b, Figures 118-119).

The stretch of US 101 spanning between these underpasses is eight lanes with fencing on either side of the highway, making it dangerous and difficult for wildlife to cross at-grade. Installing directional fencing at structures that have documented wildlife use would increase the safety for wildlife and vehicle drivers. Specifically, we recommend installing directional fencing along US 101 from the US 101 Coyote Creek bridge in the south to the Coyote Creek underpass at the US 101 and Hwy 85 interchange to the north.

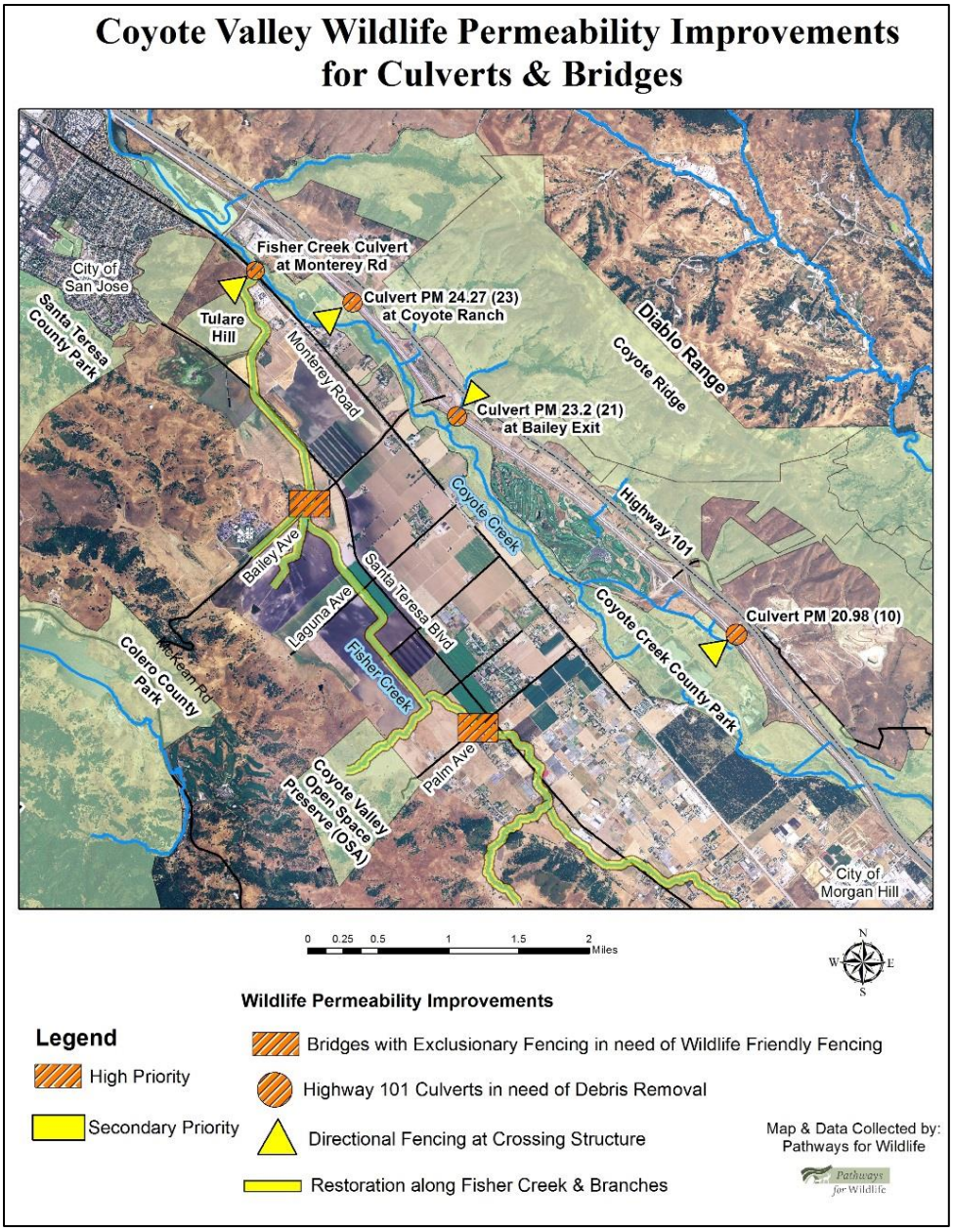

Figure 117. Infrastructure in Coyote Valley with current or previous need for maintenance. Note that the three culverts along US 101 were cleared of sediment in 2016. These culverts can facilitate movement of medium and large mammals.

