



Parks &
Open Space



Masters of the Environment
University of Colorado Boulder



Carcass Count Inventory & Monitoring Methodology

US 36 Between Boulder and Lyons

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Introduction

This document provides an overview of methods for identifying and documenting animal carcasses along the US 36 corridor between Boulder, Colorado and Lyons, Colorado.

Graduate students at the University of Colorado, Boulder (CU Boulder) developed this methodology as a component of a Capstone project for the Masters of the Environment (MENV) program. Graduate students are conducting this research in collaboration with Boulder County Parks and Open Space (BCPOS), as part of their “Safety for All” initiative, a collaborative effort to improve safety for motorists, cyclists, and wildlife along the US 36 corridor. Additional project partners include the Colorado Department of Transportation (CDOT), City of Boulder Open Space and Mountain Parks (OSMP), and Colorado Parks & Wildlife (CPW).

A full technical version of this methodology is maintained by BCPOS and is available upon request.

Background: Survey Location & Context

Overview

Highway US 36 links the city of Boulder and the town of Lyons, spanning 11 miles of rural land along Colorado’s eastern foothills (see *Figure 1* for a visual of this 11-mile corridor). This stretch supports multiple sensitive species and is a high-volume motor vehicle route.

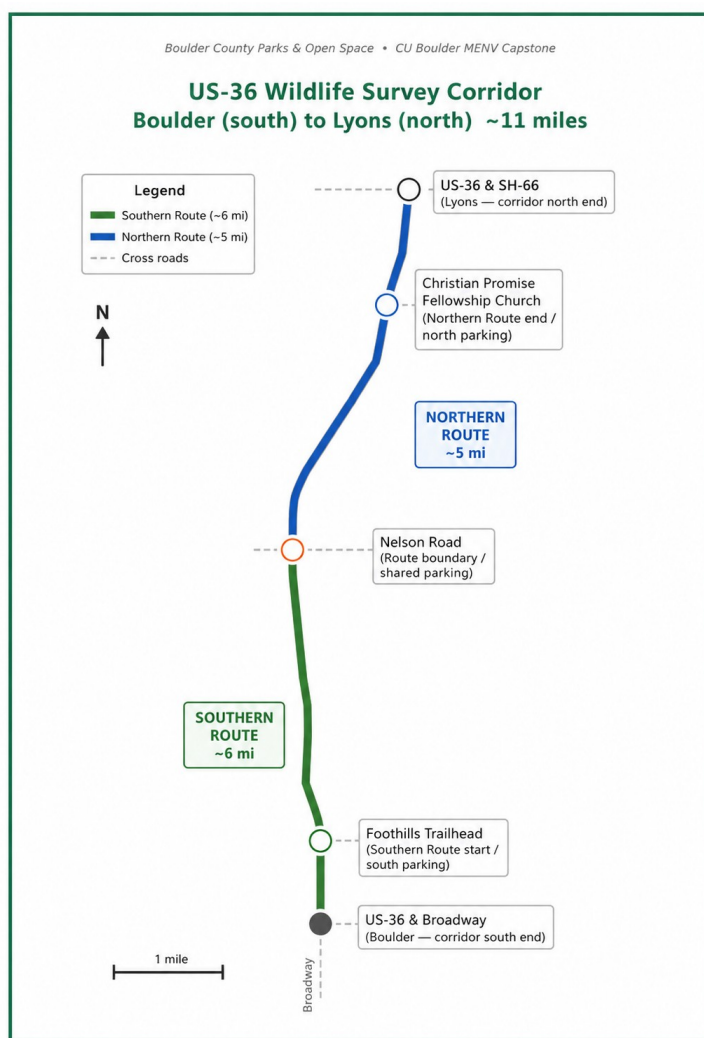


Figure 1 – US 36 Wildlife Survey Corridor between Boulder and Lyons.

