Roadkill on HWY 20/26/93 through Craters of the Moon National Monument and Preserve from Incidental Carcass Counts

Craters of the Moon National Monument and Preserve

National Park Service

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Contents

Abstract

Using incidental observations of roadside carcasses from 2010-2025, we identify roadkill hotspots along highway 20/26/93 through Craters of the Moon National Monument and Preserve (CRMO).

Study Area

Highway 20/26/93 is a 2-lane highway which runs from Arco to Carey, Idaho (Fig.1). This highway has a speed limit of 65 mph. Approximately 23.5 miles of this highway is completely within CRMO and about 4 miles either doubles as the boundary or is very close (≤ 1600 ft) to the boundary. This ~27.5 stretch of HWY is the focus of this report, however some maps will show the HWY all the way into Arco (mile marker 247) as data for this stretch has also been reliably collected by CRMO staff that commutes to and from the Lost River Valley.

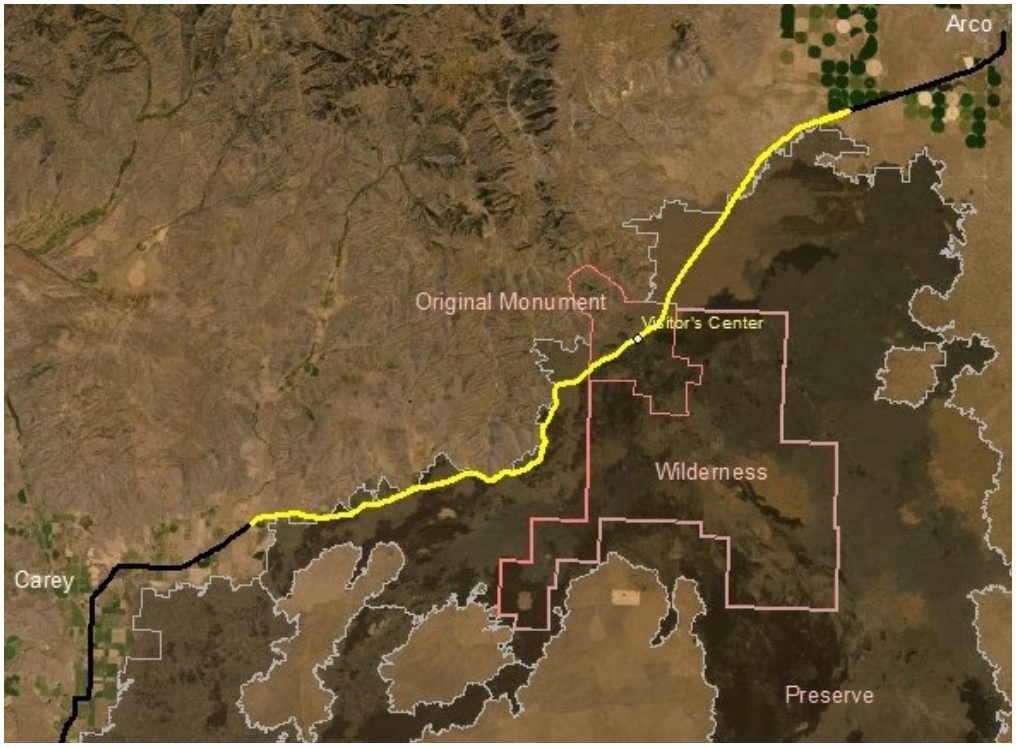

Figure 1. Overview of highway 20/26/93 (black line) from Carey to Arco, Idaho. Mile marker 212-241 (through CRMO) highlighted in yellow.

Wildlife-vehicle collisions (WVC) are common on this stretch of highway. Habitat along the highway through CRMO consists mainly of sagebrush steppe but the highway also passes through or close to woodlands of limber pine and Douglas-fir, cinder gardens, vegetated lava, wetlands and unvegetated lava.

The Data Set

Data for this analysis comes from the CRMO Wildlife Observations Database 1921-2021 (Hoffman 2021) and the CRMO Roadkill Database 1963 to 2025 (Stefanic 2025). The first record of a roadkill in the Observation Database dates to 1963. The original purpose of this database, however, was not to document roadkill but rather to document wildlife species, especially notable or unusual wildlife observations on CRMO. Documentation of roadkill within this database is often sparse and sporadic for the 50 years following that first roadkill record. In addition, the records do not consistently include location data (mile marker numbers) until 2002, though we can likely assume that any roadkill data prior to CRMO expansion in 2000 was collected from the approximately 4 miles of road within the original monument (roughly mile marker 227.4 to 231.3).

One species stands in contrast to the sparse reporting over this time, mule deer. Mule deer roadkill were reported annually from 1984 to 2001 within annual deer census reports. Unfortunately, these records also do not include location data. Additionally, mule deer populations were much higher in the 80s and 90s and thus roadkill numbers from these reports are not likely an accurate reflection on today's conditions.

The monument expanded in 2000 and with it approximately 23.5 miles of highway were swallowed up by CRMO. Unfortunately, this did not seem to signal an increase in roadkill documentation. In fact, roadkill data from 2001 to 2009 is incomplete and ranges wildly from 25 records (2007) to years with no records at all (2004, 2005, 2009).

Starting in 2010, tracking roadkill became a larger priority for Resource Management staff and the data set became more robust. Thus, this report only relies on data collected from 2010 to the present.

The data in this report is from CRMO employee reports of carcasses they encountered driving to and from work or encountered during work hours. No surveys were conducted to systematically look for roadkill except for the summer of 2022. In 2022, a seasonal Biological Science Technician (Wildlife) was tasked with driving the road from mile marker 211 to mile marker 244 every Monday and Thursday morning from April 1 through the end of September. This was done as an effort to see if a more systematic approach would yield more evidence of roadkill. Staff was not informed of this effort to keep the roadkill reports coming in in the usual manner. After the summer the two data sets were compared, and they were identical. Not a single roadkill was added by this effort. Other studies have shown that a much more labor-intensive method would be required to capture roadkill numbers more accurately (probably involving running the road every morning and night). Even then, any animal capable of making it more than a couple dozen feet from the roadway would still likely be missed.

It is recognized that this roadkill data represents significantly less than an actual number of WVCs and roadkill. Most researchers believe that WVCs are substantially under-reported (Huijser et. al. 2008). In fact, Conover et. al. (1995) estimated that deer-vehicle collisions are underestimated by at least 50 percent. Many animals that are injured wander away from the road before they die and are never found (Huijser et. al. 2008). Animals can be scavenged or drug off the road before a CRMO employee comes along to record it. It is likely roadkill that occurs on weekends and holidays are especially prone to be missed this way. It is also likely that roadkill was under-reported between the spring of 2020 through 2022 due to the COVID-19 pandemic. During this period, employees teleworked to a greater extent than in other years of the data set and thus were on the road less to see and report roadkill.

It is also recognized that there is likely an inherent bias in the data skewed toward the section of highway from the Visitor Center east toward Arco, especially for the years 2010-2023. This is because most Resource Management staff responsible for the database lived in that direction. Fewer employees drove in the other direction toward homes in the Sun or Magic Valleys, and those that did came to the office less frequently (they either teleworked or reported to one of the other Southern Idaho Parks on other days). These employees were also less likely to report roadkill than resource division staff.