Figure 118. First coyote to travel through Culvert PM 20.98 west on 1/2/2017 after it was cleared out by Caltrans in 2016.

Figure 119. Bobcat traveling west through Culvert PM 24.27 west on 10/29/17 after Caltrans removed the exclusionary fencing that was set up in front of the culvert in 2016.

Currently, Lindsay Vivian at Caltrans District 4 is working with Ann Calnan at Santa Clara Valley Transportation Authority (VTA) to identify a funding and planning mechanism to install directional fencing along US 101 in Coyote Valley (Lindsay Vivian Caltrans District 4 pers. comm. 12/10/2022, Ann Calnan, Santa Clara VTA pers. comm. 1/1/2023). We are also currently working on a US 395 wildlife connectivity project with Caltrans that has installed over 15 miles of directional fencing and jump-outs. Caltrans has shared those directional fencing schematics, which are state-approved designs. These designs and schematics can be shared with Caltrans District 4 staff to inform planning along US 101.

10.0 Additional Recommendations and Best Management Practices

The following recommendations are based on a review of data from multiple studies as well as additional best management practices for wildlife connectivity that go beyond the focus of this particular study. These recommendations include habitat restoration, livestock grazing management, and managing recreation.

10.1 Habitat Restoration and Livestock Grazing Management

Efforts are underway to plan for habitat restoration in the NCVCA as part of the CVCAMP planning process. The findings from this and previous studies can be used to inform habitat restoration and management actions specific to improving wildlife habitat and connectivity, especially along wildlife movement thoroughfares.

Previous studies have indicated that Fisher Creek is an important throughfare for facilitating wildlife movement across the valley floor (Diamond, T. and A. Snyder. 2016). Data collected during the Coyote Valley Linkage Assessment study from 2015-2016 found that camera stations at Coyote Creek County Park and OSA's Coyote Valley Preserve, which are relatively unfragmented core habitats with Coyote Valley, had the highest number of detections per 100 trap nights throughout the study period. A large camera array was also set up along Fisher Creek to compare species detections with these core habitat sites. Three out of the five camera stations along Fisher Creek recorded similar amounts of detections compared to Coyote Creek County Park and Coyote Valley Open Space Preserve. These data indicate that Fisher Creek is facilitating similar numbers of animal detections as found in adjacent core habitats (Diamond, T. and A. Snyder. 2016). Additionally, one of the collared bobcats from the 2017-2018 study, B01 Serpentine, routinely used the riparian habitat along Fisher Creek that spans from Santa Teresa Blvd. to Bailey Ave within NCVCA Laguna Seca (Serieys, L.E.K. and C.C. Wilmers. 2019, Figure 125). This could be an important wildlife throughfare area.

The NCVCA Laguna Seca property has extensive cattle operations, and the cows are often found grazing along Fisher Creek. During the course of our study, we observed that cattle have access to Fisher Creek year-round. There have been extensive studies in the literature that document negative impacts of cattle operations and wildlife movement. Cows tend to outcompete other ungulates such as deer and Tule elk for resources such as food and water (Simpson et al. 2011, deLeeuw et al. 2001, Brown et al. 2010, Langner, C. pers. comm. 11/23/2022). However, other studies include guidance for cattle operation management regimes that are compatible with restoration efforts (e.g., Vernon et al. 2022).

Given the importance of riparian areas in NCVCA Laguna Seca for wildlife movement, we recommend the following actions to maintain both the wildlife linkage (corridor) and cattle operations:

- Create a section of wildlife friendly fencing design along Fisher Creek and the bypass channel to allow for wildlife movement.
- Restore native vegetation in the riparian area along Fisher Creek and the bypass channel, especially the area that runs between Laguna Seca and Spreckels Hill.
- Exclude cattle from the Fisher Creek and bypass channel riparian areas to allow for vegetation recovery, habitat restoration, and wildlife movement.

- Work with a range ecologist to develop a livestock grazing management plan that ensures compatibility of livestock grazing with wildlife habitat and connectivity needs.