The combination of high traffic levels and active wildlife movement has made this section of US 36 one of the highest priority roadways for wildlife management in the state. US 36 between Boulder and Lyons generates 40% of all Wildlife Vehicle Collisions (WVCs) reported in Boulder County (Boulder County, 2024b). Statewide, there were over 7,770 animals killed on roads in 2025 (Longwell, 2026). These crashes cost an estimated \$80 million annually (Kintsch et al., 2022). It is important to note that in this document, the term “survey” refers to the

inventory and monitoring process taking place on US 36 between Boulder and Lyons to detect and count roadside carcasses. While the existence of roadside carcasses is often related to WVCs, these surveys do not attempt to determine the cause of mortality or attribute individual carcasses to specific WVC events. Instead, comprehensive carcass count surveys on US 36 between Boulder and Lyons provide a broader measure of wildlife presence and mortality patterns within the corridor, which is important given the documented impacts of WVCs on both human safety and wildlife populations in this area.

Who Owns the Land Along US 36

Researchers must understand who owns the land along US 36, which is shared by several entities. Access permissions and survey protocols differ depending on whose property a carcass is found. CDOT owns the right-of-way (ROW), generally about 40 feet on each side of the road. A mix of public agencies, privately owned conservation easements, and private owners manage the land beyond the ROW.

Why This Corridor Matters

A 2022 study by CDOT and CPW identified the stretch of US 36 from Nelson Road to Hygiene Road as being in the top 5% of priority road segments in eastern Colorado in need of wildlife connectivity mitigations. This prioritization is based on collision data, elk and deer migration routes, traffic volumes, proximity to suburban areas, and other factors (Kintsch et al., 2022). Additionally, this segment of US 36 is located within the foothills/plains transition zone and is surrounded by thousands of acres of public lands. As such, when animals move seasonally, or up or down in elevation, the road presents a deadly barrier for them to navigate.

In 2024, BCPOS partnered with environmental consultants to assess potential wildlife crossing locations along the corridor, with a focus on large ungulates like elk and deer (Boulder County, 2024a). The assessment included an overview of structure types to support the movement of smaller animals, and noted that smaller animals are underreported in general, in wildlife crossing planning processes overall. Smaller animals are often underreported because elk and deer account for the majority of reported collisions and pose the greatest associated vehicle damage and human injury risk.

The MENV capstone team's work builds on this fact of underrepresented small animal mortalities by systematically documenting collisions across all species, including smaller mammals, birds, reptiles, amphibians, and insects. Prioritizing the capture of complete data on mortalities across all taxa in the corridor will provide BCPOS, CPW, and CDOT with a more complete picture of wildlife movement and mortalities throughout this corridor.

Currently, BCPOS is working with road ecology experts, and in close collaboration with CDOT and CPW to finalize designs for a system of wildlife crossing structures in the corridor, including underpasses, an overpass and exclusionary fencing. The intention is to pursue construction of these structures when final agreements are reached, and funding becomes available.

Researchers conduct carcass count surveys from April to November 2026, covering spring migration of ungulate species through the onset of winter. This timeframe also corresponds with the MENV academic year. This initial survey effort is designed to be repeatable so that future researchers, agency staff, or consultants can continue monitoring the corridor in subsequent years.

Carcass Count Survey Methodology

This carcass count survey methodology outlines steps and establishes protocols for researchers to detect animal carcasses. In the context of this project, researchers detect carcasses by systematically and consistently walking the US 36 corridor.

Vehicle vs Walking Surveys

Surveys by vehicle appear more often in carcass count literature (Collinson et al., 2014) and may be more frequently utilized as a strategy, as they increase the area that can be surveyed.

However, vehicle surveys are known to underreport the number of carcasses detected and to capture large animals like elk and deer while missing small animals. In fact, one study reported that carcass detections are 12–16 times lower than the actual mortality rate when surveys are performed by vehicles (Hallissey et al., 2022). Santos et al. (2016) also reported that vehicle surveys result in lower carcass detection rates, especially for smaller species. One of the main goals of the US 36 survey between Boulder and Lyons is to increase small animal detection; therefore, completing walking surveys is key.