Discussion

Since 2010, 571 individual roadkill have been reported along the portion of HWY 20/26/93 that runs through CRMO (between mile marker 212 and 241). Thirty-two different species have made up this roadkill (Fig. 2). The majority (38%) of these reports are of mule deer. Elk are the second-most reported roadkill at 12%. Mountain cotton tails are third at 12% (Lagomorphs taken together make up about 16%, see Appendix A Fig. 13). Greater sage-grouse make up 7% followed by yellow-bellied marmots at 5%. Red fox and coyotes account for about 4% each. Pronghorn records account for 2%. Short-eared owls (1.7%), badgers and great-horned owls (1.4% each) are the only other species found in the data at greater than one percent.

The large number of deer (and to a lesser extent elk) roadkill reports make the data best suited to look at where these collisions are most likely to occur. Sample sizes for all other species are small in comparison.

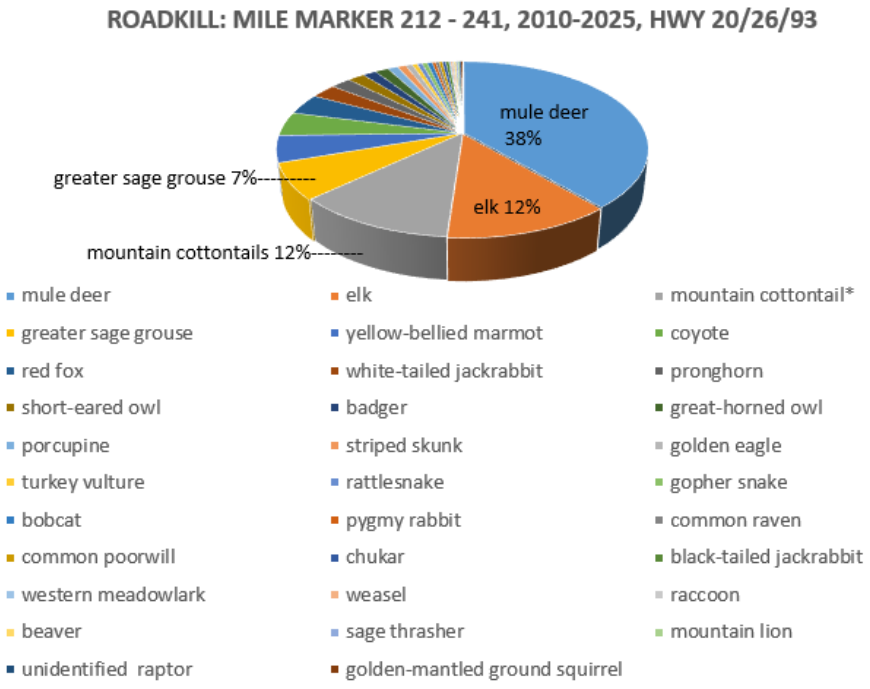

Figure 2. Species breakdown of reported roadkill 2010-2025.

Big Game Hot Spots

Big game WVCs are especially of interest because they are the animals most likely to cause vehicle damage and /or injury to motorists. Three species of big game are represented in the data; mule deer, elk and pronghorn (Fig.3).

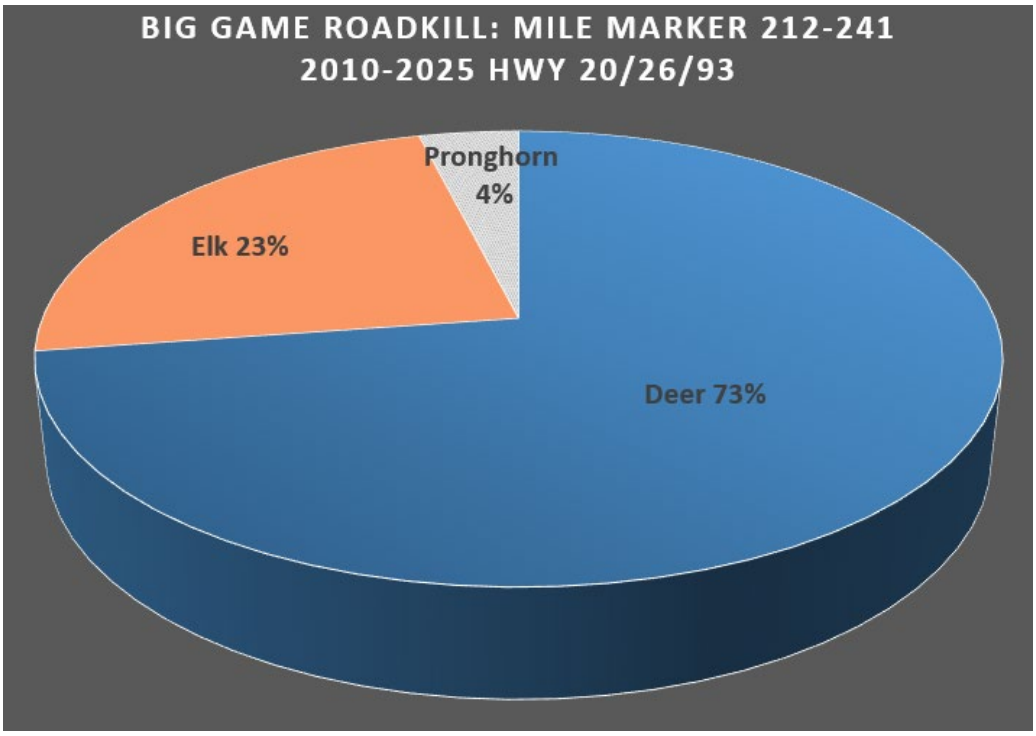

Figure 3. Species breakdown of big game roadkill 2010-2025.

Taken collectively, they reveal several stretches of highway that pose the biggest threats to motorists (Fig.4). The red central stretch of highway in Figure 4 (mile marker 228-235) is largely driven by deer as Figure 5 shows when just deer roadkill hotspots are mapped. Seperating out just elk (Fig. 6) reveals a different picture. A hot spots emerges between mile marker 220 and 222, an area known as Hay Drop Curve. The stretch of highway between mile marker 226 and 227 is also highlighted as a likely place for elk-vehicle collisions. Beyond the boundary of CRMO, another area of concern emerges between 239 and 242 as well as near the airport outside of Arco. Pronghorn roadkill reports only make up 2% of the big game roadkill reports but when they are mapped by themselves, (Fig. 7) a somewhat predictable result is seen. Hotspots emerge in areas (milepost 239-241 and 242-243) where pronghorn are known to cross the

highway during migration from winter to summer grounds or vice versa (Kaufman et. al 2022) (Fig. 8).