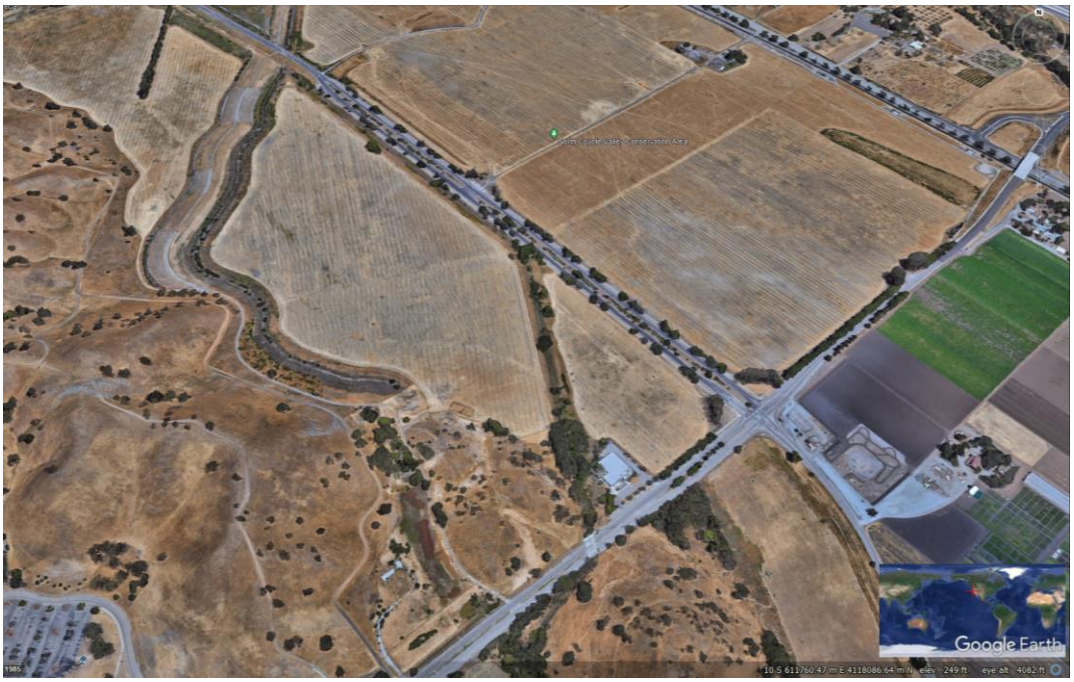

Figure 125. Riparian habitat adjacent to Fisher Creek between Santa Teresa Blvd. and Bailey Ave.

10.2 Managing Recreational Impacts on Wildlife

Planning is underway for future use, management, and restoration of the NCVCA properties. Wildlife connectivity and water resources are the primary conservation values to preserve and enhance in this area, with recreation and public access a secondary value that should be planned to be compatible with wildlife and water resources. Given this, there is a need for guidance around how to manage recreation in areas important for wildlife movement and connectivity.

There has been extensive literature documenting the negative impacts of recreation to wildlife in protected areas, which has been summarized in recent publications (e.g., Lucas, E. 2020). For example, a study in Sonoma County found a five-fold decline in the density of native carnivores and a substantial shift in community composition from native to nonnative species in protected areas with recreation compared to protected areas without recreation (Reed and Merenlender 2008).

In light of these publications, and given how narrow the Coyote Valley wildlife linkage is, we recommend careful consideration of recreational uses and trail planning at the NCVCA properties. Recreational activities risk further constraining wildlife movement between the protected properties in an already fragmented landscape, which could jeopardize the functionality of the wildlife linkage and ultimately detour critical movement of sensitive species such as mountain lions and American badgers, in which genetic flow is critical for improving the health of these species populations, both locally and regionally (Gustafson et al. 2018, Diamond et al. 2022).

Any trail planning should take into consideration the overall functionality of the linkage. Guidance in the literature regarding buffer areas for different wildlife species to reduce disturbance should be consulted to inform planning. It may be beneficial to site trails near areas of existing disturbance, such as roads and sidewalks, and avoid areas of core habitat and wildlife thoroughfares, such as riparian areas with cover. Establishing a monitoring and adaptive management plan to evaluate wildlife responses to recreation and adjust management over time will be important.