As can be expected, walking surveys take longer than driving, and given the survey area totals 11 miles, the corridor is split into two sections named the Northern Route and Southern Route. The Northern Route is defined as US 36 between Nelson Road and the Christian Promise Fellowship Church. The Southern Route is US 36 between the Foothills Trailhead parking lot and Nelson Road. The Northern Route is approximately 5 miles. The Southern Route is roughly 6 miles. The routes are unequal in distance but balanced in the time it takes to perform the surveys since there is additional driving time for researchers to survey the Northern Route.

Survey Variables

There are many variables in conducting a carcass count survey. Surveying is always conducted by two researchers. This is important for safety, allows for shuttling two vehicles between the start and end points of a survey, and enables one researcher to walk on the east side and one on the west side of the road. Researchers alternate between walking north and south on survey days to ensure sections of the route are surveyed at different times of the day. Additionally, surveying the Northern Route and Southern Route are alternated across all days of the week to remove any bias for detecting carcasses on specific days. Researchers conduct three surveys per week and start within 15 minutes of sunrise. Starting early increases detection rates as carcasses are

discovered before they are eaten or moved by other wildlife. Surveys take approximately 2.5 hours, and Table 1 details the time it takes to perform the various steps.

Step	Time
Vehicle shuttle to start	10 minutes
Parking and putting on gear	5 minutes
Walking the route	2 hours
Return shuttle to pick up vehicle from start	10 minutes

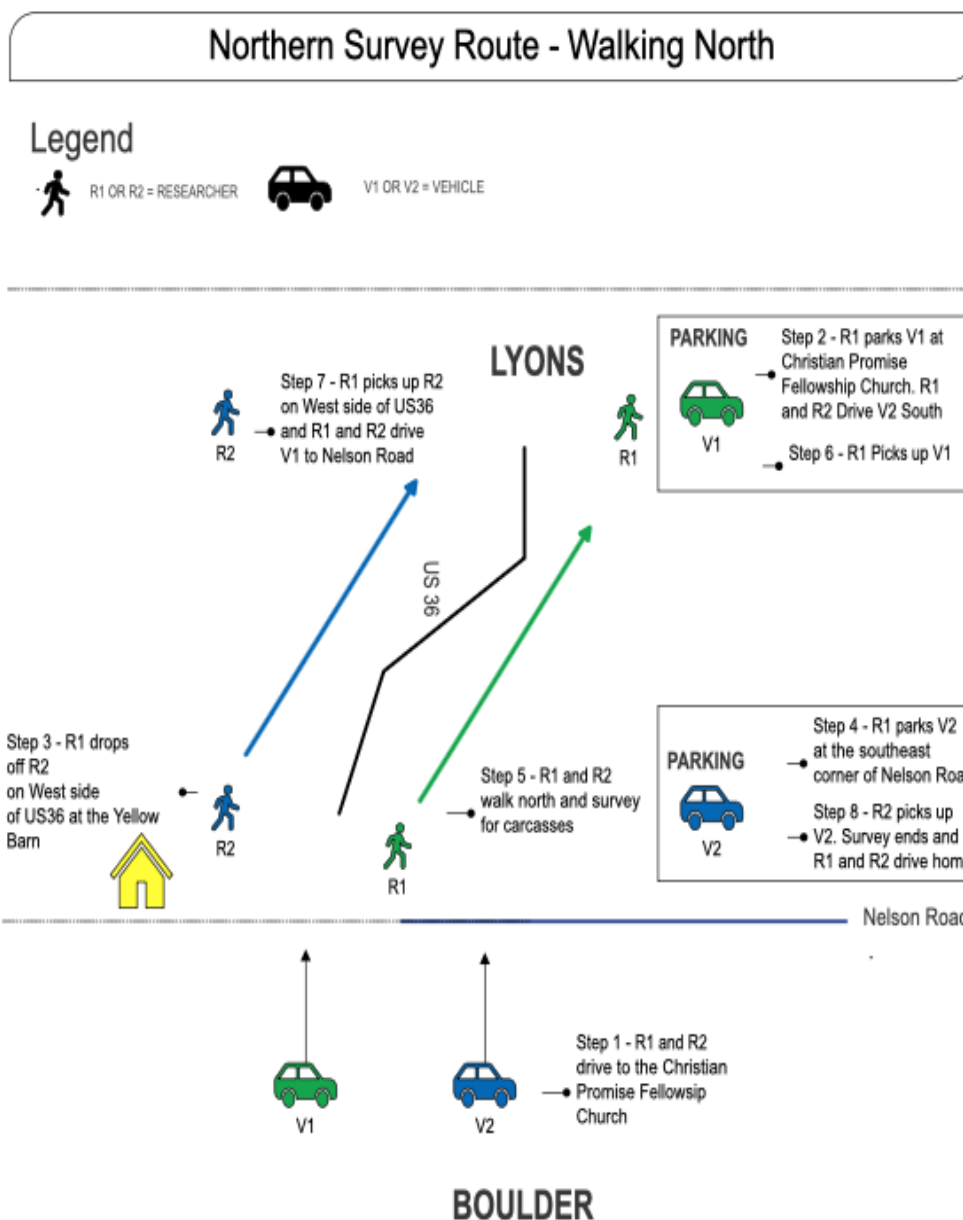
Table 1 – Survey steps and associated time

