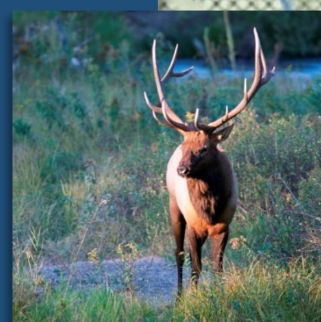
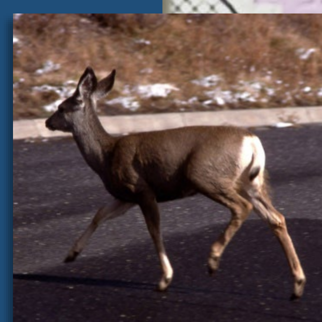
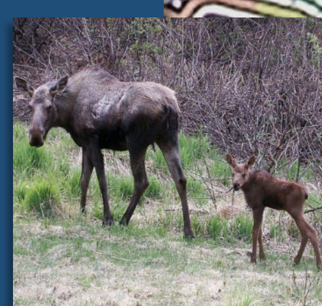
January 2022

UTAH DEPARTMENT OF TRANSPORTATION

Wildlife Vehicle Collision Study
SR-224, Summit County







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EXECUTIVE SUMMARY

State Route 224 (SR-224) in Summit County begins on Guardsman Pass Road at the Summit-Wasatch County line and descends northward, where it connects with US Interstate 80 (I-80) at Kimball Junction (mile post [MP] 11.5). The frequency of wildlife-vehicle collisions (WVC) within this corridor is a source of economic, safety, and natural resource concern. The Utah Department of Transportation (UDOT), which is committed to motorist safety, commissioned this study to provide current data and analysis to inform ongoing discussions among state agencies, local governments, and community groups.

This study focuses on big-game species—mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and moose (*Alces alces*). The two primary sources of data used for the WVC analysis are (1) wildlife carcass collection locations from the Utah Wildlife-Vehicle Collision Reporting System (UDWR 2021) and (2) reported animal-related vehicle crashes (ARC) obtained from the UDOT Safety Program (UDOT 2021). Both datasets provided data for the 11-year period from January 1, 2010, through December 31, 2020. During this period, 224 big-game carcasses were collected, and 247 animal-related crashes were reported through the UDOT Safety Program. Based on these data, vehicle collisions with big-game species in the corridor cost drivers an average of $125,308 per year. This economic impact calculation is based on the average costs of collisions with big-game species and does not include all potential user costs.

The first part of the report presents results of temporal and spatial analysis of WVC within the SR-24 corridor. Factors considered include annual snowfall, Average Annual Daily Traffic (AADT), seasonality, and species composition of carcasses. Spatial analysis considered the location of WVC in relation to land use, critical wildlife habitat designations, and speed limits. Hot spot analysis was also performed.

The second section of this report provides comparisons of WVCs for other highways in the region. This information provides regional context for SR-224 in terms of the frequency and scale of carcasses collected and animal-related crashes. Regional highways analyzed include the following:

- I-80 between Salt Lake City (Parleys Canyon) and Coalville,
- US-40 from I-80 to Heber,
- SR-32 from US-40 to I-80, and
- SR-248 from Park City to Kamas.

Analysis results presented in this report are intended to provide information and context for ongoing stakeholder discussions. Only with continued collaboration between state agencies, local governments, and community groups can appropriate WVC mitigation be considered or implemented for SR-224. Stakeholder input can be used to balance local needs with other regional mitigation needs, ensure appropriate cost/benefit for mitigation efforts, and coordinate land use with mitigation.

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SR-224 WILDLIFE-VEHICLE COLLISION STUDY

INTRODUCTION

The purpose of this wildlife-vehicle collision study (study) is to provide information and regional context to aid further discussion and identify potential options to mitigate wildlife-vehicle collisions (WVCs) along the State Route 224 (SR-224) corridor (study area). Successfully mitigating WVCs is a multi-faceted effort, the success of which depends on the collaborative work of many groups; largescale, long-term planning; and financial contributions. Both the road network itself and the surrounding land uses were considered in the mitigation options proposed in this study. Surrounding land uses have the potential to negatively impact wildlife use of crossing structures by repelling wildlife and, therefore, should be considered as important as the roadway itself. No single state agency or group has jurisdiction over all components required for successful WVC mitigation within the study area.

This study provides guidance based on remotely researched information that could change in the future or change based on site-scale analyses. This study is not intended to replace the guidance of local experts or state agencies. The supporting research and study summarize a wealth of information that supports the dynamic, long-term mitigation planning of the study area. The study and recommendations are based on the current configuration of the roadway and not based on future widening or other changes in capacity or traffic patterns.

Data Sources

The research analyzed big-game carcass reports and animal-related crash (ARCs) data to provide context and support for the study. The species included in the study are mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and moose (*Alces alces*). The foundation for this research is 11 years of data from (1) wildlife carcass collection locations from the Utah Wildlife-Vehicle Collision Reporting System (UDWR 2021) and (2) animal-related crash reports obtained from the UDOT Safety Program (UDOT 2021). These datasets provided data from January 1, 2010, through December 31, 2020. For the purposes of this report, the carcass collection data is referred to as “carcass” data, the animal-related crashes are also referred to as “ARC” data, and in combination, the two datasets are referred to as “WVC” data.

Both data sources are considered incomplete and imperfect datasets, and neither fully illustrates the extent of the problem in the study area. For example, carcass data does not include animals that were hit and merely injured, nor those that moved away from the roadway before perishing. It does not provide information on the number of cars involved in each incident. The animal- related crash data includes incidents reported to law enforcement, which is only a portion of all animal-involved crashes that occur, as many incidents go unreported.

Economic Impacts of Wildlife-Vehicle Collisions

Wildlife-vehicle collisions have social, economic, and environmental impacts. Bissonette et al. (2008) analyzed and summarized the costs associated with deer-vehicle collisions (DVCs) in Utah from 1996 to 2001. The study assessed the costs associated with human fatality, human injury, vehicle damage, and loss of deer. The total cost of DVCs during the study period was $45,175,454 for the State of Utah, with a mean collision cost of $3,470.

Utilizing the mean value calculated by Bissonette et al. (2008), the economic impacts of DVCs in the study area can be estimated. The mean cost was adjusted for inflation for the years 2010 to 2020 by using the US Bureau of Labor Statistics Consumer Price Index inflation calculator (USBLS 2021). Using this method, the estimated average total annual cost of DVCs in the study area is $89,218 (Table 1).

Table 1. Economic impact of deer-vehicle collisions (DVCs) calculation.

YEAR	TOTAL DVC	MEAN COST (2001)	CPI INFLATION	DVC COST BY YEAR
2010	4	$3,470	$4,272	$17,088
2011	6	$3,470	$4,407	$26,442
2012	3	$3,470	$4,499	$13,497
2013	13	$3,470	$4,564	$59,332
2014	33	$3,470	$4,638	$153,054
2015	34	$3,470	$4,644	$157,896
2016	22	$3,470	$4,703	$103,466
2017	14	$3,470	$4,803	$67,242
2018	38	$3,470	$4,922	$187,036
2019	23	$3,470	$5,009	$115,207
2020	16	$3,470	$5,071	$81,136
			Average	$89,218

a CPI = U.S. Bureau of Labor Statistics Consumer Price Index.

Based on a study conducted by the Western Transportation Institute, an average cost of $17,000 per elk collision and $30,000 per moose collision (Huijser et al. 2009) was included to calculate the total cost of big game-vehicle collisions in the study area. The average cost of big game-vehicle collisions per year is $125,308 based on carcass data alone (Figure 1). This calculation does not include all potential costs, such as the costs associated with traffic delays experienced by the traveling public.

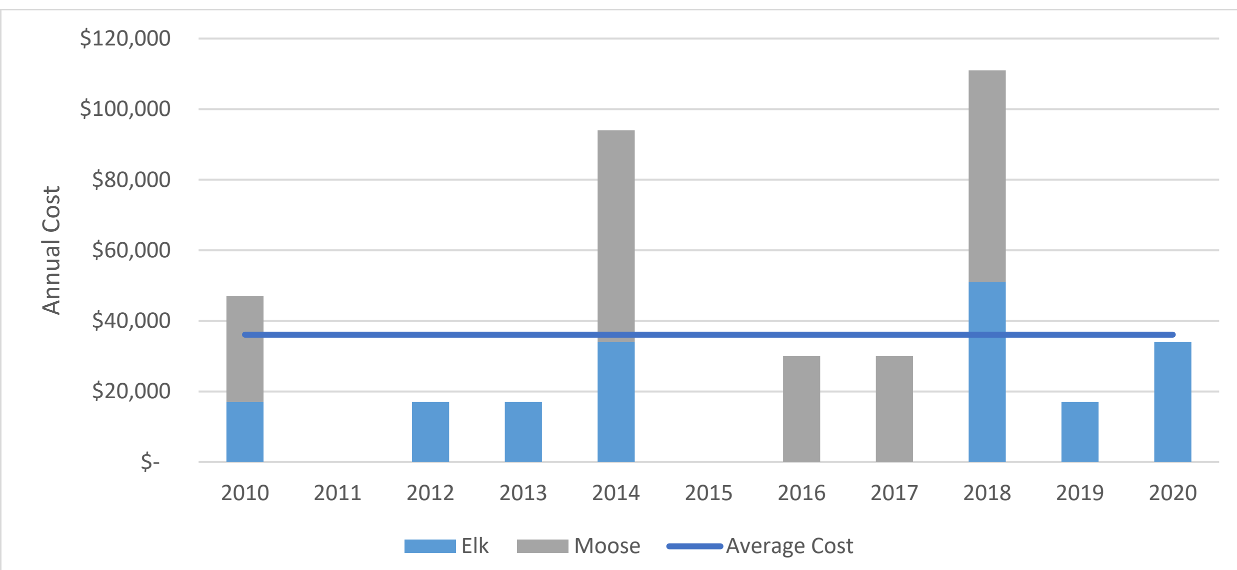


Figure 1.Estimated annual cost of vehicle collisions with moose and elk along SR-224 from 2010 to 2020.

Mitigation Overview

There are many mitigation measures that can be implemented to reduce WVCs. Table 2 provides a brief overview of several common wildlife mitigation methods, their effectiveness (if known), and general cost estimates (escalated to 2021 costs). The characteristics at each site determine which combination of methods has the potential to provide the greatest positive impact.

Table 2. Overview of common wildlife-vehicle collision mitigation methods.

MITIGATION MEASURES	EFFECTIVENESS[a]	AVERAGE RANGE[c]
Driver Warning Methods		
Static Warning Signs	Low	$
Speed Limit Reduction	Unknown	$
Seasonal Warning Signs	Low - moderate	$
Automatic Detection System	Experimental and case specific	$$
Road Improvements		
Median Barrier Upgrades	Experimental	$
Roadway Lighting	Unknown - low	$
Vegetation Removal	Moderate – potentially habitat-fragmenting	$
Traffic Calming Techniques	Unknown	varies
Pavement Grates/Guards		
Painted Pavement Grate	Low	
Double-width Cattle Guard	High – Potential to maim big game	
Wildlife-specific Pavement Grate	High – Safe for big game	
Electrified Pavement Grate	High – Experimental	
Fencing		
Exclusionary Fencing	High	$$$
Electric Fencing	Experimental - High	$$
Escape Ramps	Preliminary research is mixed – design specific	$
Crossing (with fencing)		
Landscaped Overpass	High	$$$$
Open-span Bridge Underpass	High	$$$
Culvert	High	$$
Vehicle / Wildlife Underpass	Case specific	varies
At-grade, restricted crosswalk w/Automatic Detection System	Experimental and case/design specific	$$$
At-grade, restricted crosswalk w/out Detection System	Low-moderate	$$

a Percentages from Huijser et al. 2008 page 27. b Must be combined with wildlife fencing option.

FOCUS AREAS

Analysis of WVCs is based on 11 years of data from (1) wildlife carcass collection locations from the Utah Wildlife-Vehicle Collision Reporting System (referred to hereafter as carcass data) and (2) animal-related crash (ARC) reports obtained from the UDOT Safety Program. These datasets provided data from January 1, 2010, through December 31, 2020. When wildlife carcasses are collected from roadway shoulders, information regarding the species, age, sex, etc., is recorded. With this information it is possible to focus analysis on big-game species (i.e., deer, elk, and moose) and exclude the rest (domestic animals, livestock, and other wildlife). Figure 2 shows annual big game carcass and ARC reports for the entirety of SR-224.

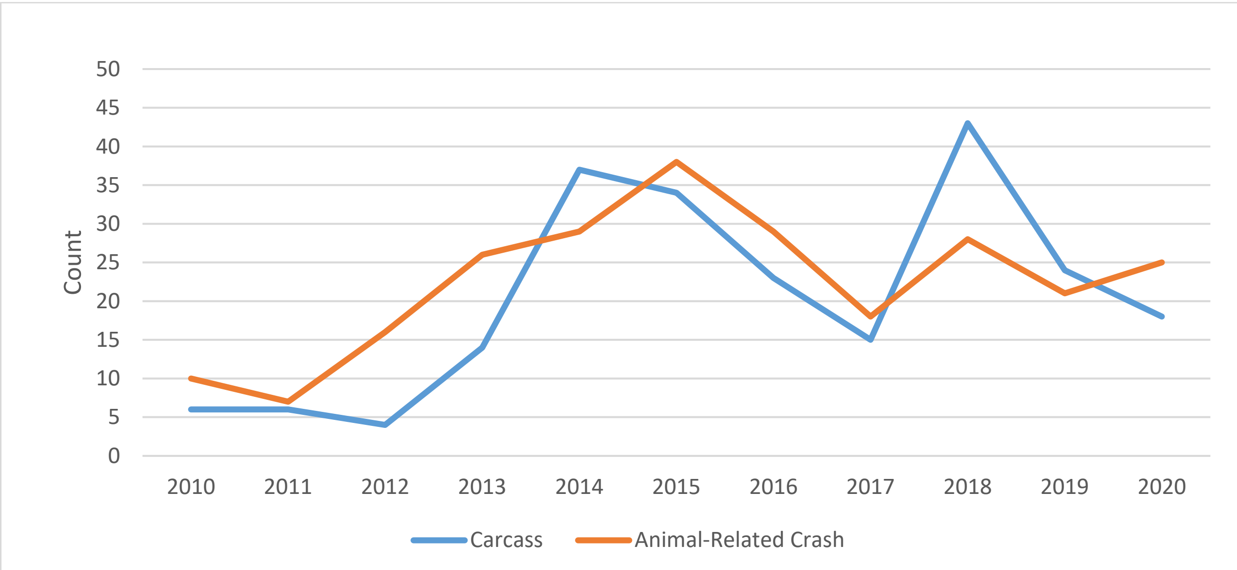


Figure 2. Annual carcass and animal-related crashes reports from 2010 to 2020 for SR_224.