10.3 Managing and Enhancing Wildlife Thoroughfares

Based on a synthesis of data from previous studies as well as this particular study (Serieys, L.E.K. and C.C. Wilmers. 2019, Diamond, T. and A. Snyder. 2016), we created a map delineating areas featuring high rates of wildlife movement between the NCVCA properties (Figure 126). These locations are numbered within the map and are prioritized based on the data results (Figure 127). It is important to note that these wildlife thoroughfares are restricted to the study area and specifically along the roads. Future research should focus on surveying the interior of the NCVCA properties (i.e., Laguna Seca, Tulare Hill, and Tulare Meadows) and surrounding properties (i.e., IBM, Calero County Park) to understand wildlife movement in these core habitat areas that were not surveyed in this or previous studies. These locations are described in more detail below, along with a description of particular recommendations to protect and enhance their functionality for connectivity.

1. Santa Teresa Blvd. fence line at NCVCA Laguna Seca. This is as sensitive location in which wildlife are traveling between NCVCA Laguna Seca and NCVCA Tulare Meadows and Tulare Hill, featuring grassland habitat on both sides of Santa Teresa Blvd that may be important for badger. At the locations in which there were openings in the fence line, we recorded wildlife moving both east and west into the NCVCA Laguna Seca. We also recorded deer traveling both north and south along the fence line, and recorded a badger at the NC01 gate. We recommend a dedicated wildlife crossing such as a culvert or overpass with directional fencing as a long-term solution within this span of Santa Teresa Blvd. We recommend increasing the permeability of the fence line and the gate as a short-term solution.

2. Drainage ditch between NCVCA Tulare Meadows and NCVCA Laguna Seca. Wildlife was recorded traveling between NCVCA Tulare Meadows and NCVCA Laguna Seca at this location. Gate NC20 at Tulare Hill is also one of the more permeable gates without meshed fencing. The drainage ditch provides both cover and water for wildlife to travel along. We recommend vegetation restoration and also as a possible location for a future dedicated wildlife crossing location, such as a culvert or overpass, at this location.

3. Habitat with cover spanning into NCVCA Laguna Seca. Wildlife was documented traveling east and west into NCVCA Laguna Seca at this location. There is a tree line that animals maybe following and using as cover. Gate NC02 provided access into Laguna Seca as it is the most permeable gate for wildlife to travel through. This gate had the highest rate of multiple species use. We recommend to keep the gate permeable and not to add in restrictive fencing to the gate.

4. Fisher Creek by Santa Teresa Blvd. at NCVCA Laguna Seca and NCVCA Tulare Meadows. Fisher Creek is a critical component of the Coyote Valley linkage as it provides the best available riparian habitat for wildlife to travel across the valley floor. Of importance, a mountain lion was recorded traveling along Fisher Creek at NCVCA Tulare Meadows in 2018 (Figure 142). Both recreation and cattle could have negative impacts to

this sensitive habitat. We recommend livestock exclusion fencing to keep the cattle out of the riparian areas along the bypass channel and Fisher Creek with a 300' buffer. The fencing should be wildlife-friendly to allow for wildlife access to these riparian areas. Recreation should not occur within the riparian areas. We also recommend restoring riparian vegetation along Fisher Creek and the bypass channel to enhance wildlife movement.