Vehicle Shuttle

To travel to the survey routes, researchers perform a vehicle shuttle between the survey start and end points. When surveying the Southern Route, researchers park one vehicle at the Foothills Trailhead parking lot at 5273 North Broadway, and another at the southeast corner of Nelson Road and US 36 where there is a small pullout for a vehicle. For the Northern Route, researchers also park at the southeast corner of Nelson Road and US 36 and at the Christian Promise Fellowship Church at 12650 N Foothills Hwy with the permission of the church's pastor. "Boulder County Researcher"



magnets are displayed on both sides of the vehicles when parked, and research permits are displayed on the vehicle's dashboard. Figures 2 and 3 describe how vehicle shuttling works.



Step 1- R1 and R2 drive to the Christian Promise Fellowship Church.

Step 2 – R1 parks V1. R1 and R2 drive V2 South.

Step 3 – R1 drops off R2.

Step 4 – R1 parks V2.

Step 5 – R1 and R2 survey.

Step 6 – R1 picks up V1.

Step 7 – R1 picks up R2 and drives to Nelson Road.

Step 8 – R2 picks up V2. Survey ends.

Figure 2 – Northern Survey Route showing shows steps for two researchers to survey from Nelson Road to the Christian Promise Fellowship Church

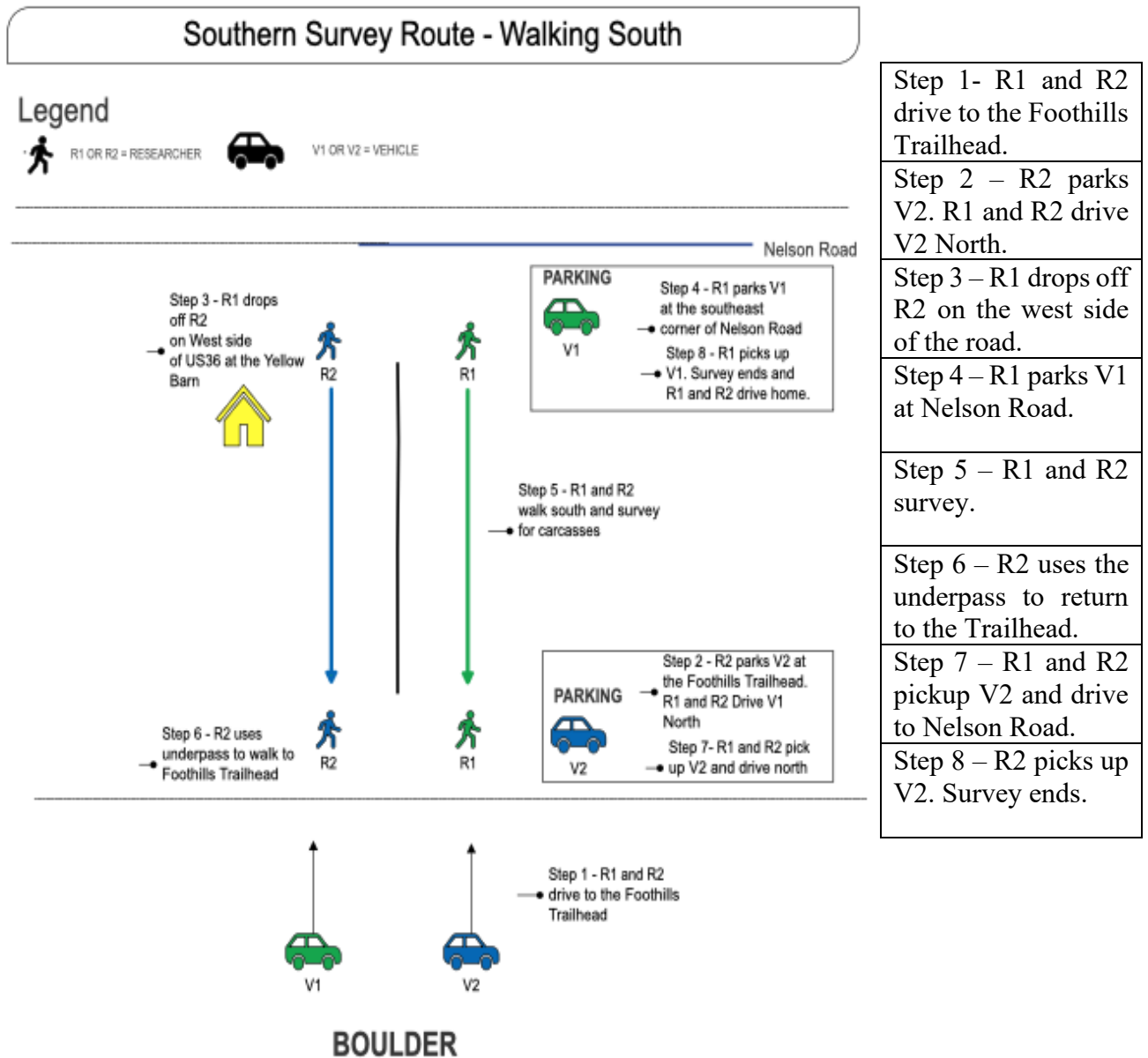


Figure 3 – Southern Survey Route showing steps for two researchers to survey from Nelson Road to the Foothills Trailhead parking lot

Land Ownership Considerations

Surveying along US 36 involves being on, or adjacent to, multiple land ownership types. The following rules govern how the survey team navigates these boundaries:

- **On all segments:** Researchers must stay within the CDOT Right-of-Way (approximately 40 feet from the edge of the road) as much as possible.
- **Adjacent to private land:** Researchers must remain within the ROW at all times. Carcasses visible beyond the ROW are noted, but researchers do not cross onto private property.
- **Adjacent to BCPOS or OSMP land:** Researchers may move beyond the ROW only if they feel unsafe within it, have confirmed land ownership, have notified their survey partner, and are carrying the appropriate researcher permits.

Researcher Safety

Researchers always prioritize safety while conducting surveys. Surveys are only conducted when it is safe to do so. The following section explains the key safety practices in place to protect the survey team, motorists, cyclists, wildlife, and any other user of the 11-mile stretch of roadway while conducting surveys.