A further breakdown of the species composition reveals the vast majority of big-game carcasses collected along SR-224 are mule deer. Figure 3 shows the annual carcass count from 2010 through 2020.

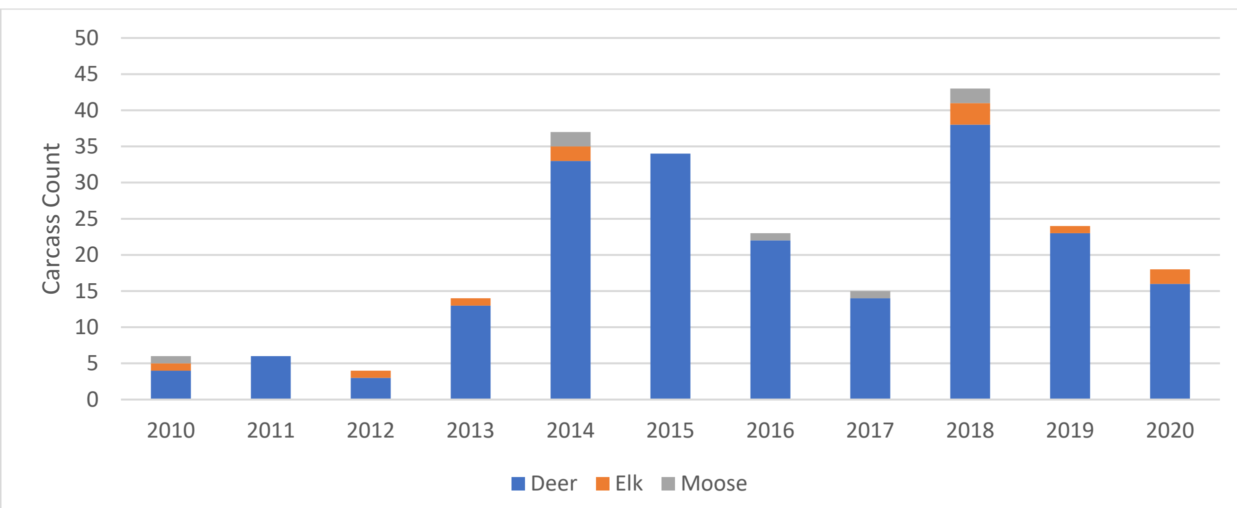


Figure 3. Species composition of big game carcasses reported along SR-224 from 2010 - 2020.

Analysis of SNOTEL snowfall data as observed at the Thanes Canyon monitor (#814, elevation 9,230 feet) (NRCS 2021) found that snowfall appears to have an inverse relationship with WVCs—as snowfall amount increases the total wildlife carcasses and animal-related crashes tend to decrease. Figure 4 shows the number of annual carcass and animal-related crashes reports with annual average and maximum monthly snow depths. The 4 years with maximum snow depth near 70 inches (2010, 2011, 2017, and 2019) recorded 40 or less combined carcasses and animal-related crashes, while the 2 years with average snow depth below 30 inches had more than 70 combined carcasses and animal-related crashes.

A second observation related to snowfall is that during years when high-elevation snowpack is minimal by May, more carcass and animal-related crashes are observed than during years with deeper, longer-lasting snow packs. For example, during 2015 and 2018 (the two years with the highest number of carcass and animal-related crashes), area snowpack was less than 10 inches on May 1. In comparison, during 2011 and 2017, when animal-related crashes and carcass reports were exceptionally low, area snowpack persisted until June 1.

Note: snowfall values from SNOTEL represent start-of-month, instantaneous records for the 6-month period between January and June. Annual average values are therefore calculated as the sum of monthly values divided by 6, while maximum values are the highest observed monthly values for each year.

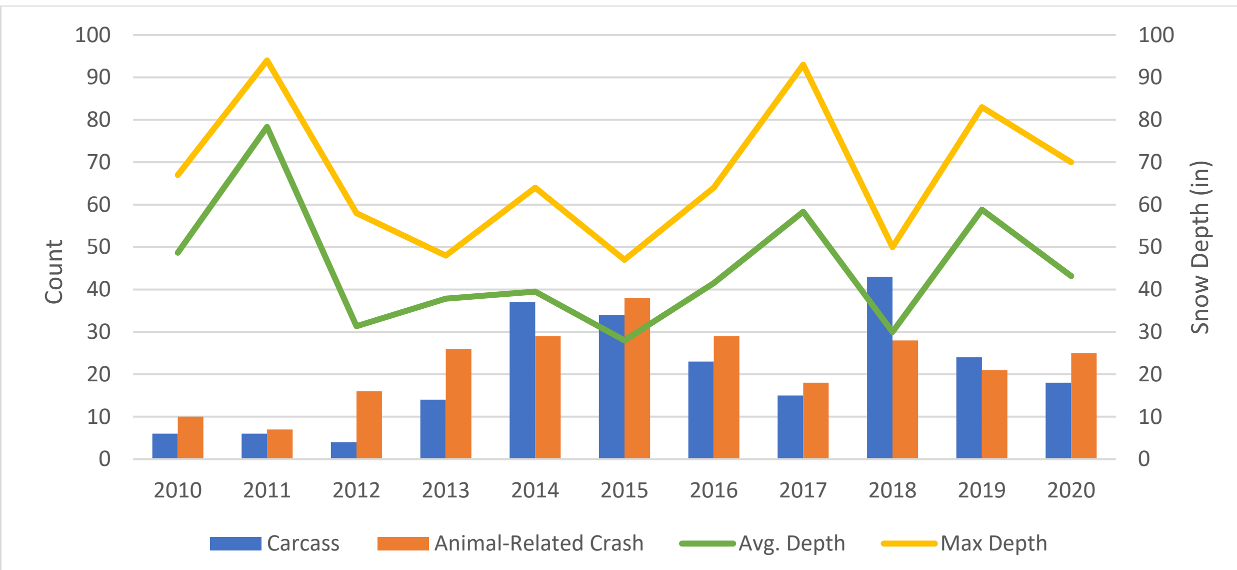


Figure 4. Annual maximum and average snowpack from SNOTEL in relationship to total carcass and animal-related crashes.

Additional analysis was performed to investigate the possible relationship between snowpack depth and carcass counts for elk and moose. The inverse relationship of increasing snowpack and decreasing wildlife incidents seems to hold (see Figure 5). For example, during the 3 years with the deepest snowpack (2011, 2017, and 2019) there was a total of two carcasses, one elk and one moose. By comparison, in 2018 there was only light snowpack, but during that year three elk carcasses and two moose carcasses were reported. The relationship is not entirely consistent, however; 2014 saw relatively deep snowpack and two elk and two moose were killed. 2015 was a low-snow year and yet no big-game carcasses were reported.

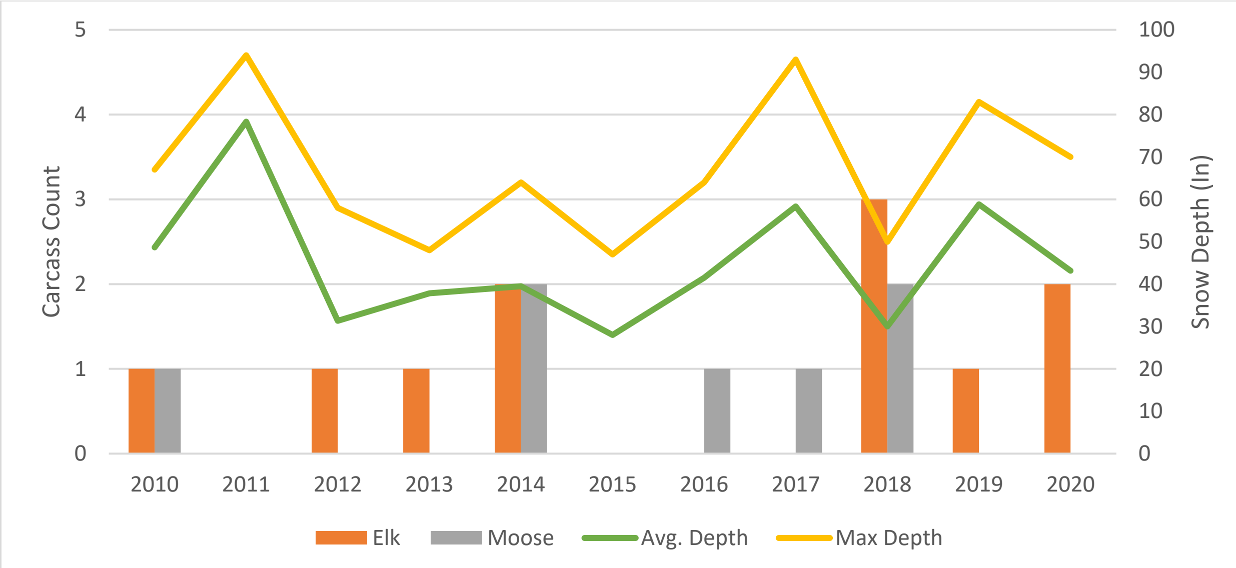


Figure 5. Annual carcass reports for elk and moose plotted against average and maximum monthly snowpack depth.

Seasonality appears to be a factor in the number of wildlife carcass and animal-related crashes reports; higher numbers of both occur in the summer and fall. Figures 6 and 7 show the number of carcasses and animal-related crashes by season.

Winter: December, January, February
Spring: March, April, May
Summer: June, July, August
Fall: September, October, November

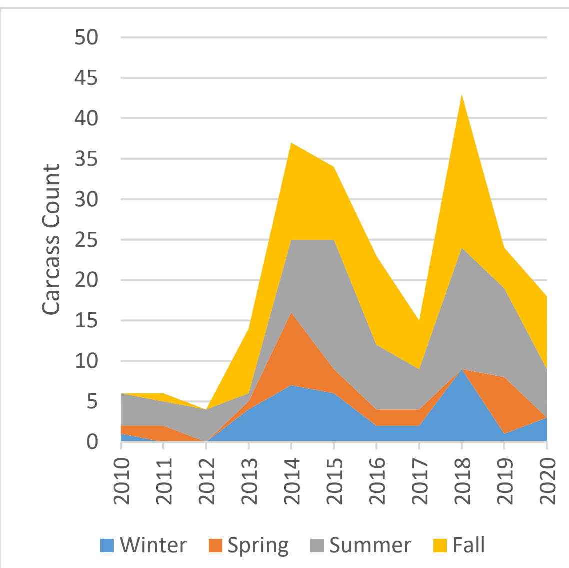


Figure 6. Seasonality of carcass reports, 2010 - 2020

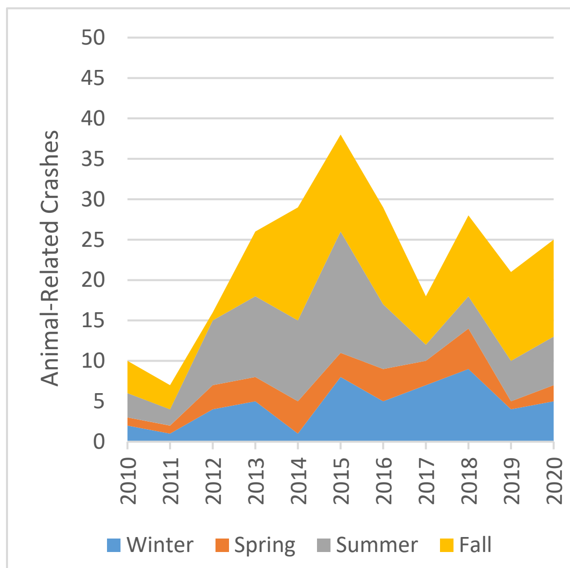


Figure 7. Seasonality of ARCs, 2010 - 2020

Figure 8 shows severity of reported wildlife-related crashes by year. The vast majority of crashes resulted in only property damage; however, on average one wildlife-related crash results in possible or suspected minor injury each year.

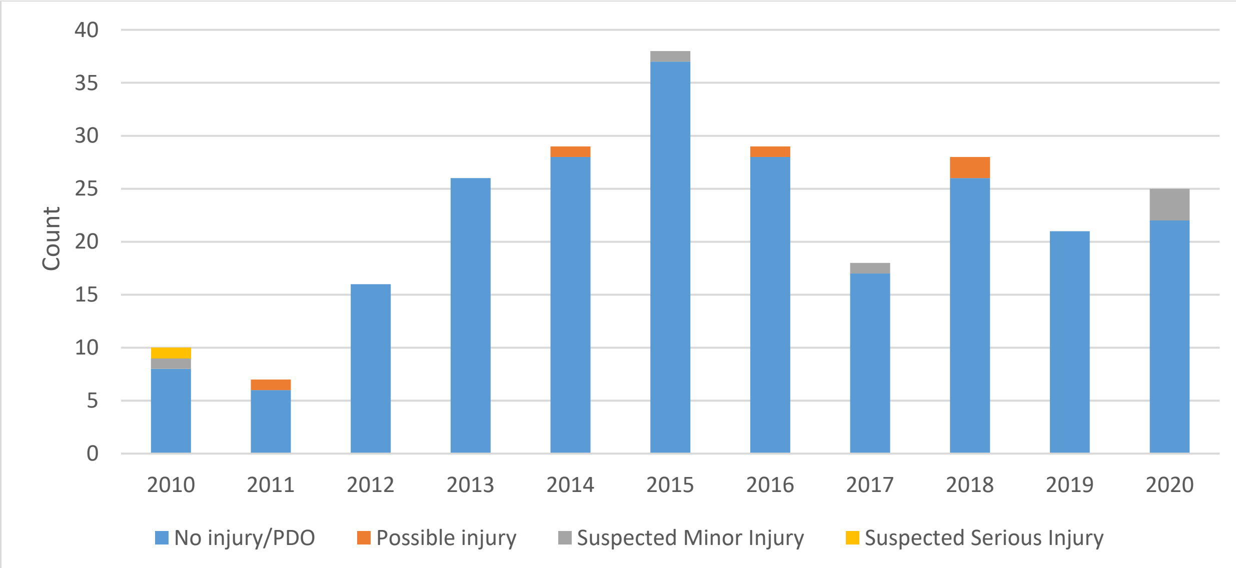


Figure 8. Animal-related crash severity by year for SR-224 for 2010–2020.

Both carcass and animal-related crashes data are collected with location information, which allows the mapping of the reports along the roadway. The mapped locations of carcass and animal-related crashes may be only approximate, but they are nevertheless spatially accurate to within a few hundred meters. This allows a more-refined analysis of locations to within 0.5 miles.

For the purposes of this study, a “hotspot” has been defined as a location where animal-related crashes and carcass values exceed the average values for all 0.5-mile posts along the analysis corridor (MP 4.5–11.5). Using this criterion, locations exceeding 13 carcasses collected and 15 animal-related crashes are considered hotspots. Therefore, the section of the SR-224 corridor between MPs 6.5 and 10.5 is considered a hotspot. Figure 9 shows wildlife-related crashes and carcass report locations plotted by 0.5-mile post.