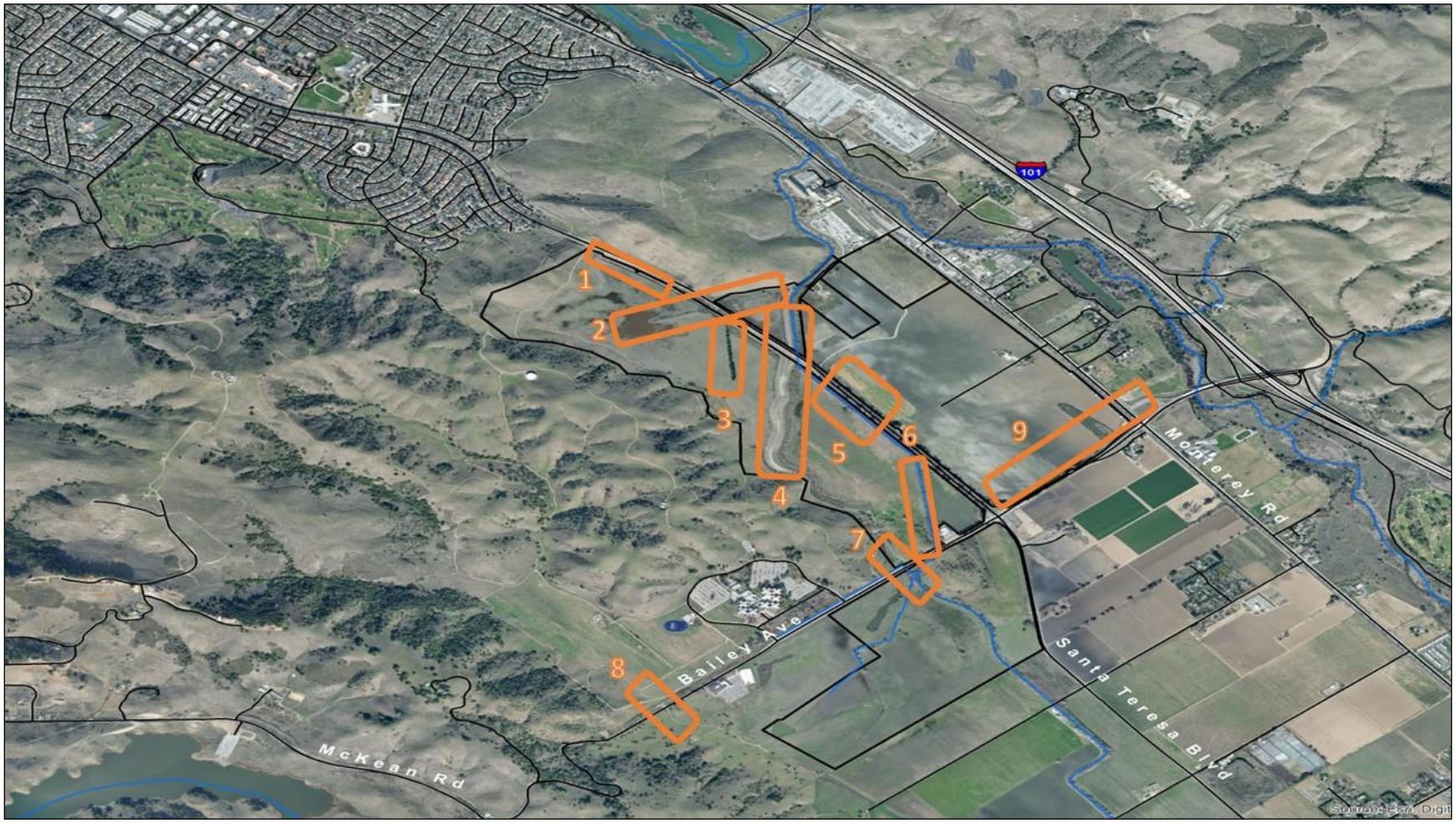

Figure 126. Map of wildlife thoroughfares areas within the North Coyote Valley Conservation Area (study area denoted in black). Note that interior core habitat on the west side of NCVCA Laguna Seca and within NCVCA Tulare Meadows and Tulare Hill have not yet been surveyed for wildlife. Thus, these conceptual thoroughfares are limited to within the area investigated in the current study.

Number on Map	Location	Priority Level
1	Santa Teresa Blvd fence line at NCVCA Laguna Seca	High
2	Drainage ditch between NCVCA Tulare Meadows and NCVCA Laguna Seca	High
3	Habitat with cover spanning into NCVCA Laguna Seca	High
4	Fisher Creek by Santa Teresa Blvd at NCVCA Laguna Seca and NCVCA Tulare Meadows	High
5	Santa Teresa Blvd at NCVCA Laguna Seca and NCVCA Tulare Meadows	Moderate
6	Fisher Creek at NCVCA Laguna Seca from Santa Teresa Blvd to Bailey Ave	Moderate
7	Fisher Creek by Bailey Ave at NCVCA Laguna Seca and NCVCA Addition	High
8	IBM parcourse habitat and adjacent habitat across Bailey Ave	High
9	NCVCA Tulare Meadows	Moderate

Figure 127. Wildlife thoroughfares in the study area and relative priority level.