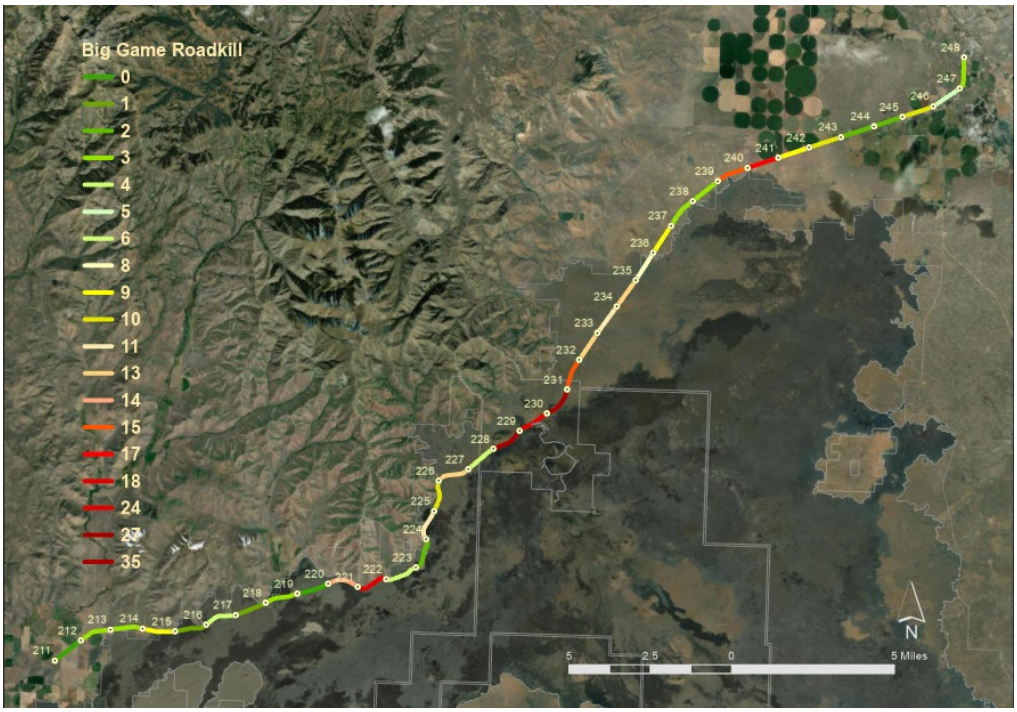

Figure 4. Big game roadkill reports 2010 -2025.

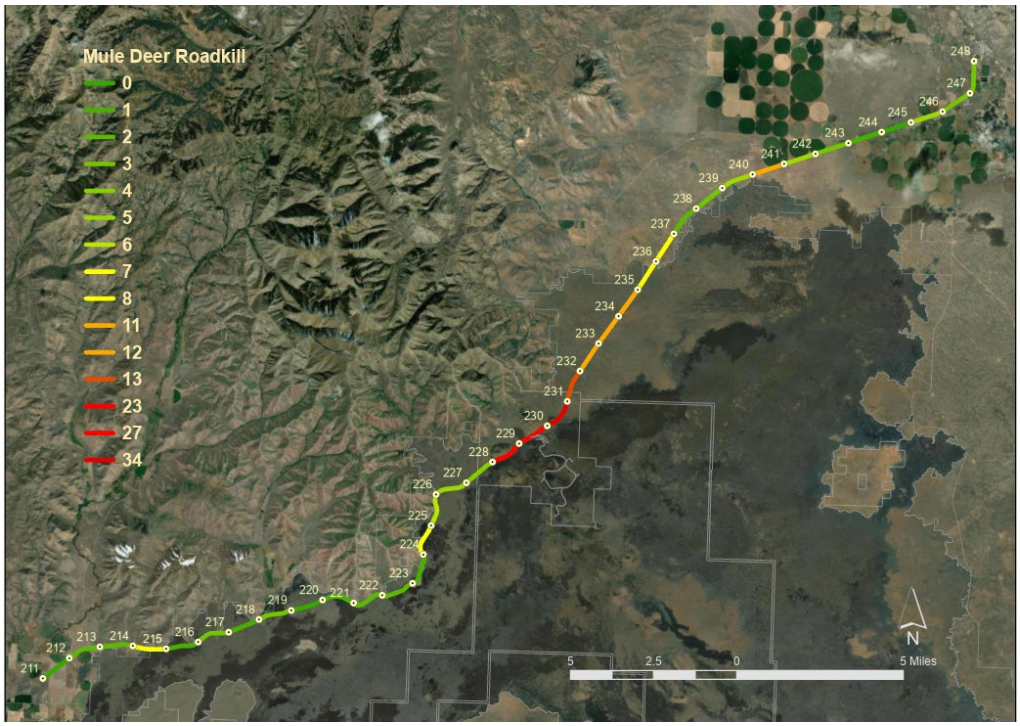

Figure 5. Mule deer roadkill reports 2010 -2025.

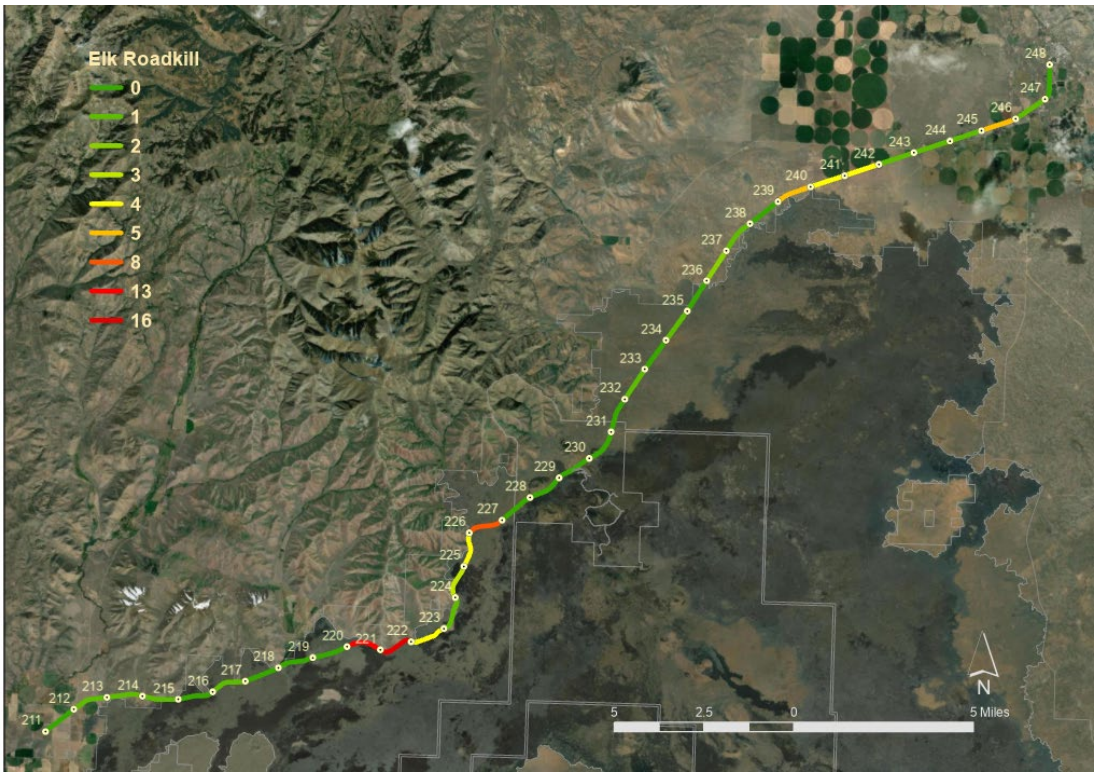

Figure 6. Elk roadkill reports 2010 -2025.