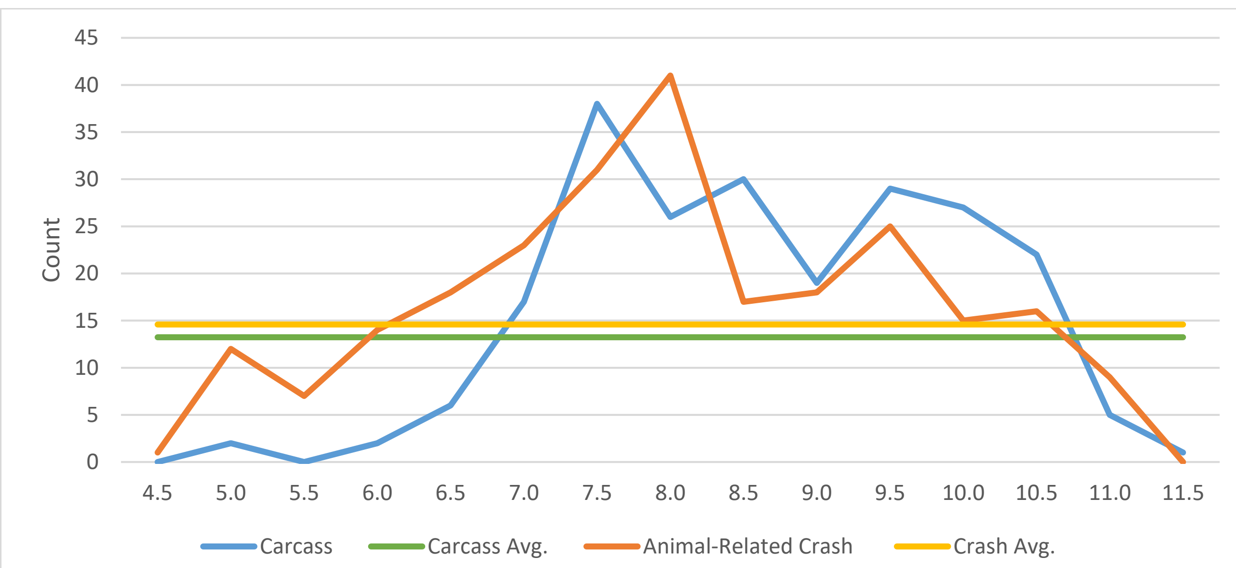


Figure 9: Total wildlife carcass and animal-related crashes by 0.5-mile post, 2010 - 2020.

See Figure 10 for a map of carcass hotspot locations and Figure 11 for a map of animal-related crash hotspot locations across the study area.

Based on hotspot definitions, the entire SR-224 corridor from MP 6.5 to 10.5 is considered a hotspot. However, the existing roadway characteristics allow for a fairly straightforward split into two distinct hotspot locations: the first is the section of SR-224 near McPolin Farm, and the second is the section of SR-224 through the unincorporated area of Snyderville.

These segments by mile post are:

- **SR-224 MP 6.5–8.5 (McPolin Farm)** starts at Payday Drive/Holiday Ranch Loop Road and proceeds south approximately 2.0 miles to the culvert at Dutch Draw (approximately MP 8.6)
- **SR-224 MP 9.0–10.5 (Snyderville)** starts at the culvert over Dutch Draw (approximately MP 8.6) and continues north to the intersection of SR-224 and Bobsled Boulevard/Cutter Lane.

The formation of hotspots can be attributed to many factors, some of which can combine and compound. These include vegetation, adjacent land use, trails, migration patterns, season, topography, and roadway characteristics (e.g., speed, volume, visibility) (Huijser et al. 2007). Characteristics at each hotspot will be summarized according to the categories below. Each hotspot discussion will include mitigation options and approximate cost estimates.

- **Collision characteristics**. Spatial and temporal collision characteristics are summarized for each hotspot by species to provide context.
- **Habitat value**. Big-game habitat preferences were the strongest influence in WVC locations in the study area. These designations, as established by the Utah Division of Wildlife Resources (UDWR), are reviewed for each hotspot to aid in understanding the significance of the location to the wildlife.
- **Vegetation**. General vegetative cover is reviewed. Vegetative cover can be used to estimate areas within the hotspot that are more important to wildlife.
- **Hydrology**. The location of streams, lakes, reservoirs, and wetlands can be used to estimate critically important areas within a hotspot for wildlife and also identify engineering constraints for mitigation implementation.
- **Topography**. Topography can be used to approximate wildlife movement corridors within a hotspot as well as identify engineering constraints for mitigation implementation.
- **Land use**. General land uses within the hotspot analysis are discussed in this section, including zoning information.
- **Access points and intersections.** This category identifies exiting roadway intersections and other access points, such as private driveways, found along the highway. Information regarding the mile post locations, purposes, and other details are listed for each.
- **Future development plans**. Planning authorities for each hotspot location are identified. If a significant mitigation action is to take place, these city and county departments should be consulted to confirm that the action is compatible with future land uses beyond the road network (e.g., wildlife crossings should not be placed in areas that have been newly zoned for commercial development or other incompatible land use).

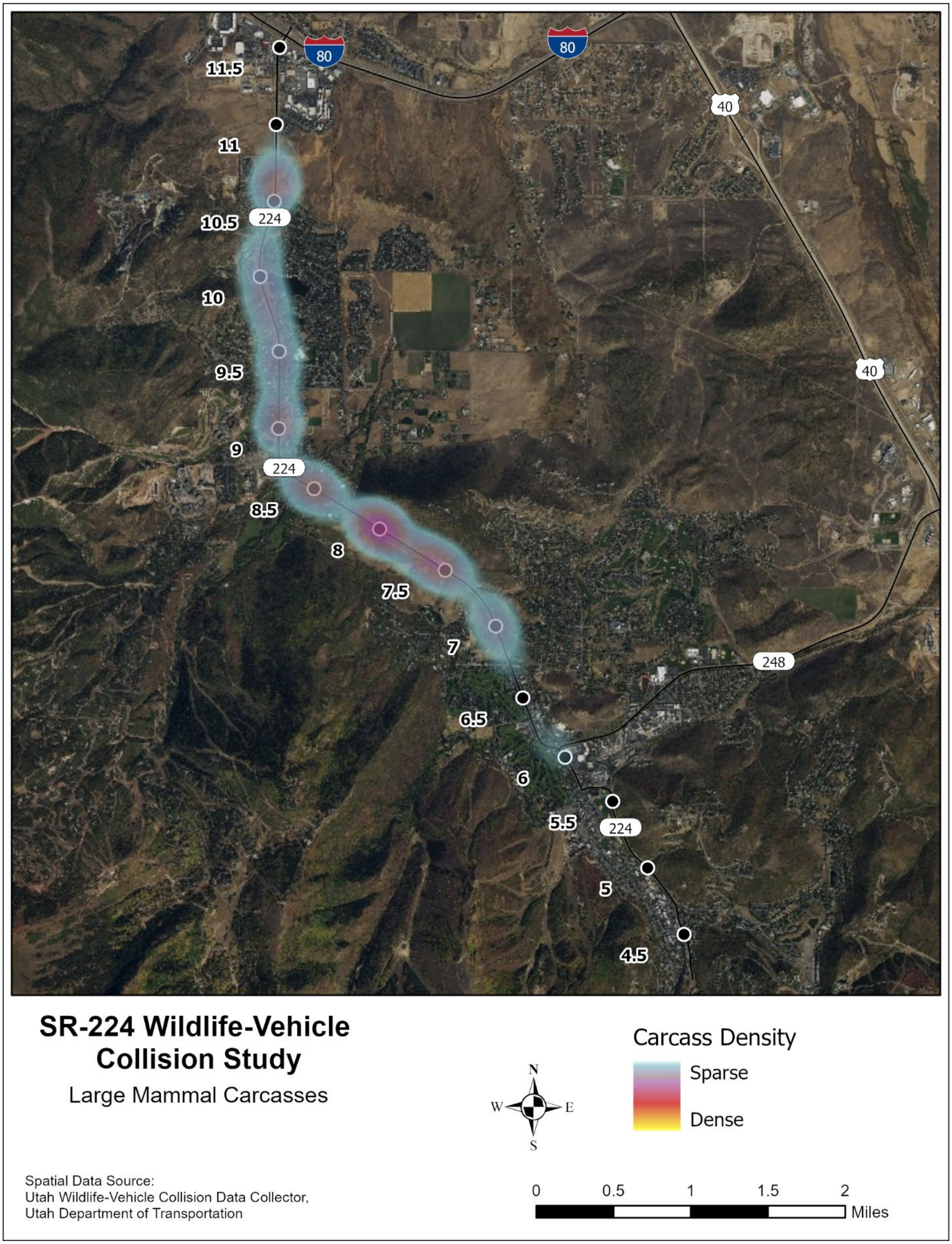


Figure 10. Map of wildlife carcass report hotspot locations along SR-224.

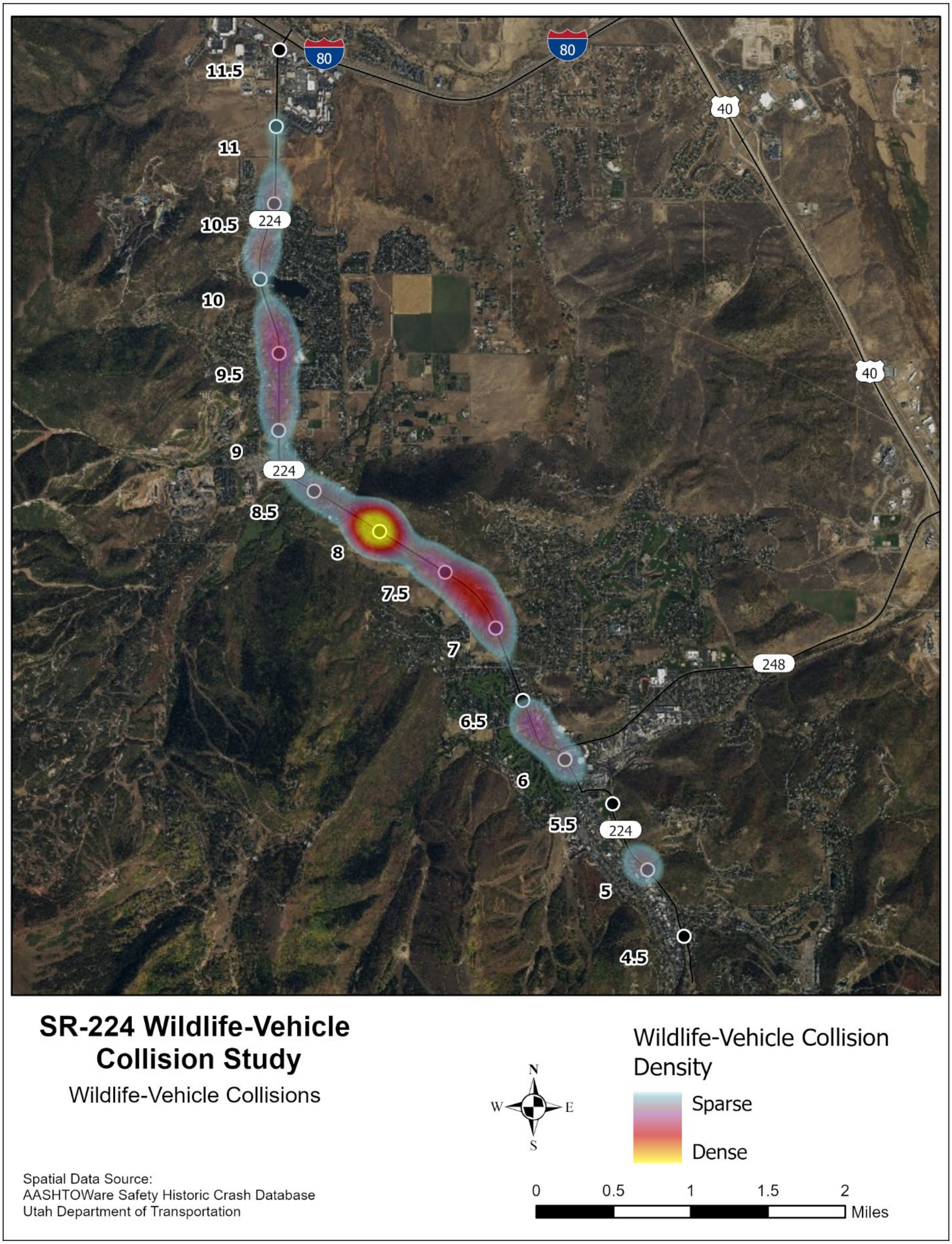


Figure 11. Animal-related crashes hotspot locations along SR-224.

- **Roadway characteristics.** General roadway characteristics, such as alignment, annual average daily traffic (AADT), right-of-way slopes, and median characteristics are briefly reviewed. Roadway characteristics may impact wildlife's ability to cross roads and may also represent engineering constraints for mitigation implementation.
- **Structures**. Existing structures such as bridges over waterways, underpasses for local roads, and overpasses for highways and culverts were inventoried to identify structures within each hotspot area that could be used for wildlife mitigation.
- **Hotspot history**. If the location was identified in a previous study as a problem area it is briefly reviewed in this section.
- **Current mitigation efforts.** Current, ongoing, and proposed mitigation efforts are summarized so that future recommendations can be prioritized.

McPolin Farm hotspot: SR-224, MP 6.5 to 8.5

This hotspot is located near the McPolin Farm. It begins at the intersection of SR-224 and Prospector Drive/Saddle View Way and extends north approximately 2.0 miles to the culvert over Dutch Draw (approximately MP 8.6). This area is associated with summer and fall foraging of big game in the large agricultural fields and natural vegetation. Figure 12 is a Google Earth image of the hotspot location looking southeast, the approximate viewpoint of which is shown in Figure 15.

Figure 12. Google Earth image SR-224 near McPolin Farm. Image perspective is looking south east with Park City in the upper right corner.

Collision Characteristics. This portion of SR-224 experiences the highest number of animal-related crashes and carcass reports of the entire SR-224 corridor. The vast majority of animals killed along this section of highway are mule deer, although elk are also killed in WVCs along this highway section more often than anywhere else in the corridor. Figure 13 shows the species composition of wildlife carcasses collected from 2010 to 2020 by ½ mile post.