5. Santa Teresa Blvd at NCVCA Laguna Seca and NCVCA Tulare Meadows. We recorded the majority of wildlife traveling both east and west between these two properties at-grade along Santa Teresa within this location. Wildlife may be using the vegetated median to travel across the road. Vegetative medians might provide a benefit to wildlife traveling across the road as it gives them the opportunity to stop and assess before continuing to travel across the rest of the road, instead of traveling across the entire span of the road without the ability to hide and wait for vehicles to pass by (Beier P. pers. comm. 2009). However, there is limited scientific literature on this subject. We also noted rodent nests within the vegetated median, such as Dusky footed woodrats, which also might be acting as an attractant for carnivores to hunt within the vegetated median. Reducing human use of the median could help make it more functional for wildlife.

6. Fisher Creek at NCVCA Laguna Seca from Santa Teresa Blvd. to Bailey Ave. The bobcat telemetry study found that this riparian stretch, which runs adjacent to Fisher Creek, featured a high rate of bobcat movement in comparison to the adjacent fields (Serieys, L.E.K. and C.C. Wilmers. 2019). This habitat might also benefit from restoration to help guide animals to travel within the meadow habitat than along the roads. Livestock exclusion fencing that is also wildlife-friendly would be beneficial in this location.

7. Fisher Creek by Bailey Ave. at NCVCA Laguna Seca and NCVCA Addition. This location includes Fisher Creek and the Fisher Creek bypass channel, both of which run under Bailey Ave. Multiple species have been recorded traveling through the bridge and culvert over several studies. We recommend clearing the

bridge of sediment and restoring Fisher Creek. Since the culvert tends to become inundated with water after flooding events, we recommend the installation of a dry culvert as a dedicated wildlife crossing (if possible, depending on hydrological conditions).

8. IBM parcourse habitat and adjacent habitat across Bailey Ave. At this location we recorded the highest rates of wildlife at-grade detections and the highest rates of deer detections. We recommend investigating conservation options to protect the land on the south side of Bailey Ave.

9. NCVCA Tulare Meadows. We recorded a high rate of multiple individuals of coyotes that were consistently traveling along the Bailey Ave. access road throughout the study period. This habitat might also benefit from restoration within the meadow system to provide more cover than the existing tree line along Santa Teresa Blvd. to help guide animals to travel within the meadow habitat rather than along the road.

11.0 Potential Next Steps for Future Research

This section provides recommendations for future research in the NCVCA and broader Coyote Valley linkage. The results from this and previous studies should be treated as a baseline assessment of existing conditions. As the system is restored and managed for increased wildlife connectivity and wildlife habitat, wildlife use and movement within the NCVCA are likely to change as well, which in turn might result in new insights as to where infrastructure such as wildlife crossing structures should be located and how recreation should be managed. Thus, ongoing monitoring and adaptive management will be important to assess how wildlife respond to management and restoration actions.

The continuation of roadkill surveys to build upon the existing body of roadkill data would be highly beneficial to better understand where there are roadkill clusters. Roadkill clusters can identify locations where wildlife is regularly attempting to cross roads and getting hit by vehicles. Having multiple years' worth of roadkill data is required for conducting the Roadkill Hot Spot analysis in GIS, which is used to identify statistically relevant roadkill hot spots within a study area with road data locations. Further roadkill surveys along McKean Road would also be beneficial, as this was the first study to conduct standardized surveys along this road. We also recommend determining the locations of any existing culverts along McKean Road that could facilitate wildlife movement and monitoring these culverts with camera traps to complement roadkill survey data. At-grade camera monitoring of Monterey Rd and McKean Rd in combination with roadkill surveys (as was done for Bailey Ave and Santa Teresa Blvd in this study) would also increase understanding of how animals are interacting with these roads.

There are multiple properties that wildlife could be using as "stepping stones" to cross the broader linkage. Stepping stones consist of core habitat without much human land use occurring within them (Corridor Ecology 2019). These stepping stones could be facilitating movement of sensitive species, such as mountain lion and American badger. It would be important to identify these stepping stones to manage them for wildlife movement.