The Buddy System

Every survey is conducted by a minimum of two people. Researchers keep pace with each other and stay within sight or regular radio contact throughout the survey. Surveys are never conducted alone.

Protective Equipment

Researchers wear high-visibility reflective vests and hard hats at all times while in the field. Snake chaps are worn to protect against potential encounters with rattlesnakes in the grassy roadside areas. Long pants and long-sleeved shirts provide additional protection from both vegetation and ticks. Every researcher carries a charged phone, a charged radio, a first aid kit, water, food, and personal identification cards.

Wildlife Encounters

Researchers observe wildlife from a safe distance and never attempt to approach, handle, or move any animal. For most living wildlife, researchers maintain a distance of at least 75 feet. For large live animals like elk, deer, or moose (and for any predatory species), the minimum safe distance increases to 300 feet. If a live moose or elk is encountered, researchers back away slowly without running and attempt to place a natural barrier between themselves and the animal.

Researchers never touch or move any carcass they find. If a carcass is in or near the roadway, the appropriate agency is contacted for removal. If a researcher encounters an animal on the federal or state threatened or endangered species list, such as the Preble's jumping mouse, they immediately contact BCPOS and CPW.

Road and Traffic Safety

Researchers never cross US 36 on foot. Each survey team uses two vehicles and performs a vehicle shuttle at the start of each survey day, so that one vehicle is waiting at the end of each route. Researchers walk on the shoulder of the road, staying within the ROW as much as possible. When a vehicle approaches in a narrow section, researchers stop and watch until it passes.

Weather and Conditions

Surveys are postponed or cancelled in unsafe weather conditions. Surveys do not go forward during active storms (lightning, hail, or heavy snow), red flag fire warnings, tornado watches, or when temperatures exceed 95 degrees Fahrenheit or fall below 32 degrees Fahrenheit with icy road conditions. Vehicle-based surveys may substitute for walking surveys under milder adverse conditions. Researchers also have discretion to cancel based on their personal comfort and judgement.

Communication and Emergency Protocols

Before each survey, the team logs their planned route and expected return time. Researchers check in with each other via radio throughout the survey. Any injury is reported immediately to BCPOS and CU Boulder. Every researcher carries an emergency contact card listing team members' emergency contacts, known allergies, and the locations of the three nearest hospitals.

Data Collection

Researchers use the mobile app ArcGIS Field Maps (Esri, version 26.2.1) to record carcass observations. The app includes a map with different land ownership zones to ensure proper surveying protocol, as well as other notable features like streams and culverts. The map also includes points of previously recorded carcasses to prevent double counting (see *Figure 4* for an example of a data point on the map). When a carcass is recorded, researchers note important details like date and time, species of the animal, and comments to help with future reference.

Researchers also take note of important wildlife sightings other than carcasses. These can include federally- or state-listed species, notable tracks and other animal signs, or large herds of deer or elk crossing the highway. These sightings are recorded separately from carcass data in the app.

There are times when CPW or CDOT must be contacted, such as in instances of road obstructions caused by a carcass, so that wildlife issues are managed promptly by trained professionals.