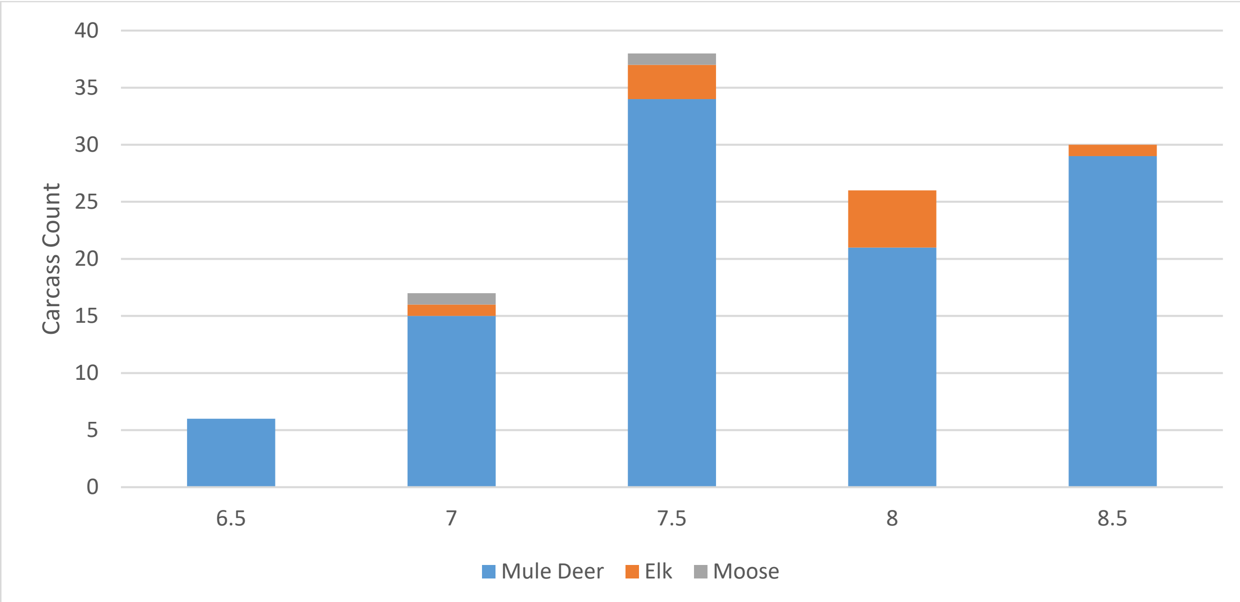


Figure 13. Species composition of big game wildlife carcass reports from MP 6.5 to 8.5 from 2010 to 2020.

Figure 14 shows the location and seasonal nature of carcasses collected by season. This area is utilized more in summer and fall than the other seasons. Milepost 7.5 has the highest carcass count in the summer while milepost 8.5 has a higher count in the fall.

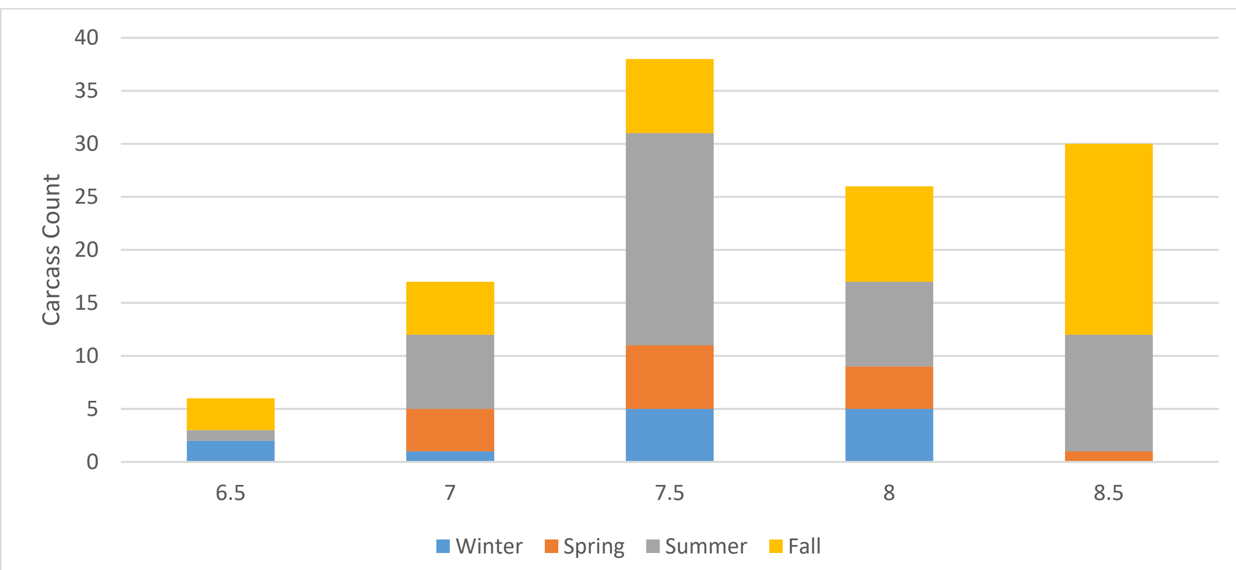


Figure 14. Wildlife carcasses for 2010–2020 summarized by species and season for the McPolin Farm area, MP 6.5–8.5.

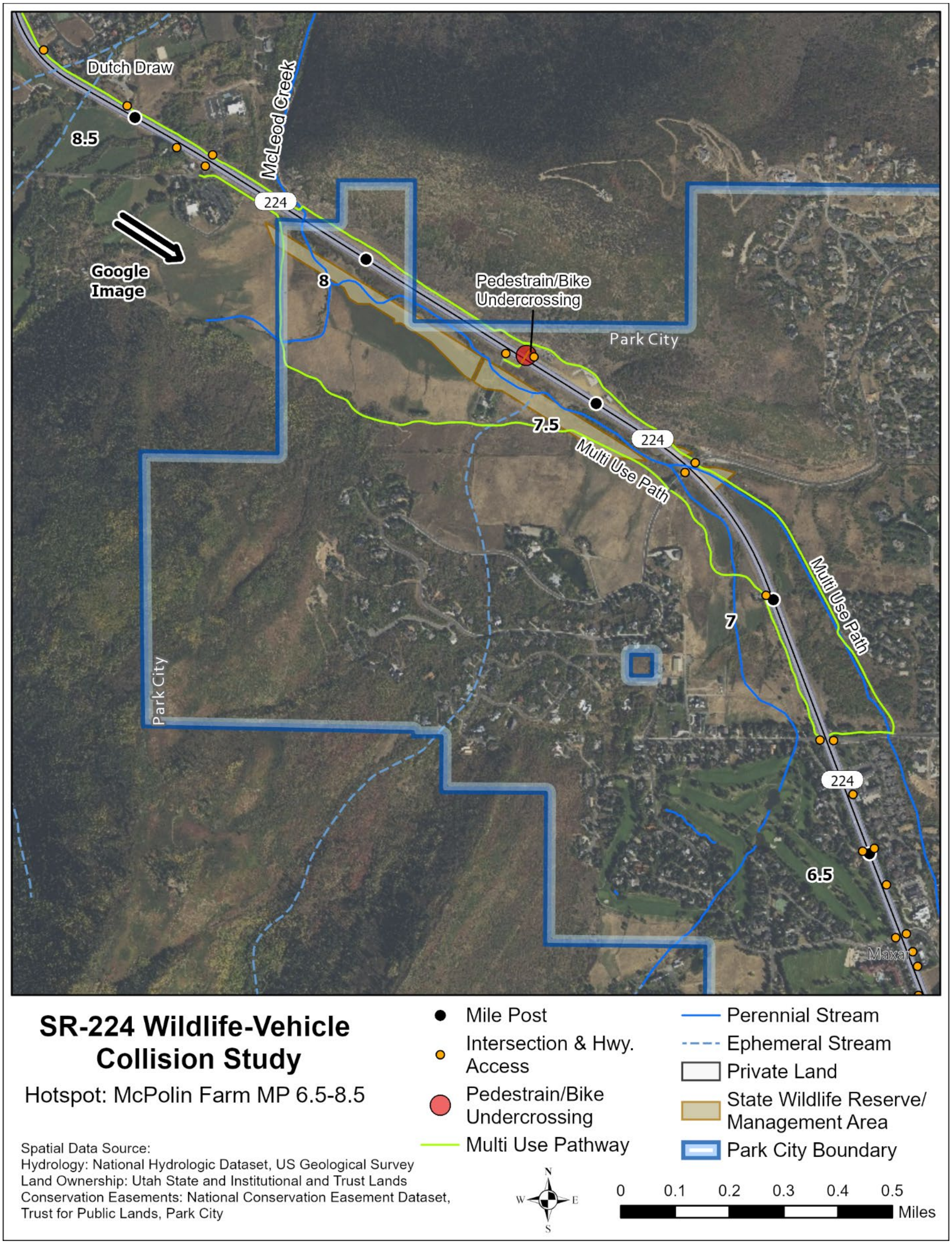


Figure 15. Map of McPolin Farm hotspot from MP 6.5 to 8.5.

A summary of animal-related crashes reported to law enforcement are presented by mile post and season in Figure 16. Mile Post 8.0 has the highest occurrence of animal-related crashes, although animal-related crashes occur frequently throughout this hotspot. Summer and fall see more animal-related crashes than the rest of the year; the lowest number of animal-related crashes occurs in spring.

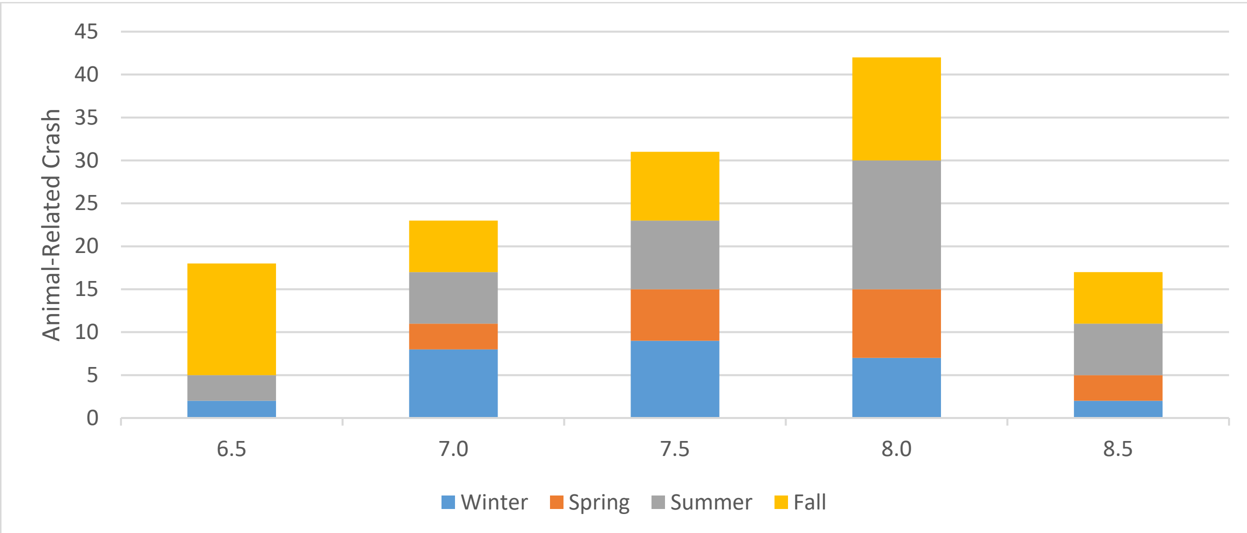


Figure 16. Animal-vehicle crashes for 2010–2020 summarized by season for the McPolin Farm area, MP 6.5–8.5.

Habitat value. Mule deer and elk are often seen browsing in the agricultural fields around McPolin Farm on the west side of SR-224. On the east side of the highway, there is a naturally vegetated hillside, which provides wildlife with cover and forage. Animals also cross SR-224 to access habitat in Snyderville Basin. It is not known if big-game animals migrate through this area to access other habitat or if the animals are resident populations. If animals are migrating through, they would be able to safely cross US-40 at a recently constructed underpass that connects habitat further east.

The UDWR has identified this entire area as crucial summer habitat for deer. Crucial year-long habitat for moose is mapped for the entire mountain range to the west of SR-224, but a small area is also mapped on the east side to capture the hillside. Elk habitat is not mapped for this location (Appendix A). The *Snyderville Basin General Plan* (Summit County 2015) identifies multiple wildlife migration routes across this area (Figure 17).

The UDWR is currently spending funds to reimburse landowners and farmers for elk depredation and crop damage. The UDWR would prefer not to facilitate wildlife passage into Snyderville Basin to reduce wildlife damage to private property. This would also reduce the amount of big game on city streets and in residential areas, where animals often get into trouble or are killed in WVCs.

Land Use. Except for the first 0.25 miles on the very southern end of the analysis area, this section of SR-224 runs through a relatively undeveloped landscape, the only long stretch of SR-224 to do so. McPolin Farm (MP 7.4–8.2) is located southwest of the highway on a large agricultural field and is permanently protected by a conservation easement. A majority of the hillside to the northeast of the highway is also protected with a conservation easement. Park

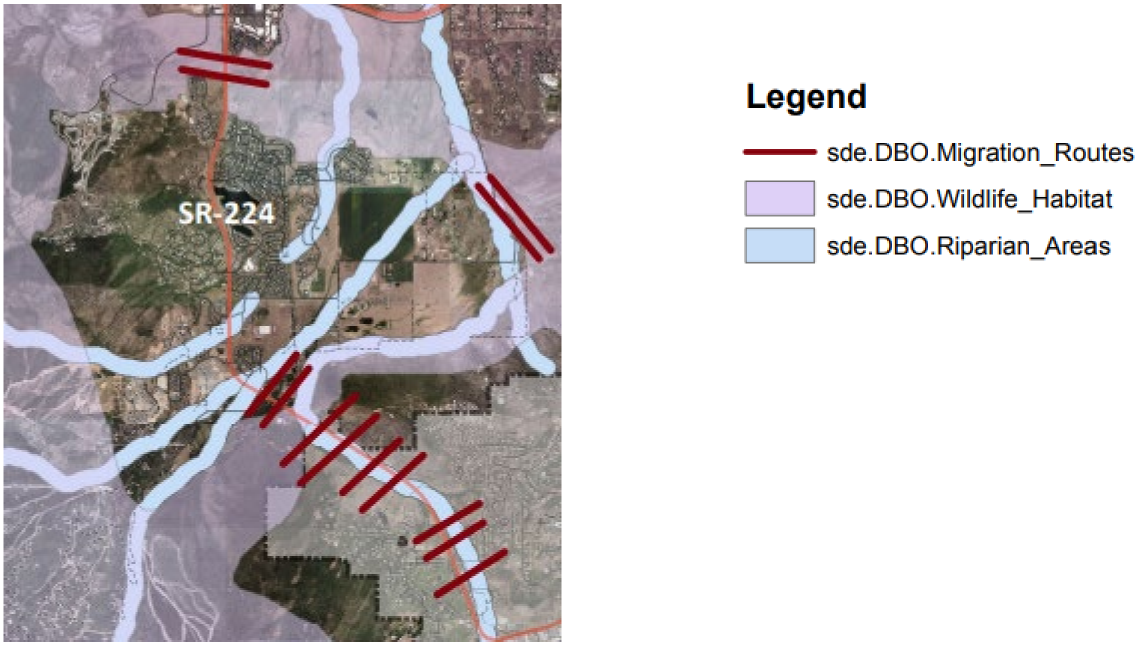


Figure 17. Wildlife migration routes across SR-224 as identified in the Snyderville Basin General Plan (Summit County 2015).