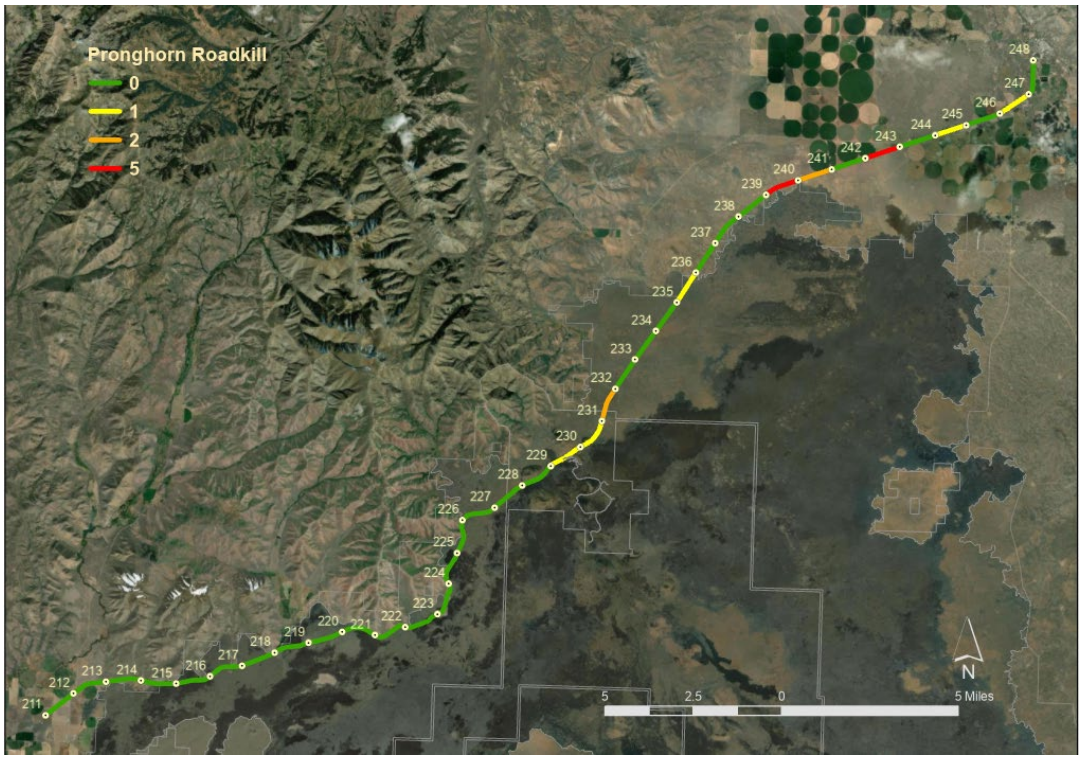

Figure 7. Pronghorn roadkill reports 2010 -2025.

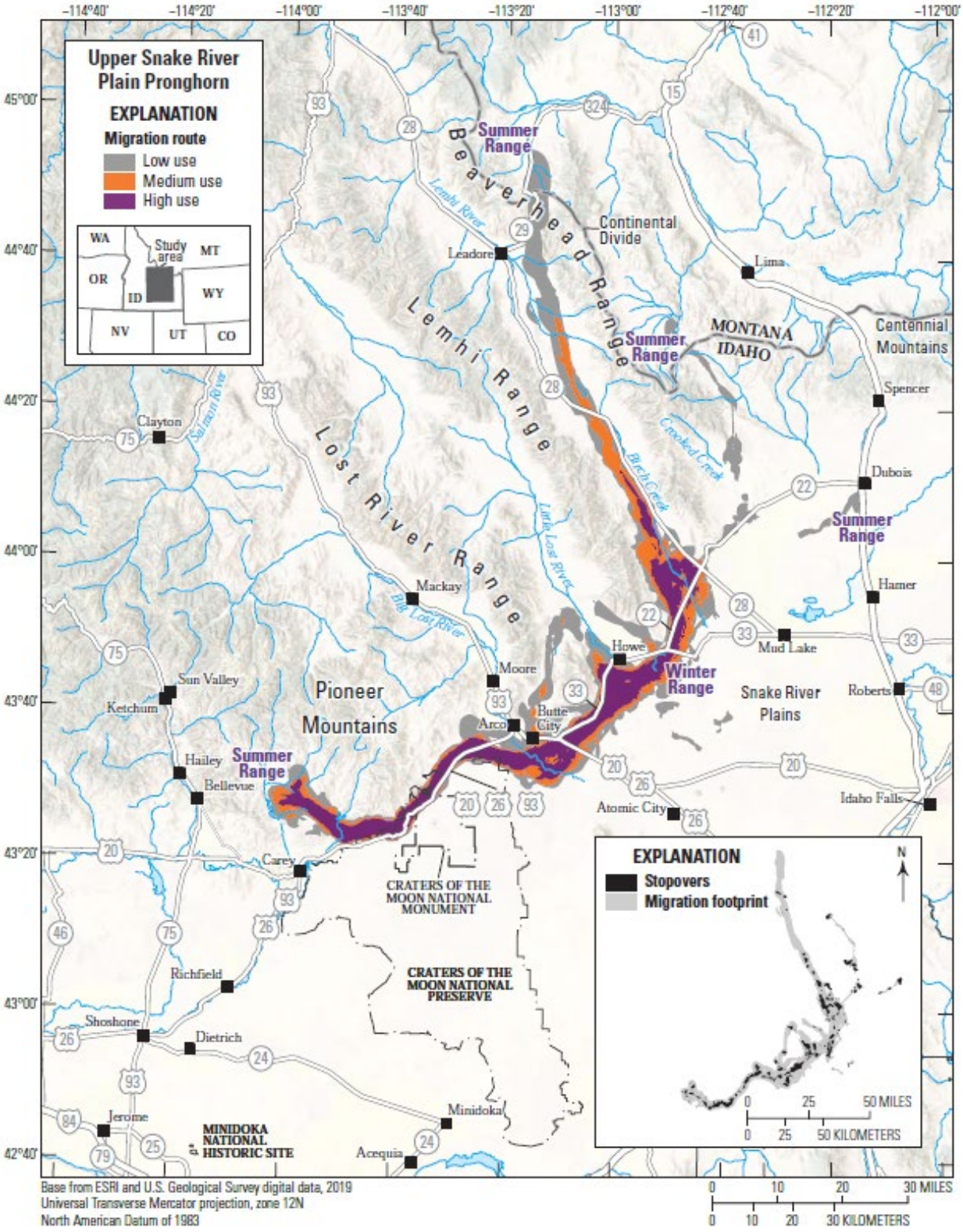

Figure 8. Migration routes and stopovers of the Upper Snake River Plain pronghorn heard.

(Ungulate Migrations of the Western United States, Volume 2. 2022).

Small Animal Hot Spots

Although small animals are much less likely to cause vehicle damage and /or injury to motorists, the threat is not zero. They especially pose a threat to motorcyclists but could also cause damage to smaller vehicles or result in accidents if drivers attempt to swerve to avoid collision with these animals.

Sample sizes of individual species of small animals, in general, are not large enough to reliably predict highway roadkill hot spots. Mapping all non-big game roadkill reports together, however, paints a picture of the most likely stretches of highway to have small animal-vehicle collisions (Fig 9). Despite the small sample sizes, mapping individual species can provide some insight into where highway traffic is encountering these species. See Appendix A for maps of some of the most commonly reported small animal species.