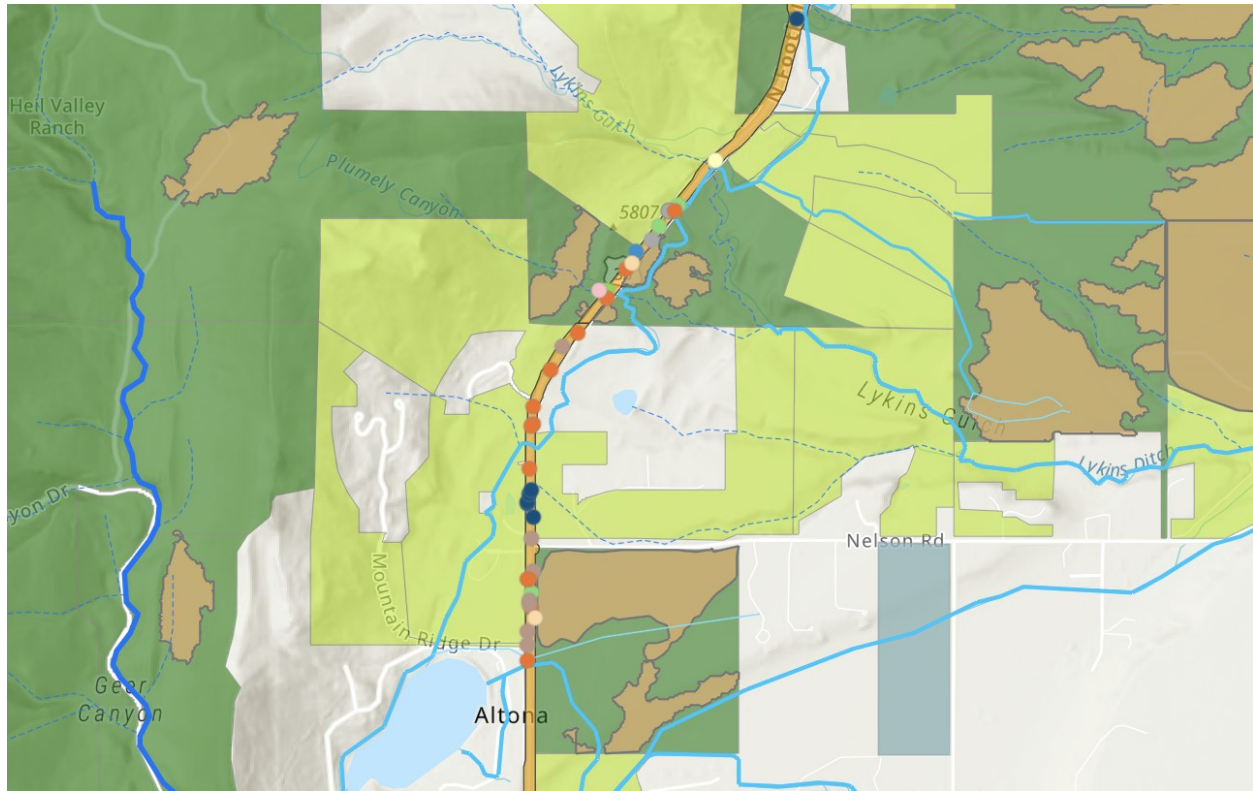


Figure 4 – An example section of the map researchers use during carcass count surveys. Different background colors represent different land types (gray areas are private land, green and blue areas are county and city land, and brown areas identify prairie dog colonies); blue lines represent streams and ditches, and the gold line shows the extent of the CDOT ROW. Each colored dot is a previously recorded carcass, with dot color indicating species.

Next Steps

Researchers will use the data gathered by these carcass count surveys to measure the impact of future wildlife crossings on US 36 and to better understand existing patterns of wildlife mortality along the corridor. This project was developed because no standardized, repeatable survey existed prior to this effort to document collisions across all species along this stretch of US 36, leaving a gap in the data needed to plan effective crossings and other mitigation strategies. These surveys are meant to be repeated for several years to gather a full picture of the number and type (species) of carcasses over time. This research will also provide baseline data for comparative context following the construction of wildlife crossing structures in the corridor.

Carcass count surveys are currently underway and will continue through November 2026. Survey findings are expected to be publicly available beginning in December 2026.

A complete technical version of the methodology is also maintained by the team and can be requested from BCPOS. For further information on the survey methodology, or to ask a question about this project, please contact Susan Spaulding, Environmental Resources Senior Specialist and BCPOS partner at sspaulding@bouldercounty.gov, or the BCPOS Wildlife Program at wildlife@bouldercounty.gov.

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