City owns the land immediately south of McPolin Farm on both sides of the highway, and another conservation easement protects the remaining portion of private property.

Figure 18 provides examples of typical land use along this section of SR-224 See Appendix B for a map of zoning and land use in this area.

Roadway characteristics. Through this area SR-224 is a four-lane highway with a center-turn lane. The paved surface varies from 80 to 90 feet wide. Average annual daily traffic for 2019 was 31,000. The speed limit through this section is 55 mph. There are three signalized intersections at the southern end of the section at MPs 6.5, 6.75, and 7.25, but otherwise traffic is free-flowing through the entire length.

Multi-use pathways parallel the highway on both sides for the majority of the analysis area. The northern pathway is much closer to the highway than the southern trail, often located within the highway right-of-way, although the southern pathway does have portions within the highway right of way. A trailhead and parking lot is located at MP 7.6, associated with the pedestrian undercrossing at the same location.

Access points and intersections: This area has relatively few roadway intersections or private property access points. Only four road intersections currently exist located at MPs 6.5, 6.75, 7.25, and 8.4. The first three are signalized intersections, all located in the first mile of the analysis section, while the last (MP 8.4) is controlled by stop signs on the local roads. Six additional private access points are located at MPs 6.6, 7.0, 7.6 (one on both sides of the road), 8.4, and 8.5. Table 3 lists the intersections and access points. Both the west and east side of SR-224 have seven access points, averaging one access for every 0.28 miles.

Hydrology. McLeod Creek flows parallel to SR-224 near McPolin Farm, then crosses through a culvert beneath the highway in a northeasterly direction at approximately MP 8.1. Dutch draw crosses under the highway from west to east at MP 8.6.

Figure 18. Google Street View images showing representative land use along SR-224 through the McPolin Farm hotspot area.

Table 3. Access points and intersections within hotspot analysis section (MP 6.5–8.5).

WEST SIDE SR-224		EAST SIDE SR-224	
MILE POST	**PURPOSE**	**MILE POST**	**PURPOSE**
6.5	Signalized intersection at Prospector Drive	6.5	Signalized intersection at Snow Creek
6.75	Signalized intersection at Payday Drive	6.6	Private driveway (east side)
7.0	Parking for US Olympics Memorial artwork installation	6.75	Signalized intersection at Holiday Ranch Loop Road
7.25	Signalized intersection at Meadows Drive	7.25	Signalized intersection at Meadows Drive
7.7	McPolin Farm access (west side)	7.6	McPolin Farm Trailhead (east side)
8.4	Intersection at Pine Canyon Road	8.4	Intersection at Temple Har Shalom
8.45	Private driveway (west side)	8.51	Private driveway (east side)

Hotspot history. SR-224 from Kimball Junction to SR-248 was listed as number five of the top five animal-carcass and animal-related crash hotspots in Utah, with an average of 2.93 animal-related crashes per mile, per year (Cramer et al. 2019).

Current mitigation efforts. Current mitigation efforts in this hotspot are limited to road signs warning of frequent wildlife roadway crossings. These signs are located at MPs 6.82 and 7.86 in the northbound travel direction and at MP 7.86 in the southbound direction.

Snyderville Hotspot: SR-224, MP 9.0 to 10.5

This hotspot is located on SR-224 through the community of Snyderville, directly north and contiguous with the McPolin Farm hotspot from MP 9.0 to 10.5. The segment starts at culvert over Dutch Draw (approximately MP 8.6) and continues north to the intersection of SR-224 and Bobsled Boulevard/Cutter Lane (approximately MP 10.35). This area is a mix of residential subdivisions interspersed with agricultural areas, a golf course, human-made ponds, and native vegetation. Figure 19 is a Google Earth image of the hotspot location, the approximate viewpoint of which is shown in Figure 21.

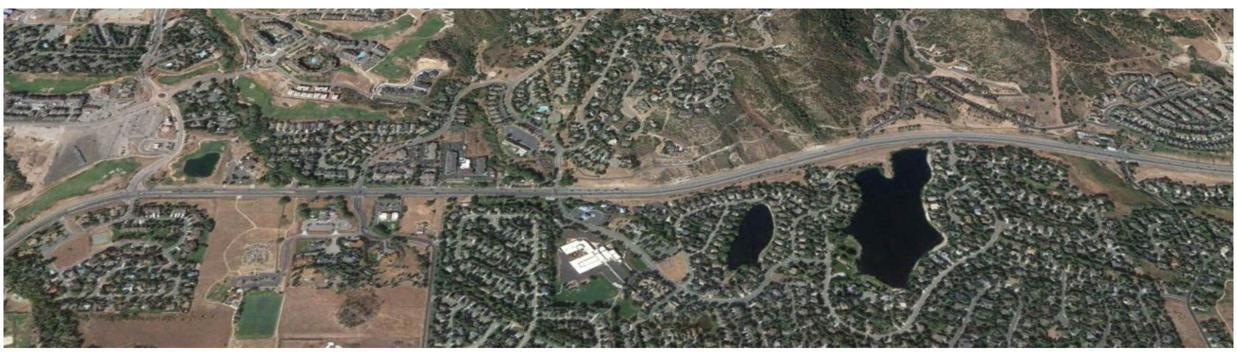


Figure 19. Google Earth image of SR-224 through Snyderville. Image perspective is looking west with Kimball Junction on the right, just outside of the frame.

Collision Characteristics. This portion of SR-224 experiences the second-highest amount of animal-related crashes and carcass reports of the SR-224 corridor. Figure 20 contains a summary of animal carcasses collected in this area since 2010. The vast majority of animals killed at this location are mule deer, although moose are killed here more than anywhere else on the highway, with five moose carcasses collected in the last 11 years. Elk appear to avoid this area; no elk carcasses have been collected since at least 2010.

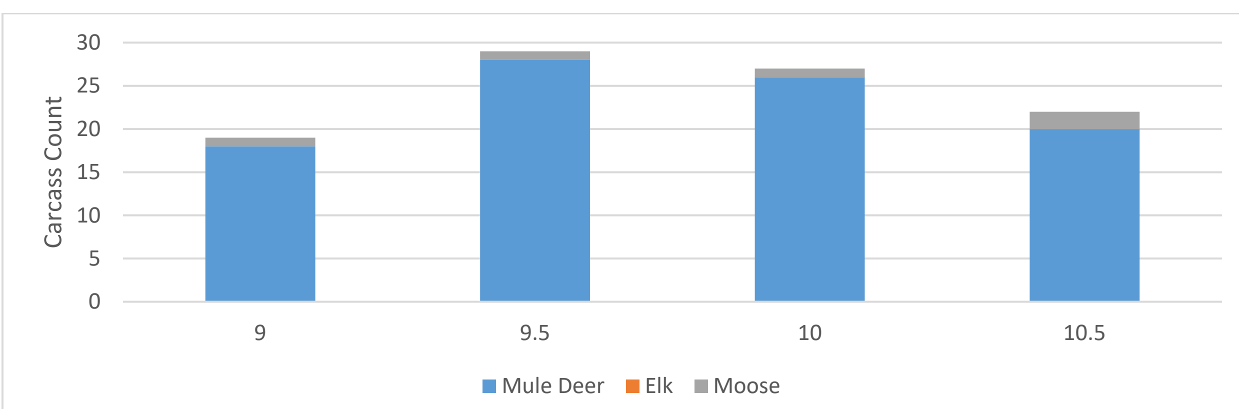


Figure 20. Species composition of big game wildlife carcass reports from MP 9.0 to 10.5, from 2010 to 2020.

Figure 21. Map of SR-224 through Snyderville, from MP 9.0 to 10.5.

A summary of animal-related crashes reported to law enforcement is presented by mile post and season in Figure 22. Mile post 9.5 has the highest occurrence of animal-related crashes. Summer and fall see more animal-related crashes than the rest of the year; the lowest number of animal-related crashes occur in spring.

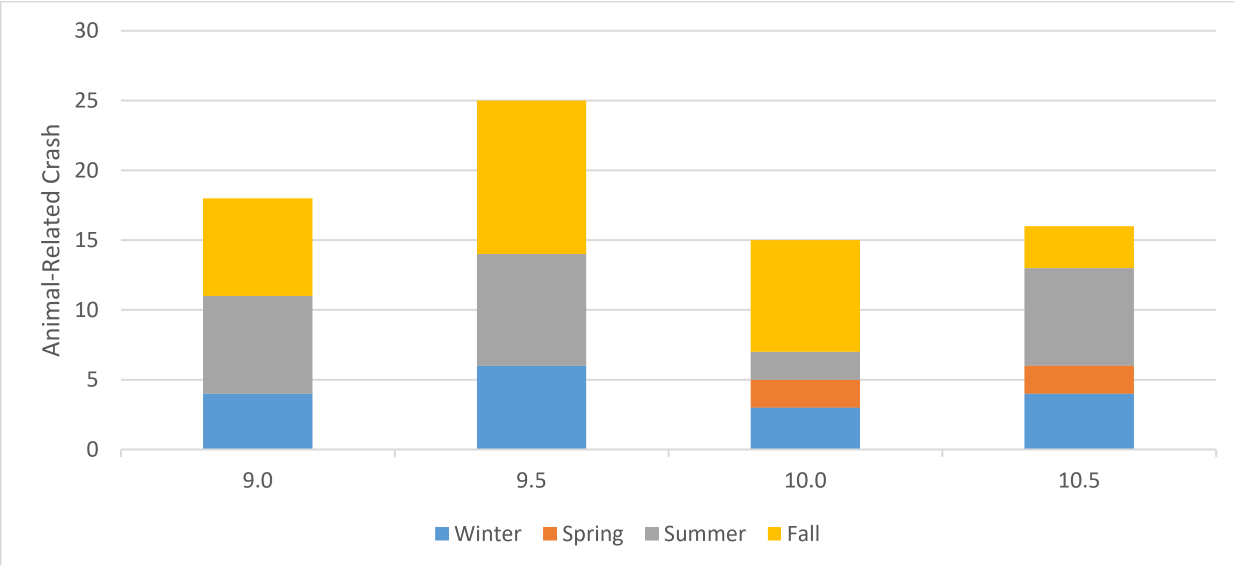


Figure 22. Animal-vehicle crashes for 2010–2020 summarized by season for the Snyderville area, MP 9.0–10.5.

Habitat. This portion of SR-224 is a mix of residential subdivisions interspersed with native vegetation, agricultural areas, and a golf course. The UDWR has identified this entire area as crucial summer habitat for deer. No habitat for elk or moose overlaps with this portion of SR-224, but crucial year-long habitat for moose is mapped for the entire mountain range to the west (Appendix A). The *Snyderville Basin General Plan* identifies a wildlife migration route across the highway at approximately MP 10.5, just north of the residential area (Summit County 2015).

Topography. The terrain of this area is generally flat on the eastern side of the highway while the west side is a moderately sloped hillside.

Land Use. The entirety of this section of SR-224 is under the land use authority of Summit County's Snyderville Basin Planning District. Land on the east side of SR-224 is zoned Rural Residential while the western side is divided into three zones, Rural Residential, Resort Center, and Hillside Stewardship. The allowed use within Rural Residential is medium-density residential development, Hillside Stewardship is lower density residential, and Resort Center allows higher density residential and commercial development. Figure 23 provides examples of typical land use along this section of SR-224.See Appendix B for a map of zoning in this area.

While not part of this hotspot, it should be mentioned that the land north of this segment, from MP 10.5 to 11.0, while zoned for residential development, is currently agricultural and pasture lands. The *Snyderville Basin General Plan* indicates that this small stretch of open space should be preserved to the extent possible to facilitate the movement of wildlife through the corridor. This may be an ideal location for a future wildlife crossing structure.

Figure 23. Google Street View images showing representative land use along SR-224 through the Snyderville hotspot area.

Roadway characteristics. In this location, SR-224 is a four-lane highway with a center-turn lane/median and paved shoulders. The paved surface varies from 80 to 100 feet wide. In many places, paved pedestrian trails parallel the highway on one or both sides. Average annual daily traffic is from 33,000. Speed along the highway is 45 to 55 mph.

Multi-use pathways parallel the highway on both sides for the majority of the analysis area. The eastern pathway follows SR-224 closely along the length of this hotspot. The western pathway runs parallel to SR-224 but is offset to the east to navigate through the hillside terrain. This pathway is not present from MP 8.5 to 9.5. A trailhead and parking lot are located at MP 7.6 and are associated with the pedestrian undercrossing at the same location.

Access Points and Intersections. SR-224 runs through an urbanized portion of Snyderville with a high occurrence of curb cuts for businesses and private residences. This section of highway also has four signalized intersections and two unsignalized intersections. Locations of access points and intersections are listed in Table 4. The west side of SR-224 has 14 access points, averaging one access for every 0.15 miles while the east side has seven access points, averaging one access every 0.28 miles.

Table 4. Access points and intersections within Snyderville hotspot analysis area (MP 8.5–10.5).

WEST SIDE SR-224		EAST SIDE SR-224	
MILE POST	**PURPOSE**	**MILE POST**	**PURPOSE**
8.8	Signalized Intersection at Canyons Resort Dr	8.7	Village Round Dr intersection
8.95	Private Driveway	8.8	Village Round Dr
9.0	Private Driveway	9.15	Signalized Intersection at Old Ranch Rd
9.05	Private Driveway	9.2	Private Driveway
9.15	Signalized Intersection at Sun Peak Drive	9.3	Private Driveway
9.25	Private Driveway	10.08	Intersection at Springs Rd
9.36	Private Driveway	10.34	Signalized Intersection at Cutter Ln
9.37	Private Driveway		
9.4	Private Driveway		
9.44	Signalized Intersection at Bear Hollow		
9.95	Intersection at Cove Canyon Dr		
10.28	Private Driveway		
10.32	Private Driveway		
10.34	Signalized Intersection at Bobsled Blvd		

Structures. There are no substantial structures crossing above or below the roadway between MPs 9.0 and 10.5. However, there is a pedestrian underpass located at MP 11.15, between the Redstone Development and the Olympic Park.

Hotspot history. SR-224 from Kimball Junction to SR-248 was listed as number five of the top five animal-carcass and animal-related crash hotspots in Utah, with an average of 2.93 animal-related crashes per mile, per year (Cramer et al. 2019).

Current mitigation efforts. An eight-foot fence is located on the west side of the highway between Snyderville and Kimball Junction (Bear Cub Drive to Olympic Parkway). It is not clear if the structure is designed to function as a snow fence or wildlife exclusion fence. Other mitigation efforts are not apparent. There are no crossing structures, fencing, or wildlife warning signage in this area.