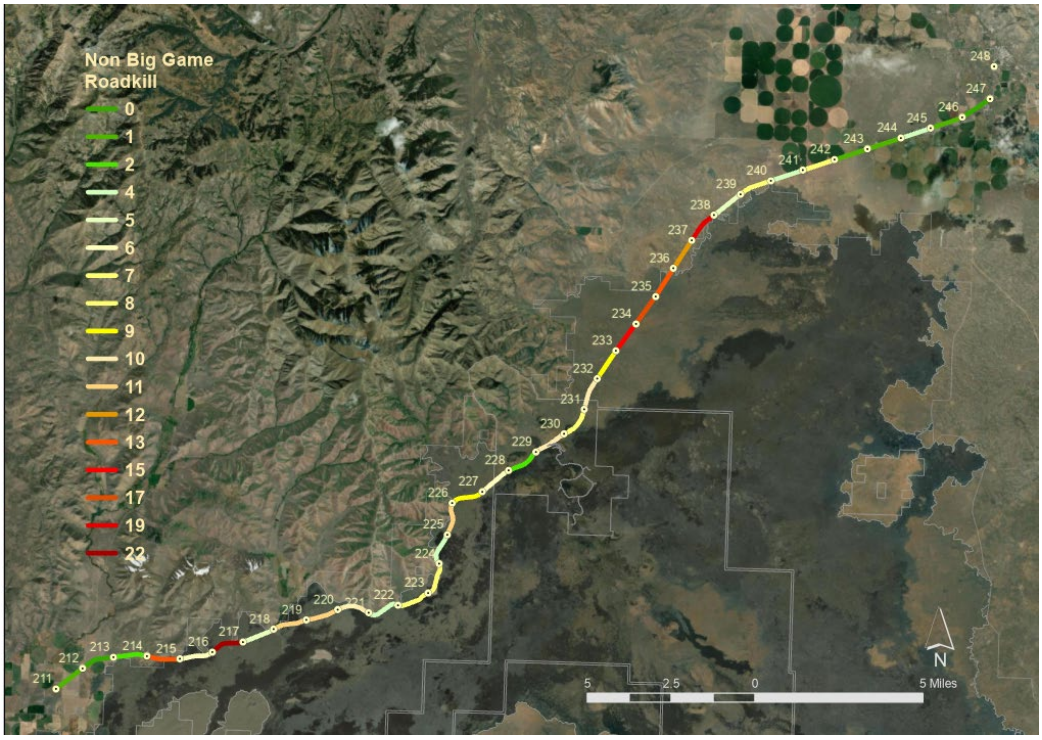

Figure 9. Non big game roadkill reports 2010 -2025

Species of Greatest Conservation Need

Among the small animals found in the data, three species; the greater sage-grouse, the short-eared owl and the pygmy rabbit are Idaho Species of Greatest Conservation Need (SGCN)

(Idaho Department of Fish and Game, 2026). All three species have a conservation status of 'vulnerable'. This means the species is at moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (NatureServe Explorer 2026).

Greater sage grouse made up about 7% of roadkill reports (38 records). The area of most frequent sage grouse-vehicle collisions (Fig. 10) is not surprising. The hotspots occur in stretches of road that have high quality sagebrush habitat on both sides of the highway, often close to known leks or where birds have been known to display near the highway during springs when deep snow covered over leks late into lekking season.

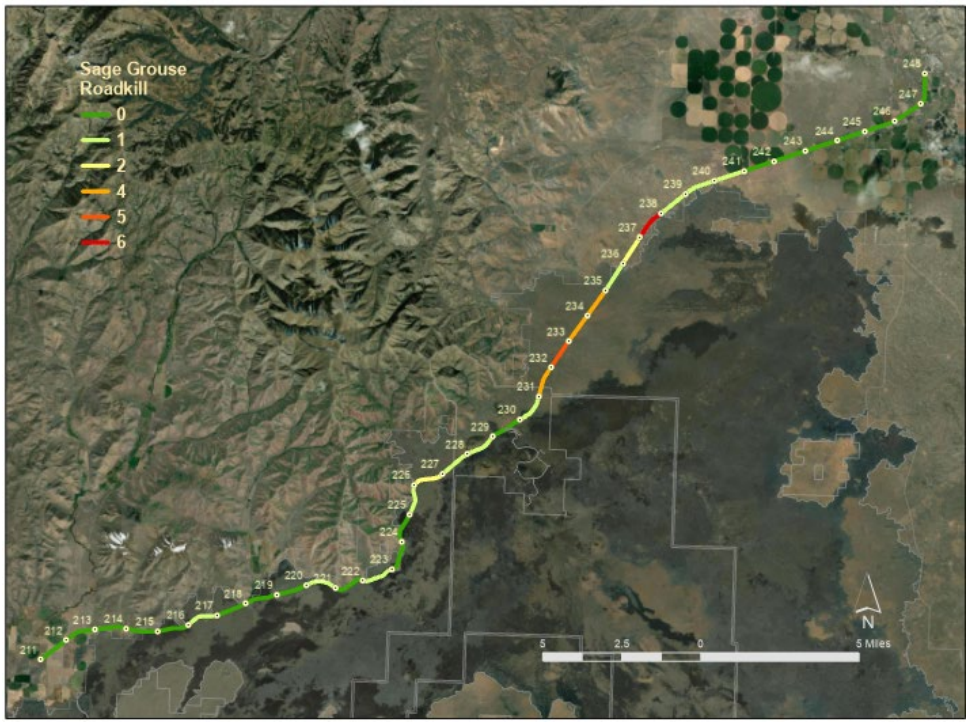

Figure 10. Greater sage grouse roadkill reports 2010 -2025

There are 2 pygmy rabbit roadkill reports in the data (2014 and 2015). Pygmy rabbits are rare on the NPS portion of the Monument and uncommon on BLM managed portions of the Monument. At the time of the roadkill reports there was a known, active pygmy rabbit territory between mile marker 236-238 where both kills were reported.

There were 9 roadkills reported for short-eared owls between milepost 212-241. This species is uncommon on CRMO but is known to be irruptive (may move into an area in abnormally large numbers when food supplies become scarce in their usual habitats). In these years, short-eared owls may become roadkill in larger numbers as they scavenge on roadkill along highways. Short-eared owl roadkill were only recorded in 3 out of the 16 years of data suggesting these may have been irruptive years.

No trend is apparent when roadkill is charted by year (Fig. 11). Roadkill reports were high

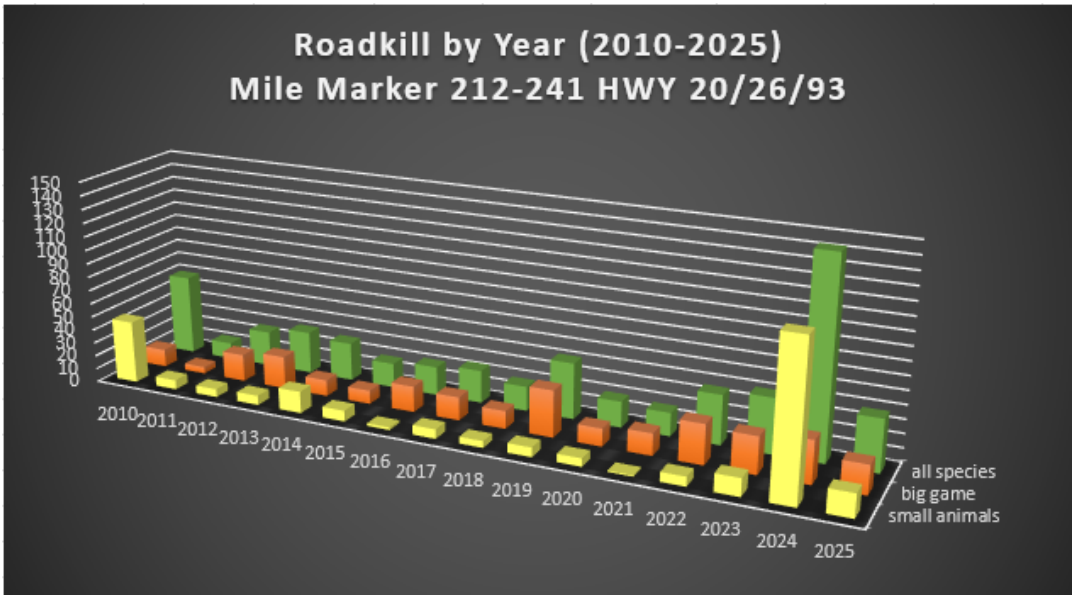

Figure 11. Roadkill reports by year 2010 -2025.