Based on data collection up to date, potential stepping stones could include the Calero Lakeview property, the IBM protected habitat, Laguna Seca, and Tulare Hill in North Coyote Valley. The Tilton Ranch, Davidson, and Baird properties and Coyote Valley Open Space Preserve in the mid and south Coyote Valley are also potential stepping stone properties where sensitive species such as mountain lion have been detected. Data collected from this study and previous studies indicate these are important core habitats for wildlife movement, but there have not been comprehensive wildlife surveys conducted on these properties as of yet.

Potential next steps for future research could include confirming if wildlife species such as mountain lions and American badger are traveling through these properties and using them as stepping stones to travel across the landscape. Methods could include setting up camera arrays to record species' movement through these habitats, which might be serving as vital connections for wildlife movement across the valley floor into Coyote Creek County Park.

There have also never been extensive wildlife surveys conducted within the NCVCA. We suggest using a mixed-methods approach that includes wildlife cameras and walking wildlife tracking transects to identify Species of Special Concern, such as American badger and Western burrowing owls. Such surveys could

also be useful in informing future trail planning and restoration. These surveys could be replicated post-restoration to better understand how wildlife might respond to new and enhanced habitat.

We conducted 1 km transects for the Midpeninsula Regional Open Space District American Badger and Burrowing Owl Habitat Suitability Assessment Study (Diamond T. et al. 2022). This was very effective in identifying badger burrows and burrowing owls that were utilizing badger burrows. We also collected hair samples at the badger burrows for genetic analysis. An extension of this research into Coyote Valley would be very beneficial, as we found that badgers in the Peninsula were more genetically related to badgers in Sonoma County than in Santa Clara County, indicating that the badger population in the Peninsula might be isolated (Diamond et al. 2022). However, more genetic samples are needed for further research into the genetic status of badgers in San Mateo, Santa Clara, San Benito, and Monterey Counties. By conducting wildlife tracking transects, a qualified wildlife tracker could identity species use and movement within the NCVCA properties.

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Appendix A: Mountain Lion Records in Coyote Valley

As a candidate for listing under the California Endangered Species Act, mountain lion populations in the Central Coast will require additional considerations. A paper recently published on mountain lion genetics revealed that the Central Coast population, which includes the counties of Santa Cruz and Santa Clara, has a low genetic diversity and effective genetic population size of 16.6 (Gustafson et al. 2018). An effective population size of 50 is assumed sufficient to prevent inbreeding depression in the short term (over the duration of five generations), while an effective population size of 500 is sufficient to retain evolutionary potential in perpetuity (Gustafson et al. 2018). It is therefore important to provide connectivity between the Santa Cruz Mountains and the Diablo Range to facilitate gene flow for mountain lions and other species to keep the greater metapopulations intact and healthy.

During the 2017-2018 bobcat radio collar study, we recorded a total of five mountain lion detections at various camera sites in Coyote Valley. These camera sites included IBM, Fisher Creek at Tulare Hill, Fisher Creek at Fisher Flats, and Coyote Creek County Park (Figures 128-129).

Figures 128-129: Mountain lion recorded at an IBM pond on 2-1-2017 and 2-5-2017, heading west into IBM towards the parcourse.

The records of the mountain lions recorded at Fisher Creek were interesting, as we first recorded a mountain lion at Tulare Hill on 2/11/2018 at 9:26 pm (Figure 130). We then recorded the mountain lion again, further east within the valley floor at Fisher Flats at 9:45pm, just 19 minutes later (Figure 131). The mountain lion was traveling east towards Monterey Road and Coyote Creek County Park. This is the only documented mountain lion movement within North Coyote Valley. On 7/25/2018, approximately five months later, we recorded a mountain lion traveling along Coyote Creek within Coyote Creek County Park, heading north towards Coyote Creek Golf Drive (Figure 132). These data further emphasize the importance of Fisher Creek as a critical wildlife throughfare for multiple species, and demonstrates that mountain lions will travel across the north section of the valley floor.

Figure 130. Mountain lion traveling along Fisher Creek at Tulare Hill on 2/11/2018 at 9:26 pm.

Figure 131. Mountain lion traveling east towards Monterey Road at Fisher Flats on 2/11/2018 at 9:45pm.

Figure 132. Mountain lion at Coyote Creek County Park by the Coyote Creek Golf Drive on 7/25/2