POTENTIAL MITIGATION OPTIONS

Options for mitigation include the methods identified in Table 2. Driver warning methods are generally the least cost prohibitive and could be implemented without a detailed planning process, but will require a traffic and safety analysis for speed limit reduction. Other methods could require a significant financial and time investment to implement, and should consider all related impacts. Some details related to wildlife fencing and wildlife crossing options follow.

Exclusionary Wildlife Fencing

Exclusion fencing is one of the most effective and inexpensive methods to prevent wildlife from entering roadways. If the ultimate goal is to simply reduce the number of animals killed and prevent WVCs, past experience from US-40 and I-80 indicates that installing an 8-foot-tall wildlife fence along both sides of the length of the highway would be effective. In addition to fencing, other design elements would have to be included, such as spacing and designs for escape ramps, road and driveway accesses using crossing grates, electric mats, gates as appropriate in given locations, and pedestrian access points for trails and sidewalks.

Because the two hotspot areas evaluated in this report are continuous, a possibility would be to fence both sides of SR-224 from Payday Drive on the south end (MP 6.7) to the Olympic Parkway entrance on the north end (MP 11.2). This would be approximately 4.5 miles of fencing along each side of the road (which is 9 miles of fence in total), covering the two hotspot areas and extending from one heavily developed area (Park City) to another (Kimball Junction).

A proposal to install wildlife fencing through the entire corridor may face opposition from local residents, especially in Snyderville, where adjacent homes and businesses might be affected. It may be possible to construct wildlife fence along the McPolin Farm area, but not within Snyderville, and so the fencing may simply direct wildlife into Snyderville and Park City (data show deer and moose collisions occurring within Snyderville currently). Considerations for fencing includes the location of pedestrian and cycling trails. To avoid conflict with pedestrians, cyclists, and accesses, an option may be to install the fencing behind the homes through the corridor.

An important consideration of installing wildlife fencing is total fence length. In a meta-analysis, Huijser et al. (2016) found that fence lengths less than 5 kilometers (3.1 miles) in length reduced collisions by only about 53 percent. This is much less than the more-dramatic collision reduction of about 87 percent, which can be potentially achieved with well-designed crossing structures and fencing. Consideration would have to be given to whether fencing would reasonably cover collision hotspots while also providing adjacent buffer zones to effectively deter animals from traversing around the mitigation. If further developed as a concept, UDOT and UDWR biologists should carefully consider (1) where the fencing should end, (2) consider habitat and topographic changes relative to the crossing structures, (3) consider the potential for creating new hot spots at fence ends, and (4) consider how to avoid such complications.

By design, the option of fencing the entire corridor would reduce and prevent wildlife from crossing SR-224. Given the configuration, length, and small size of the existing pedestrian crossings and culverts, most animals would likely be deterred or prevented from crossing. Therefore, a wildlife fence of this design would have implications for regional animal movement. Animals on the west side of SR-224 would now be prevented from moving toward Snyderville Basin. Animals in Snyderville Basin, already enclosed by fences on US-40, might be directed toward I-80 to the north. This could be a progression towards enclosing Snyderville Basin on three sides. However, this may actually suit the desires of the UDWR and some local residents and farmers, who deal with significant property damage and restitution payments from local elk populations. All of these considerations seem to point toward the need for an overall strategy for the three UDOT routes surrounding this area.

Potential Crossing Structures

Wildlife crossings could be added to the fencing to not exclude the animals from the center of the basin. Currently, two pedestrian undercrossings exist at MP 7.65 (McPolin Farm Trailhead) and MP 11.15 (Olympic Parkway); there are also box culverts at Dutch Draw and McLeod Creek that could be considered. None of these structures, as presently situated, are designed to support wildlife crossings either because of their length or size. Recommended widths and heights of undercrossings for large mammals, particularly elk and moose, are 23-26 feet wide and 13-16 feet high (Clevenger and Huijser 2011). Cramer (2011) has studied crossing structures in the Intermountain West and has found that culvert length is another important dimension for passing mule deer. The optimal culvert length is less than 100 feet, and 120 feet is considered the maximum length. Both pedestrian crossing structures are at least 120 feet long and the box culverts at Dutch Draw and McLeod Creek are 140 and 230 feet, respectively. These structures, even if augmented with wildlife fencing, would provide only minimal opportunity for mule deer, elk, and moose passage and therefore may not be effective in maintaining habitat connectivity.

To successfully facilitate wildlife crossing through either of the two pedestrian underpasses, it would be desirable to modify the existing pedestrian structures (shortened and widened) to encourage wildlife use. However, the existing pedestrian crossing located at Olympic Parkway is less desirable for shared use as a wildlife crossing due to the extensive commercial development and high-density residential development on the east side of the highway which would block wildlife from passing through the area or potentially facilitate wildlife conflicts.

The second option would be to create wildlife-specific undercrossings. Two potential crossing locations were identified for wildlife-specific culverts or underpasses. The first site is the pedestrian undercrossing at MP 7.7 in the McPolin Farm hotspot. This crossing would involve modifying an existing structure to better facilitate wildlife movement (Figures 24 and 25). The other potential crossing site is located at MP 10.85 between Snyderville and Kimball Junction near Bear Cub Drive and would require a new underpass structure or open culvert (Figures 26 and 27).

These two locations could function as permanent wildlife corridors in that they have open space and habitat on both sides of the highway and would not direct wildlife into residential areas. Furthermore, the land ownership at these locations appears to be potentially accommodating for wildlife use because rather than being private property with development pressure, these lands are either under conservation easement or owned by public entities, such as Park City, Summit County, Utah Department of Natural Resources, and Utah State University. Additional coordination and collaboration with local government and land-owning entities would be needed.

A third option to assist wildlife crossing would be the construction of wildlife overpasses. These structures would be more likely to provide a reliable crossing opportunity for elk and moose compared to culverts due to the width of roadway that needs to be crossed and the lack of openness that undercrossings could provide. Possible overpass locations would be the same as potential wildlife-specific undercrossings—the vicinity of McPolin Farm and in the open area between Snyderville and Kimball Junction—because there are combinations of conservation easements and/or public lands at both of these locations, as previously mentioned. Overpass feasibility has not been determined in this report; however, costs for one or more overpass structures are likely to be prohibitive for the width of roadway that must be spanned, as well as the large amount of cut and fill that may be required.

A final consideration is the number of crossings. Mule deer require a safe crossing approximately every 1.2 miles, based on their home-range characteristics (Huijser et al. 2008). Because the length of potential wildlife fencing is 4.5 miles, ideally the hotspot corridor would have at least three crossing locations for mule deer; however, this may not be practical from the standpoint of existing land uses and cost. Two crossings would likely be sufficient for elk and moose because they have larger home ranges than mule deer.

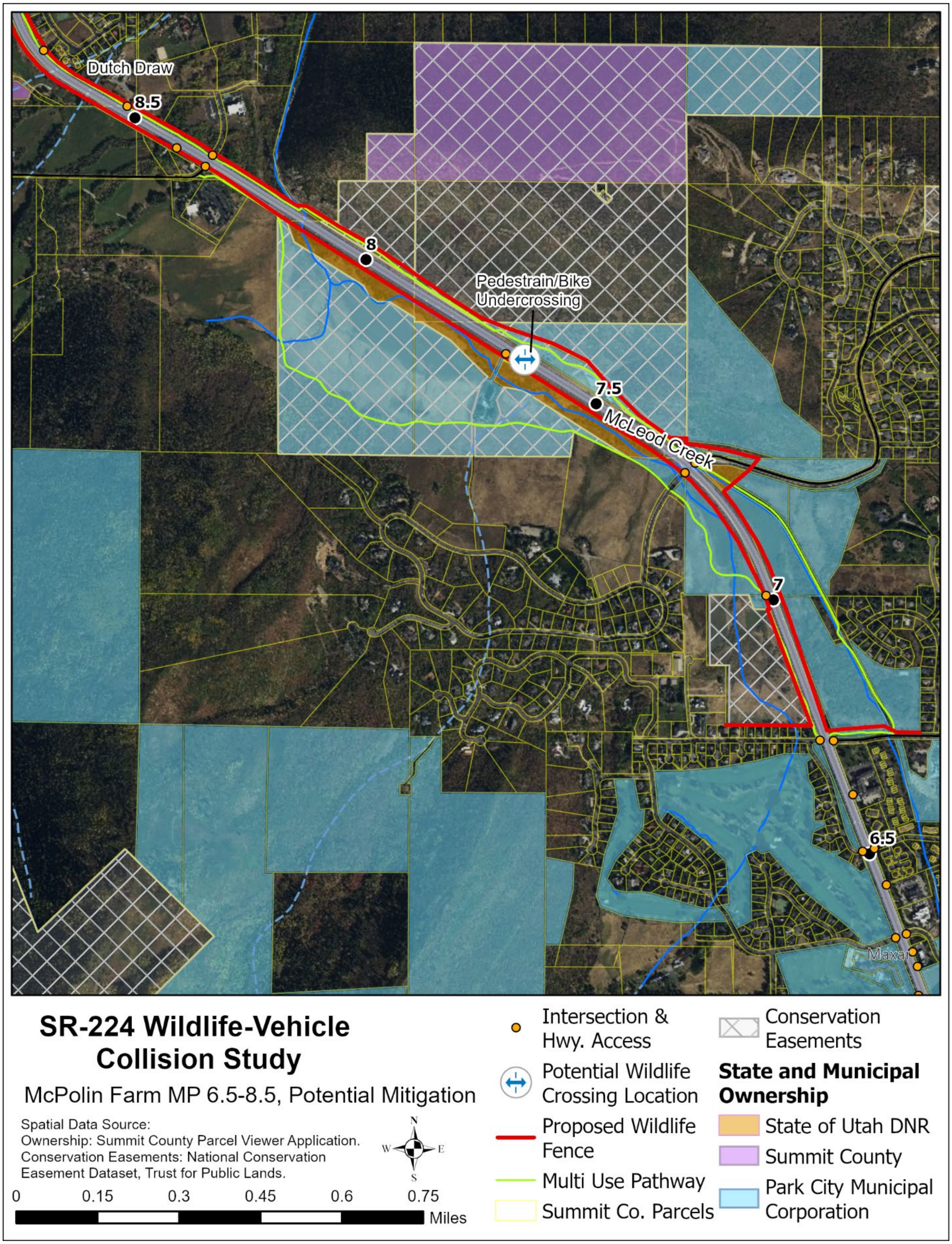


Figure 24. Aerial image map of the potential wildlife crossing structure location for the McPolin hotspot.

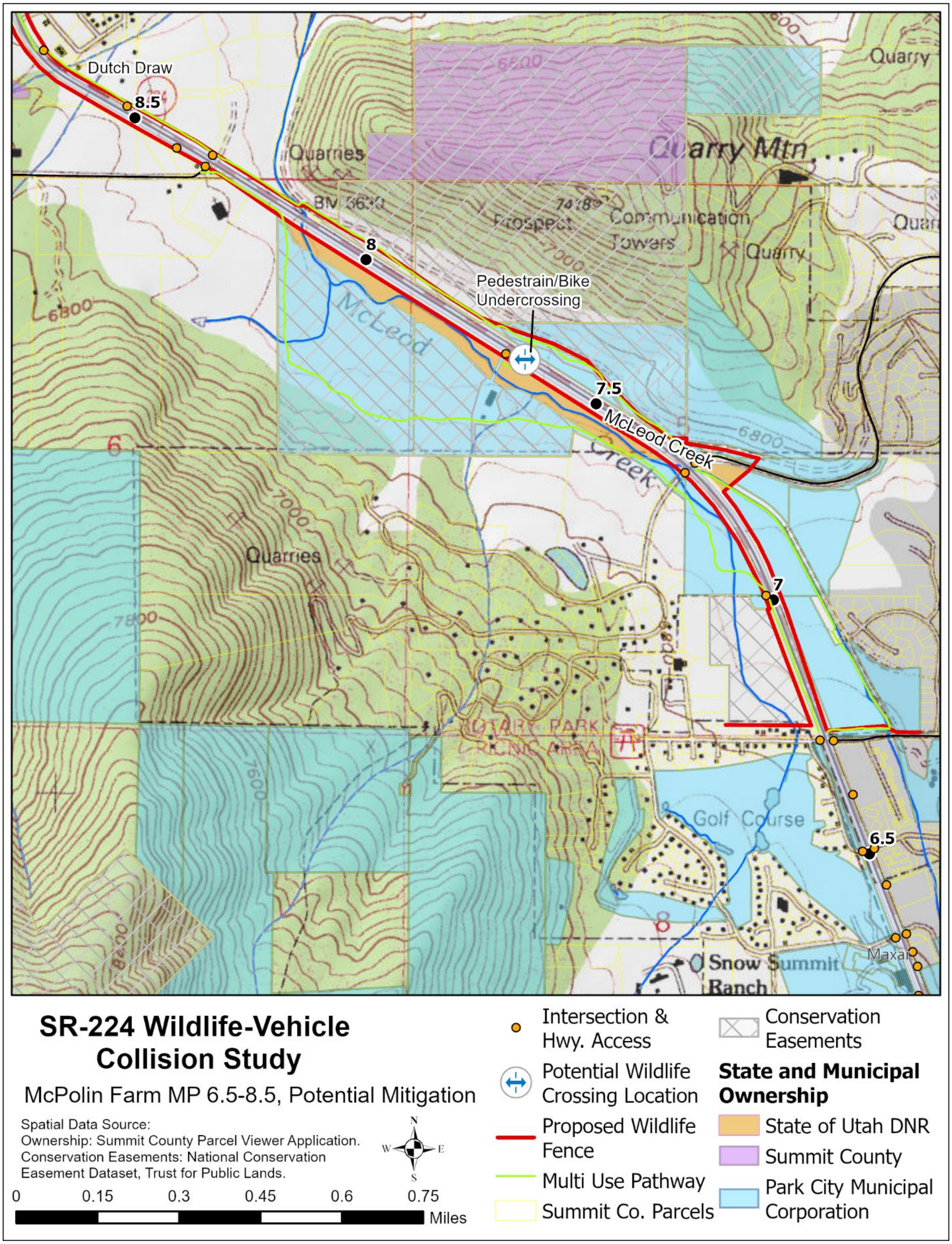


Figure 25. Topographic map of potential wildlife crossing structure location for the McPolin hotspot.