In 2010 and very high in 2024. These highs are mainly due to numerous small animal reports. Chiefly among them mountain cottontails. Yellow-belly marmot roadkill were a secondary component to these high roadkill years. This is likely the result of natural cyclic population patterns in hares and suggestive of a synchronous population cycle in marmots.

Roadkill by Month

A graph of roadkill by month reveals definite peaks and lows (Fig. 12). Roadkill is least often reported in the winter months (Dec. – Feb.), while July through September are the worst months for wildlife vehicle collisions.

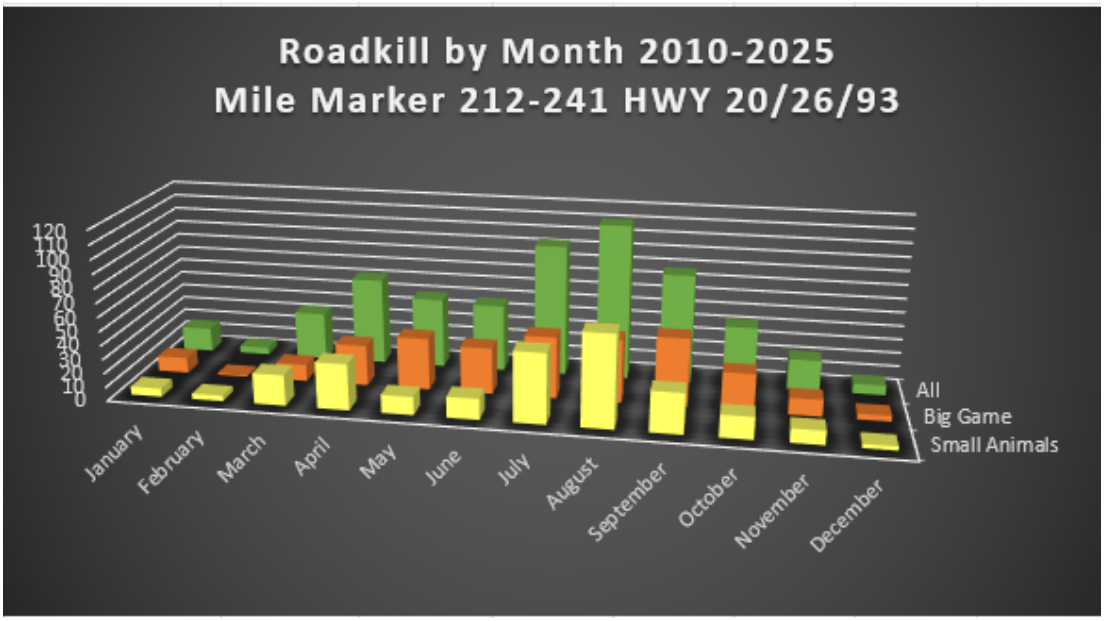

Figure 12. Roadkill reports by month 2010 -2025

Roadkill Mitigations

While the roadkill information in this is report is enlightening, the data does not come with any easy solutions to the problem of roadkill. Furthermore, CRMO does not even have control over the highway as it lies within a right-of-way under the authority of the Idaho Transportation Department (ITD). CRMO could suggest mitigations, but any measures taken would have to be instituted by ITD.

There are two main types of roadkill mitigation measures: changing driver behavior and changing wildlife behavior (Coffin, and Magnus et al. *in* Lester, 2015). Changing driver behavior includes changing driver attitude by increasing public awareness, increasing awareness of roadkill hotspots and slowing speed. Ways to alter wildlife behavior include discouraging wildlife from grazing on roadsides, preventing wildlife from crossing roads or providing safe crossings (Magnus et al. *in* Lester, 2015).

There are more than forty types of road mitigation measures available that aim to reduce wildlife mortality on roads (Rytwinski et al. 2016). Some possible mitigations measures (alone or along with reduced posted speed limits) could include wildlife advisory signage, roadkill tally signage, flashing beacons, rumble strips at hotspots, vegetation clearance from the edge of the

road, lighter colored pavement at hotspots, a community awareness program, road alignment improvements, fencing, crossing structures, wildlife reflectors, animal detection systems, etc.

Lowering speed limits, especially at night is often suggested as an easy, low-cost mitigation for lowering wildlife-vehicle collisions, the problem is, lower speed limits, especially on two-lane rural highways, (without heavy enforcement) doesn't work. Speed limits that are not intuitive to drivers, based on the context of a road tend to be ignored. Recent research in Wyoming by the Nature Conservancy (Riginos, 2019) showed that reducing the posted speed limit is not an effective measure to reduce WVCs on high-speed, rural, two-lane highways, unless other measures can be employed to effectively and consistently influence drivers to reduce their operating speeds. Riginos' research found that despite the speed limit being lowered by 15 mph, motorists on average slowed down only 3 to 5 mph. Most of the hotspots highlighted in the CRMO data are straight, level highways with good visibility, therefore reduced speed limits alone would likely be ineffective at reducing roadkill. If we want to mitigate roadkill through much of CRMO, it's going to take more than reduced speed limits.

Hay Drop Curve

One of the drivers for preparing this report is that ITD is considering straightening some curves around the area known as "Hay Drop Curve" (approx. mile marker 220-222). This area is named for the hay commonly spilled along the road here. This area has been the site of several serious accidents in the past ten years and is a hot spot for elk roadkill (Fig. 6). Elk are known to visit spilled hay sites especially in the winter months. Road straightening would give motorists greater sight distance to spot wildlife, however the increased speeds on the straightened section may negate any gains to wildlife. Inadequately secured loads and the oscillating nature of double/ triple hay trailers (which increases with speed) may be as much to blame for hay spillage as tight curves. It has been noted that hay is frequently spilled on straightaways as well as curves.