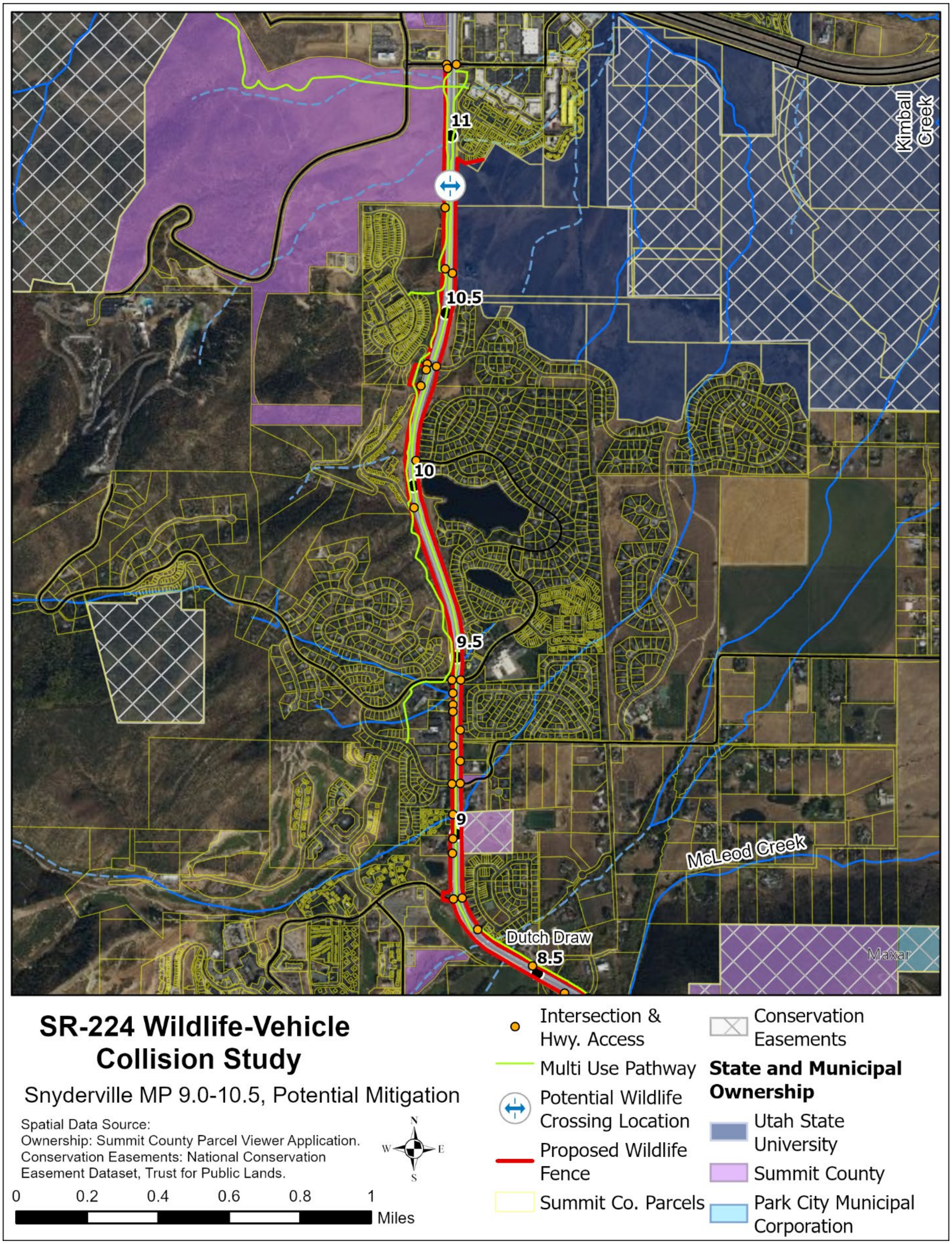


Figure 26. Aerial image map of the potential wildlife crossing structure locations for the Snyderville hotspot.

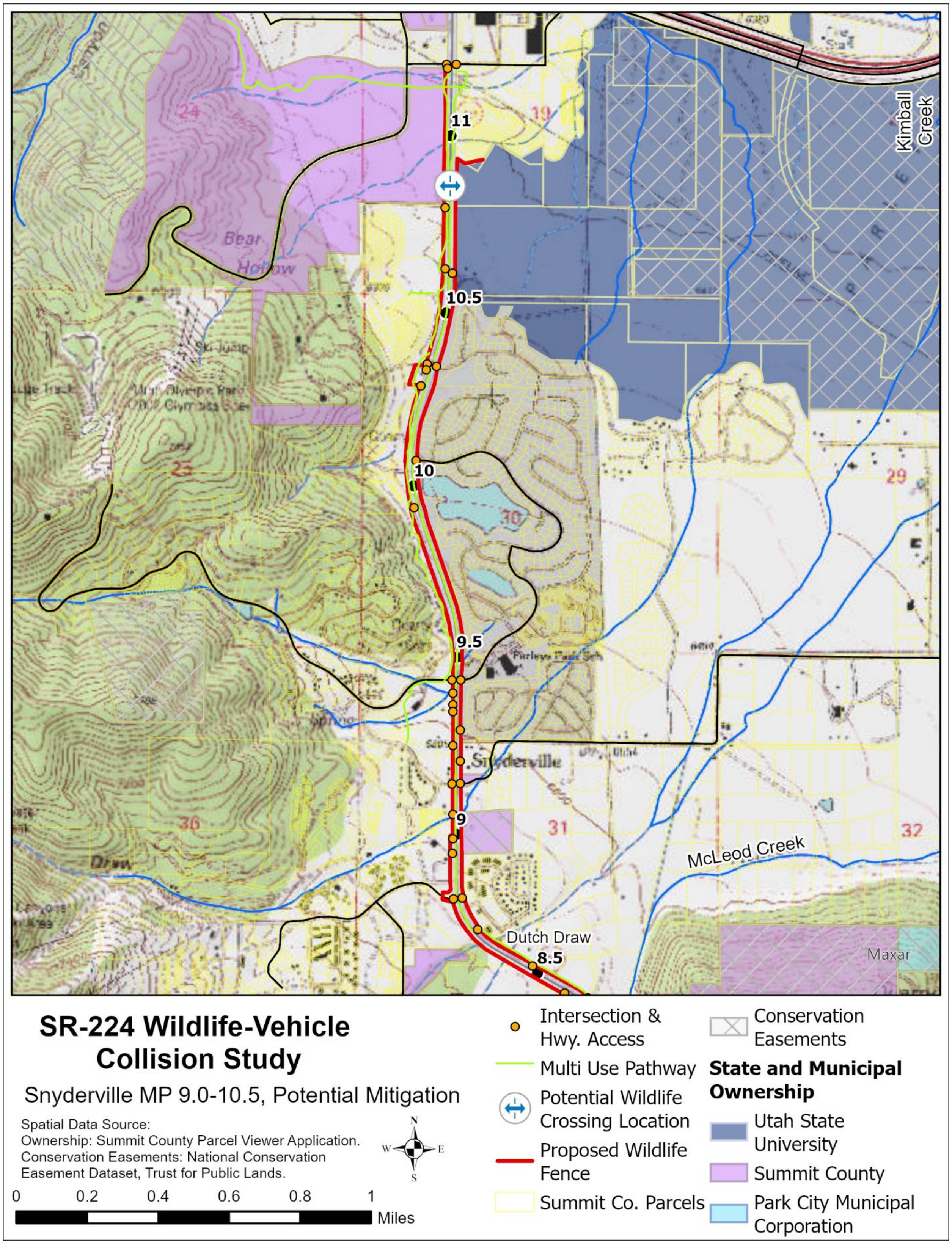


Figure 27. Topographic map of potential wildlife crossing structure location for the Snyderville hotspot.

SUPPORTING RESEARCH

To provide context to the magnitude of AVC and carcass collection along SR-224, additional analyses were completed for several other highways in the region. Figure 29 provides a map of the region. Analysis areas include the following highway segments;

- Interstate 80 between Salt Lake City (Parleys Canyon) and Coalville
- US-40 from I-80 to Heber,
- SR-32 from US-40 to I-80, and
- SR-248 from Park City to Kamas.

The project analyzed the two datasets that were also used for the SR-224 analysis, including wildlife carcass-collection locations (only deer, elk and moose) and animal-related crashes between January 1, 2010, and December 31, 2020. During this time period, a total of 6,205 wildlife carcasses were collected and 2,229 animal-related crashes were reported. For comparison purposes, counts for each variable were aggregated into 2-mile increments based on recommendation from the UDWR.

Figure 28 shows the 25 locations of the greatest number of wildlife carcass collections. In terms of total carcasses collected, the highest wildlife mortality occurs along SR-32 between MP 28 and 30 with 283 animals, however, SR-248 (MP 10-12), US-40 (MP16-18) and US-40 (MP 6- 8) also experience high levels of carcass collection with 276, 275, and 267 respectively. However, all other regional highways (except SR-224) have 2-mile segments where more than 200 carcasses have been collected as well. SR-224 is not shown on the graph as the 2-mile segment with highest carcass count ranks 27th (MP 10 to 12 with 99 carcasses) and 32nd (MP 8 to 10 ranks 32nd with 85 carcasses)

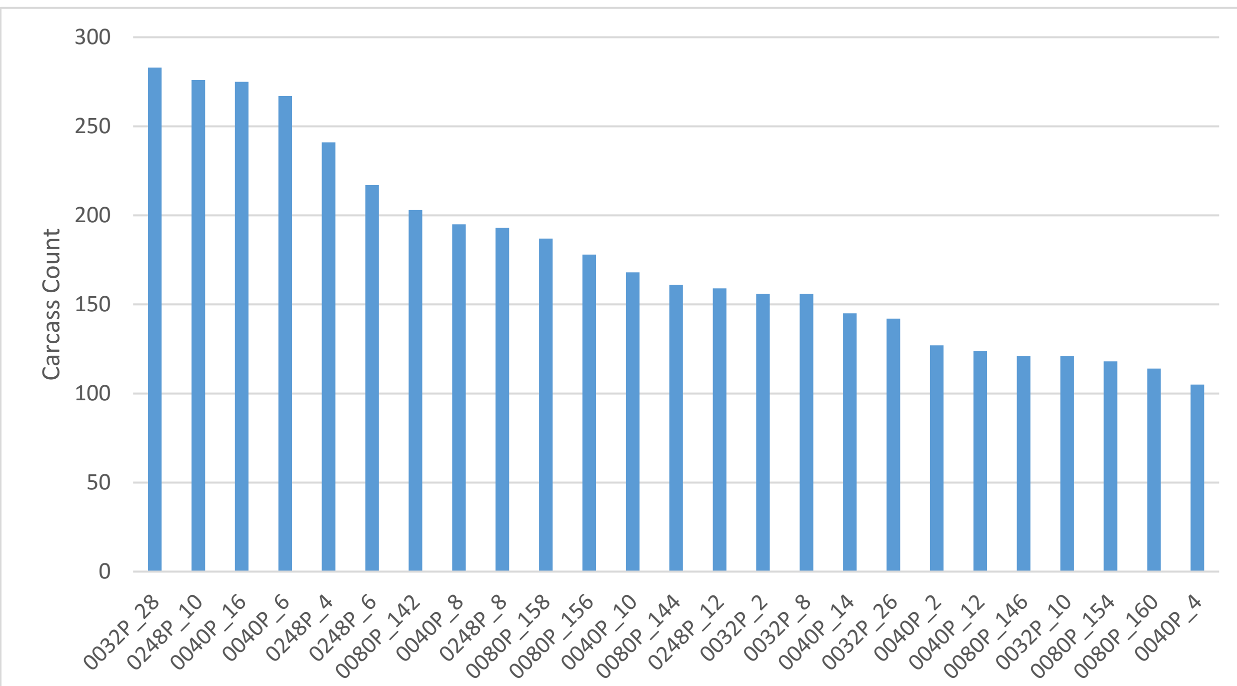


Figure 28. Regional carcass totals from 2010 to 2020 by 2-mile interval, top 25 locations.

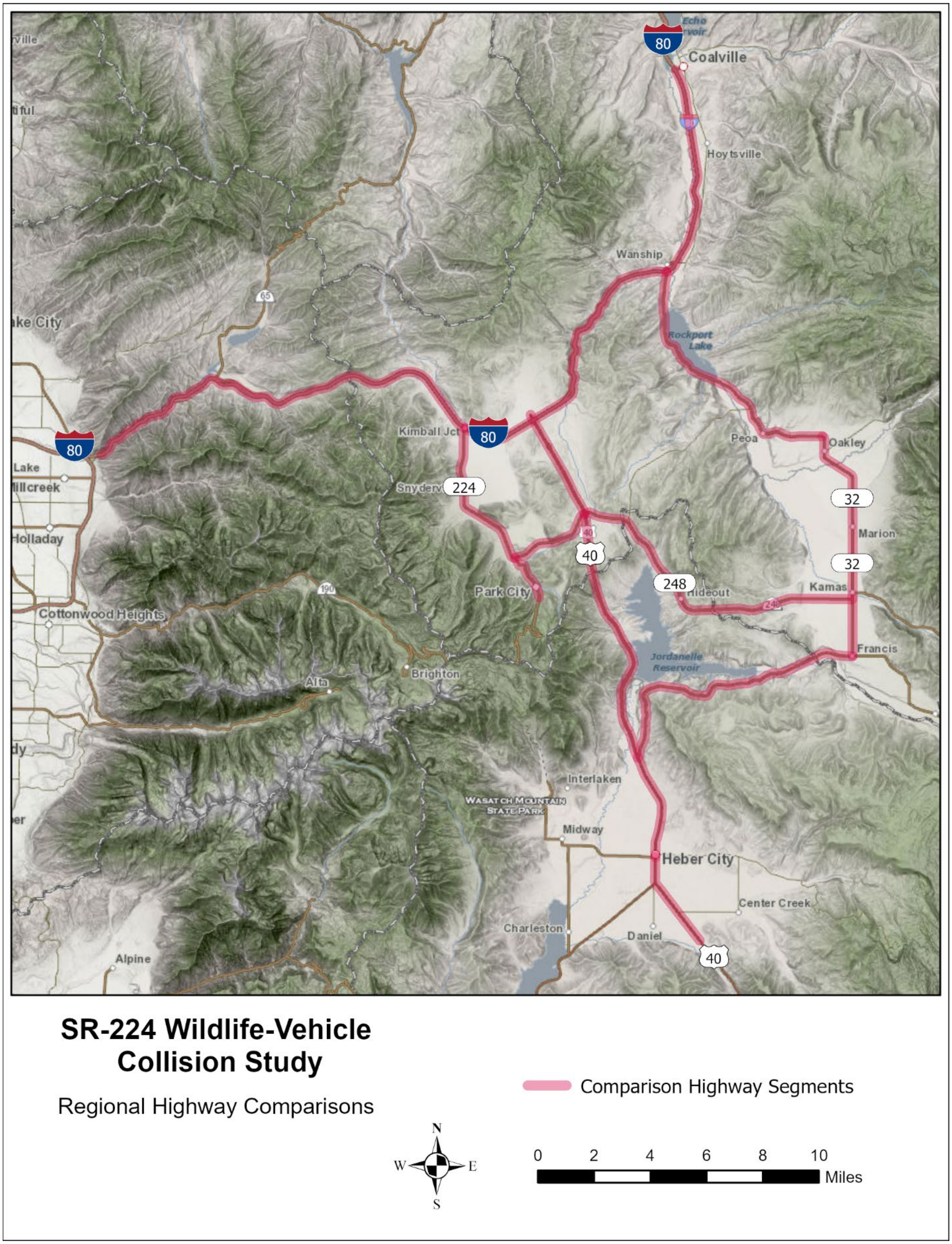


Figure 29. Regional highways used as comparisons to SR-224 for carcass and animal-related crashes.