CRMO Visitor Center

It has been suggested by some for at least 40 years that the irrigated lawns of the developed area /Visitor Center itself are an unnatural attraction for wildlife and causes animals (mainly deer) to cross the highway leading to higher rates of roadkill in the area. Griffith (1983) wrote

that “Visitor Center lawns are the attractant which draws deer across the highway in August and September” and estimated that 10 fewer deer-vehicle accidents would occur per year if lawns were phased out. In 1993 staff at Craters of the Moon National Monument began removing the non-native lawns and replacing them with a native, drought tolerant species (National Park Service, 1994). Though the number of lawns was substantially reduced in the 90s, Muntz (2001) wrote that drought conditions that year “caused the park to turn off irrigation water to lawns in the developed area by July. This loss of water contributed to deer concentrating in the riparian area and reducing the number of roadkill found on the highway. The number of roadkill (5) was the lowest since monitoring began in 1984”. CRMO currently has one small, irrigated strip of lawn remaining. This area is adjacent to the Visitor Center area and is used mainly as a picnic area and meeting place for visitors and school groups. Despite the reduction in irrigated lawns, deer are often seen visiting this remaining lawn in the summer months. While it may not be the only reason roadkill numbers are high near the Visitor’s Center, the big game roadkill data (Fig. 4) and specifically mule deer data (Fig. 5) in this report does suggest deer are still being drawn across the highway to the Visitor Center lawn.

Conclusions/ Next Steps

Roadkill surveys and the modelling of roadkill data are recognized as being important in determining the frequency of roadkill, identifying hotspots and being confident of a mitigation strategy [Litvaitus et. al. 2008, Ramp et. al 2005 and Taylor et. al 2010 *in* Lester 2015). While there is room for improvement in the collection of roadkill data through CRMO, the fact that CRMO staff has been documenting roadkill for many years makes our data set likely better than is available for most highways in the state. In fact, Huijser et. al. (2008) found that there are no standards or guidelines for the collection of data on WVCs. Data are collected inconsistently and often haphazardly, and methods vary between states and agencies.

Almost certainly, a more intensive and systematic protocol to collecting roadkill data would give us a better understanding of hotspots and animal movements than incidental carcass counts. Many types of data collection have been used by other researchers that may be helpful in refining CRMOs knowledge of roadkill. These include daily or weekly intensive systematic

surveys, headlight counts of live animals, identification of traffic volume, identification of traffic type/s resulting in the most roadkill, inventories of habitat at/ near hot spots, mitigation trials, as well as identification of features that direct animals to road segments. These are all options CRMO could explore, however it would be labor-intensive, time-consuming and costly. Given current staffing levels and budgets it is currently not feasible. If ITD or CRMO does implement mitigation measures, post-mitigation surveys would be important to determine success of the mitigation strategy.

It is hoped that even with all its' limitations, the roadkill data collected by CRMO staff over the past 16 years can paint a picture of the roadkill issue and a starting point for considering mitigations.

Appendix A: Select Individual Small Animal Roadkill Maps and Discussion

Lagomorphs (cottontails, white-tailed jackrabbits, black-tailed jackrabbits and pygmy rabbits) taken together account for ~16% of roadkill reports. Figure 13 depicts where these Lagomorph roadkills have been most reported.

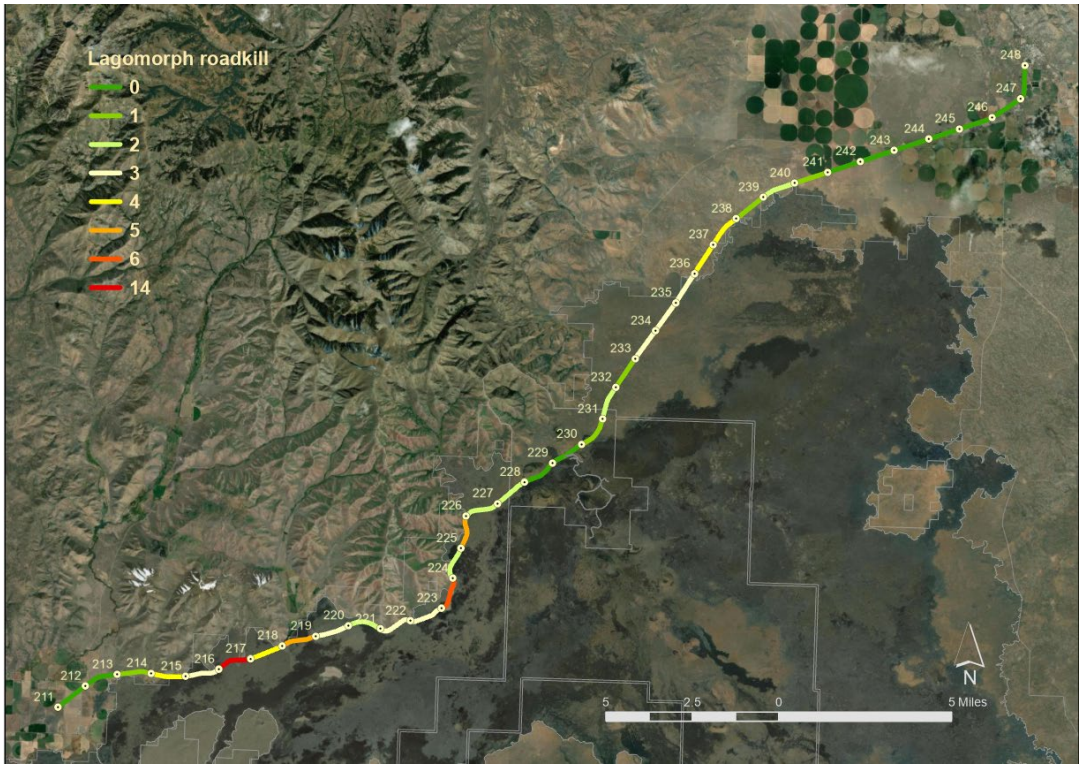

Figure 13. Lagomorph roadkill reports 2010 -2025.

Lagomorph roadkill is likely highly under-reported as they can be completely scavenged or drug off in a matter of minutes so only very fresh kills get reported.

The yellow-bellied marmot accounts for 5% of the reports (Fig. 14). Red fox makes up 4% of roadkill reports, these reports have most often come from within a ½ mile either side of the CRMO Visitor Center entrance road (Fig. 15). While this is an interesting finding, the sample size (22) is likely too small to draw any conclusions. Another canine, the coyote (also 4% of reports), follows a more typical pattern seen by other small animals (Fig. 16) with WVCs occurring most frequently between the CRMO Visitor Center and the mile marker 242, where some of the best sagebrush steppe habitat occurs on both sides of the road.

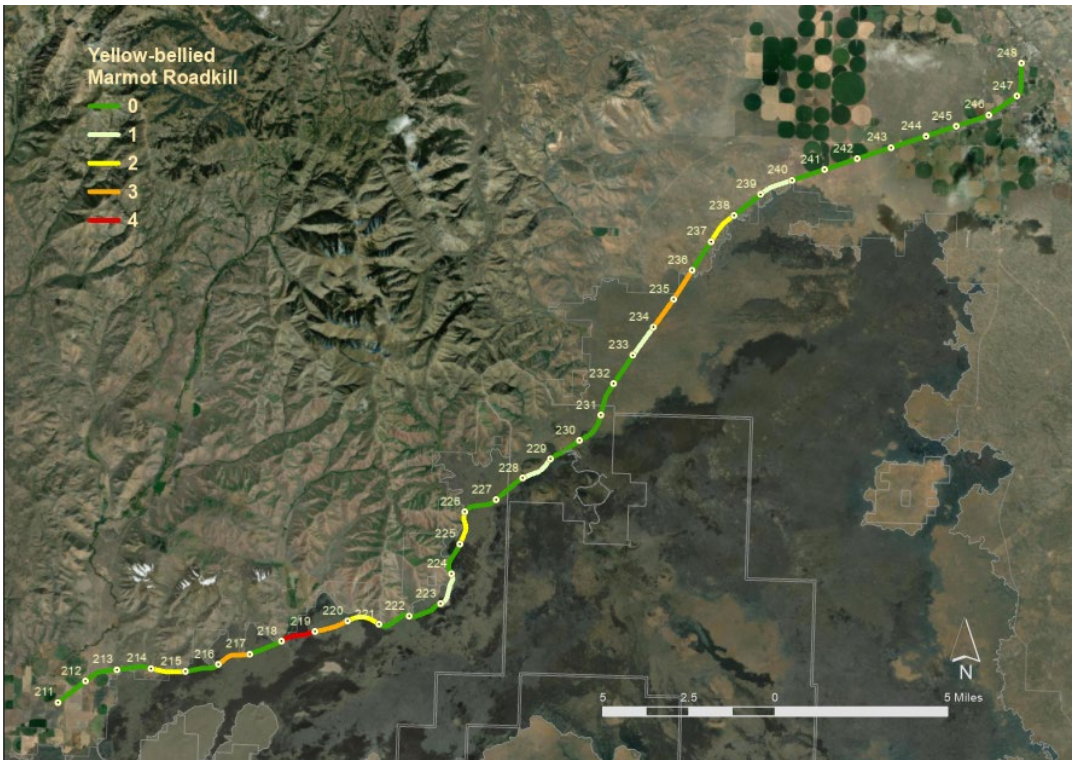

Figure 14. Yellow-bellied marmot roadkill reports 2010 -2025.

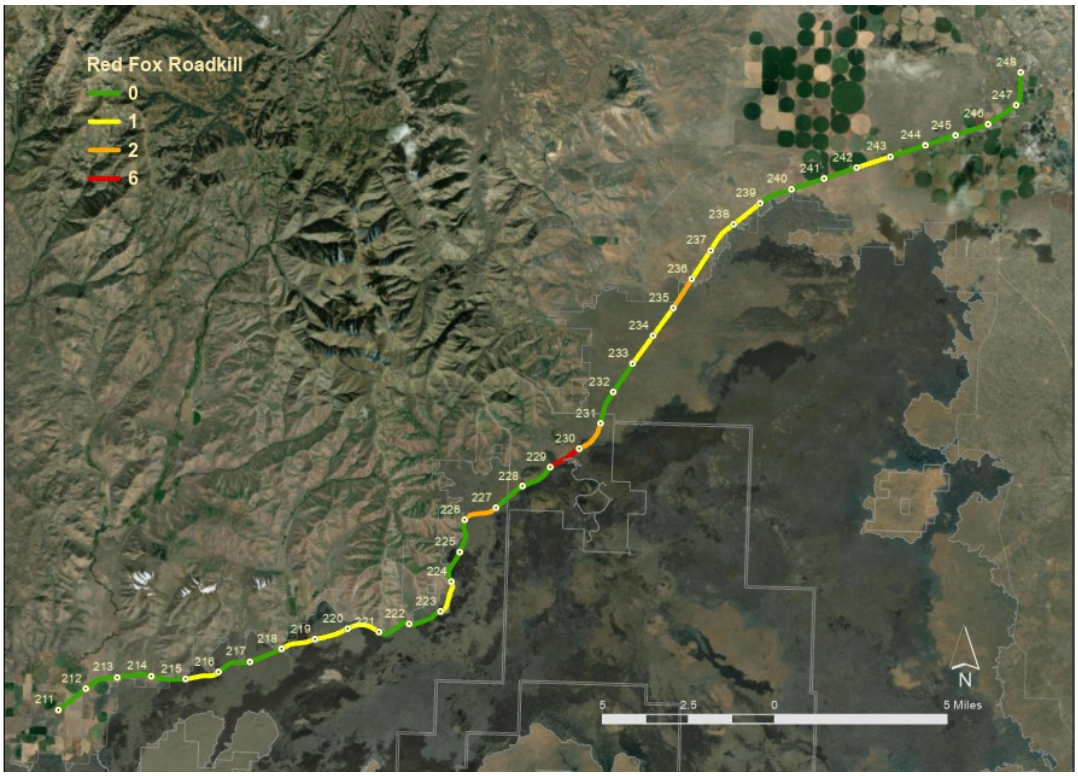

Figure 15. Red fox roadkill reports 2010 -2025.

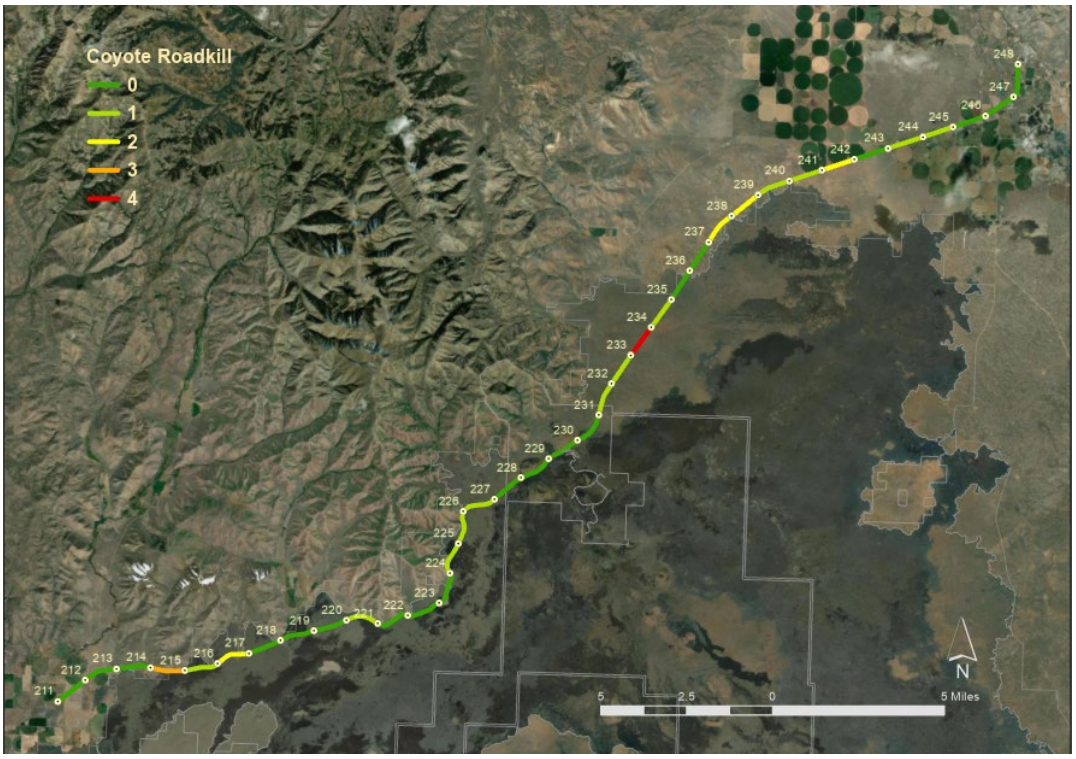

Figure 15. Coyote roadkill reports 2010 -2025.

All other individual species of small animal roadkill account for less than 2% (11 animals or fewer) each. Such small sample sizes do not lend themselves to mapping hotspots.

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