Figure 30 shows the species composition of elk and moose carcasses across the region. While mule deer are killed in far greater numbers than moose and elk, big-game animals are ubiquitous throughout northern Utah. And due to their larger size, moose and elk are more important, both in terms of vehicle safety and their status as iconic game species. Two of the top 25 elk and moose carcass locations are located along SR-224.

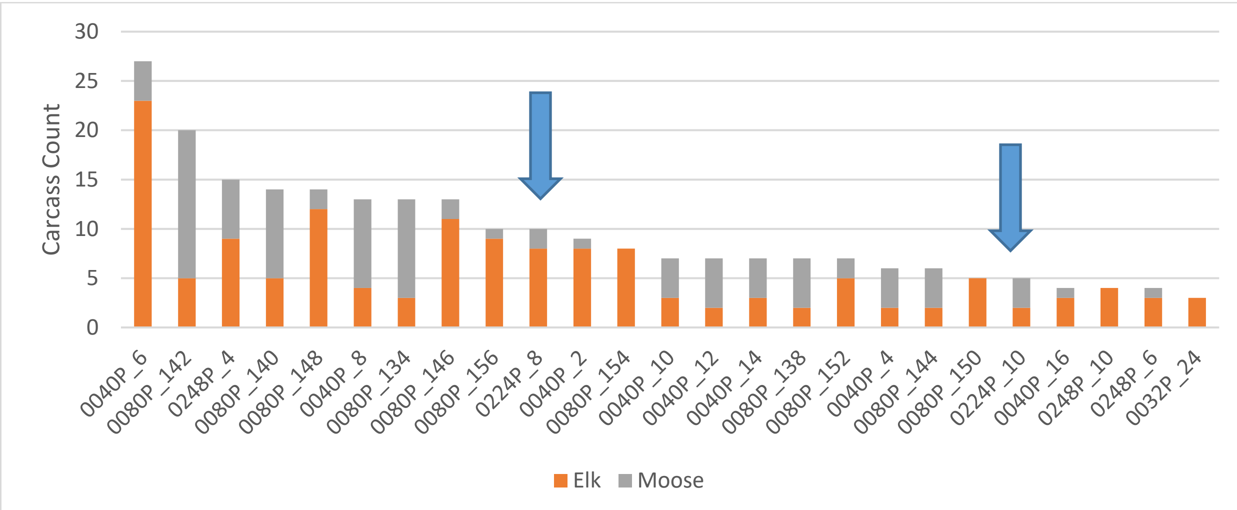


Figure 30. Regional moose and elk component of regional carcass count for 2-mile highway intervals.

The relationship between highway traffic volumes and carcass counts was explored for regional highways. Historical values for AADT (2010 – 2019) were averaged for each 2-mile highway segment to calculate the mean annual traffic volume for the ten-year period. The annual average AADT values were used to divide carcass counts for each segment. Resulting values were then multiplied by 10,000 in order allow comparison across all segments of the annual rate of carcass collections for every 10,000 daily vehicles. Figure 31 shows regional 2-mile highway segment carcass collection rates per 10,000 AADT. This analysis shows SR-32 has nine of the top 10 segments with annual carcass collection rates above 25 per 10,000 daily vehicles. In comparison, SR-224 (not show on graph) ranks 45, 50, and 56 out of 56 segments in the region with carcass collection rates below 2.6 carcasses per 10,000 daily vehicles.

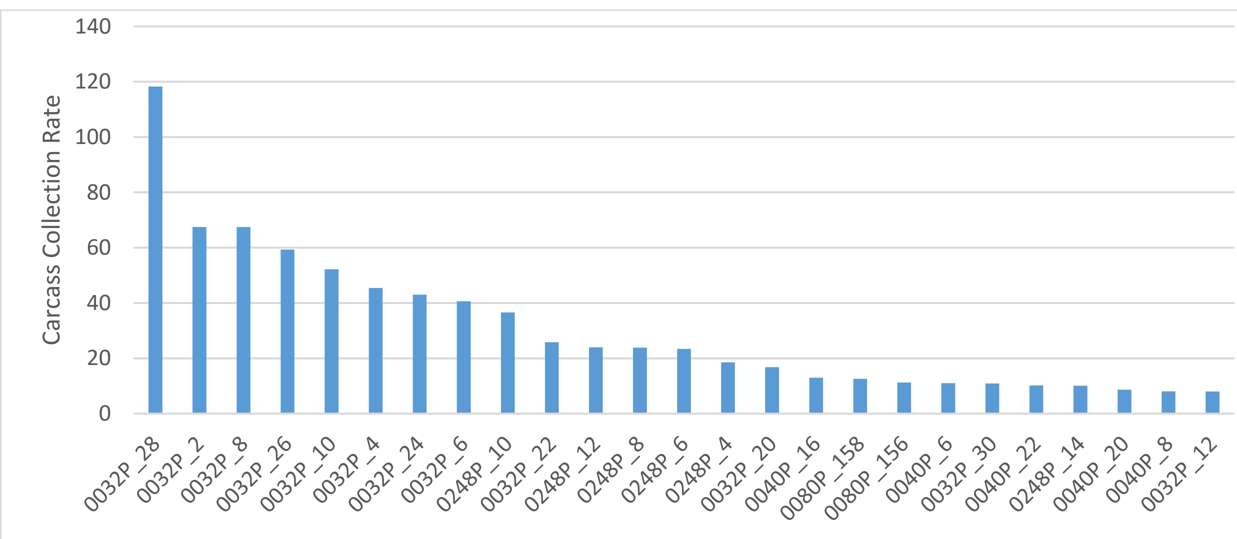


Figure 31. Regional carcass collection rates per 10,000 daily vehicles for 2-mile highway intervals.

Figure 32 shows the 25 highway segments where the most animal-related crashes occur across all species. In terms of reported vehicle collisions, SR-224 from MP 8 to 10 and SR-248 from MP 10 to 12 have the highest number of incidents: 111 and 109, respectively. Two of the highest ten locations in the region and three of the top 25 locations occur along SR-224.

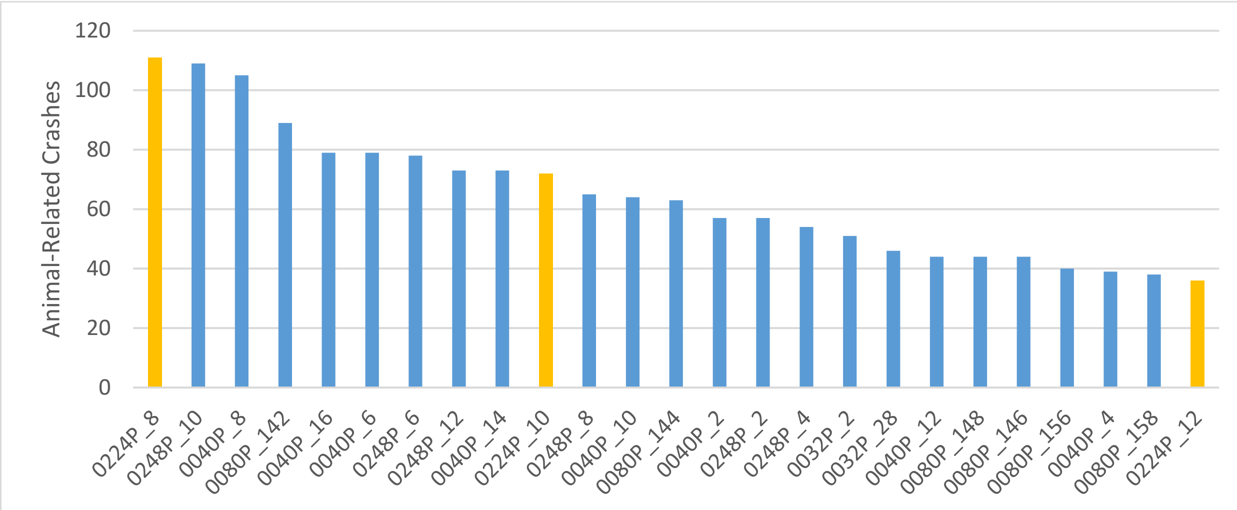


Figure 32. Regional animal-related crashes by 2-mile interval, top 25 locations.

The relationship between highway traffic volumes and animal-related crashes was explored for regional highways using the same method as carcass-traffic rates. The annual average AADT values were used to divide animal-related crashes for each segment. Resulting values were then multiplied by 10,000 in order allow comparison across all segments of the annual rate of animal-related crashes for every 10,000 daily vehicles. Figure 33 shows regional 2-mile highway segment animal-related crash rates per 10,000 AADT. This analysis shows SR-32 has six of the top 10 segments with annual carcass collection rates above 11 per 10,000 daily vehicles. In comparison, SR-224 MP 8-10 ranks 19th with animal-related crash rates below 3 per 10,000 daily vehicles.

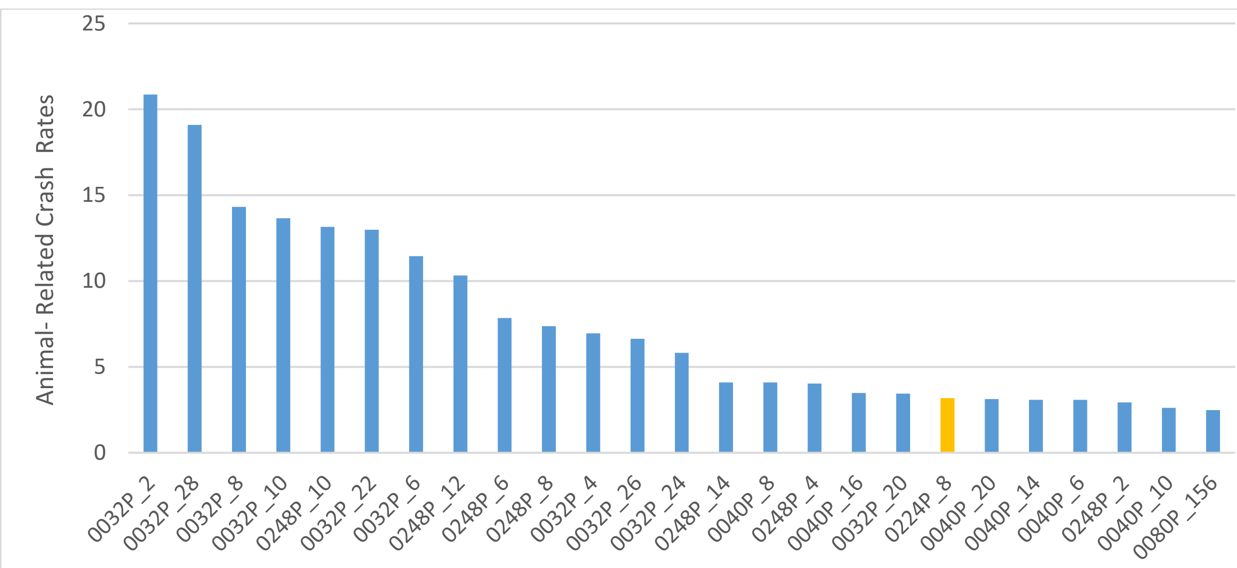


Figure 33. Regional animal-related crash rates per 10,000 daily vehicles for 2-mile intervals.

REFERENCES

Alaska Department of Transportation and Public Facilities (ADOT and PF). 2010. Environmental Assessment: Park's Highway MP 44-52.3 Lucas Road to Big Lake Road Matanuska-Sustina Borough Alaska. Anchorage: ADOT.

Bissonette, J. A., C. A. Kassar, L. J. Cook. 2008. Assessment of costs associated with deer-vehicle collisions: human death and injury, vehicle damage, and deer loss. Human-Wildlife Conflicts 2(1):17-27, Spring 2008.

Clevenger, A.P. and M.P. Huijser. 2011. Wildlife Crossing Structure Handbook: Design and Evaluation in North America. Lakewood CO: Federal Highway Administration, Publication No. FHWA-CFL/TD-11-003, March. https://westerntransportationinstitute.org/wp-content/uploads/2016/08/425259_Final_Report_Updated.pdf.

Cramer, P. 2010. Comprehensive Mitigation for Wildlife. Breakout session presented at the 2010 UDOT Engineering Conference: Transportation Energizes Utah. 11/18/2010. Sandy.

Cramer P. 2011. Determining wildlife use of crossing structures under different scenarios: 2010 annual report executive summary. Unpublished report, Department of Wildlife Resources and Utah Transportation Center, Utah State University. Logan (UT).

Cramer, P., E. Vasquez, A. Jones. 2019. Identification of Wildlife-Vehicle Conflict Hotspots in Utah. Prepared for the Utah Department of Transportation, Research & Innovation Division, Report No. UT-19.27.

Huijser M. P., J. Fuller, M. E. Wagner, A. Hardy, A. P. Clevenger. 2007. Animal-vehicle collision data collection: a synthesis of highway practice. National Cooperative Highway Research Program Synthesis 370. Transportation Research Board, Washington D.C. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_370.pdf

Huijser M. P., P. McGowen, A. P. Clevenger, R. Ament. 2008. Wildlife-vehicle Collision Reduction Study: Best Practices Manual. Western Transportation Institute. Montana State University. Bozeman. http://www.fhwa.dot.gov/environment/hconnect/wvc/wvc.pdf.

Huijser, M. P., J. W. Duffield, A. P. Clevenger, R. J. Ament, and P. T. McGowen. 2009. Cost–benefit analyses of mitigation measures aimed at reducing collisions with large ungulates in the United States and Canada; a decision support tool. Ecology and Society 14(2): 15. [online] URL: http://www.ecologyandsociety.org/vol14/iss2/art15/

Huijser, M. P., E. R. Fairbank, W. Camel-Means, J. Graham, V. Watson, P. Basting, and D. Becker. 2016. Effectiveness of Short Sections of Wildlife Fencing and Crossing Structures Along Highways In Reducing Wildlife–Vehicle Collisions and Providing Safe Crossing Opportunities for Large Mammals. Biological Conservation 197:61–68.

Huijser, M.P., E. R. Fairbanks, and F. D. Abra. 2017. The Reliability and Effectiveness of a Radar-Based Animal Detection System. Idaho Transportation Department Research Program.

Natural Resource Conservation Service (NRCS), 2021. National Water and Climate Center Report Generator 2.0, U.S. Department of Agriculture, Natural Resource Conservation Service. Website: https://wcc.sc.egov.usda.gov/reportGenerator/ accesses September 20, 2021.

Summit County. 2015. Snyderville Basin General plan. https://ut-summitcounty2.civicplus.com/DocumentCenter/View/481/General-Plan-PDF?bidId=

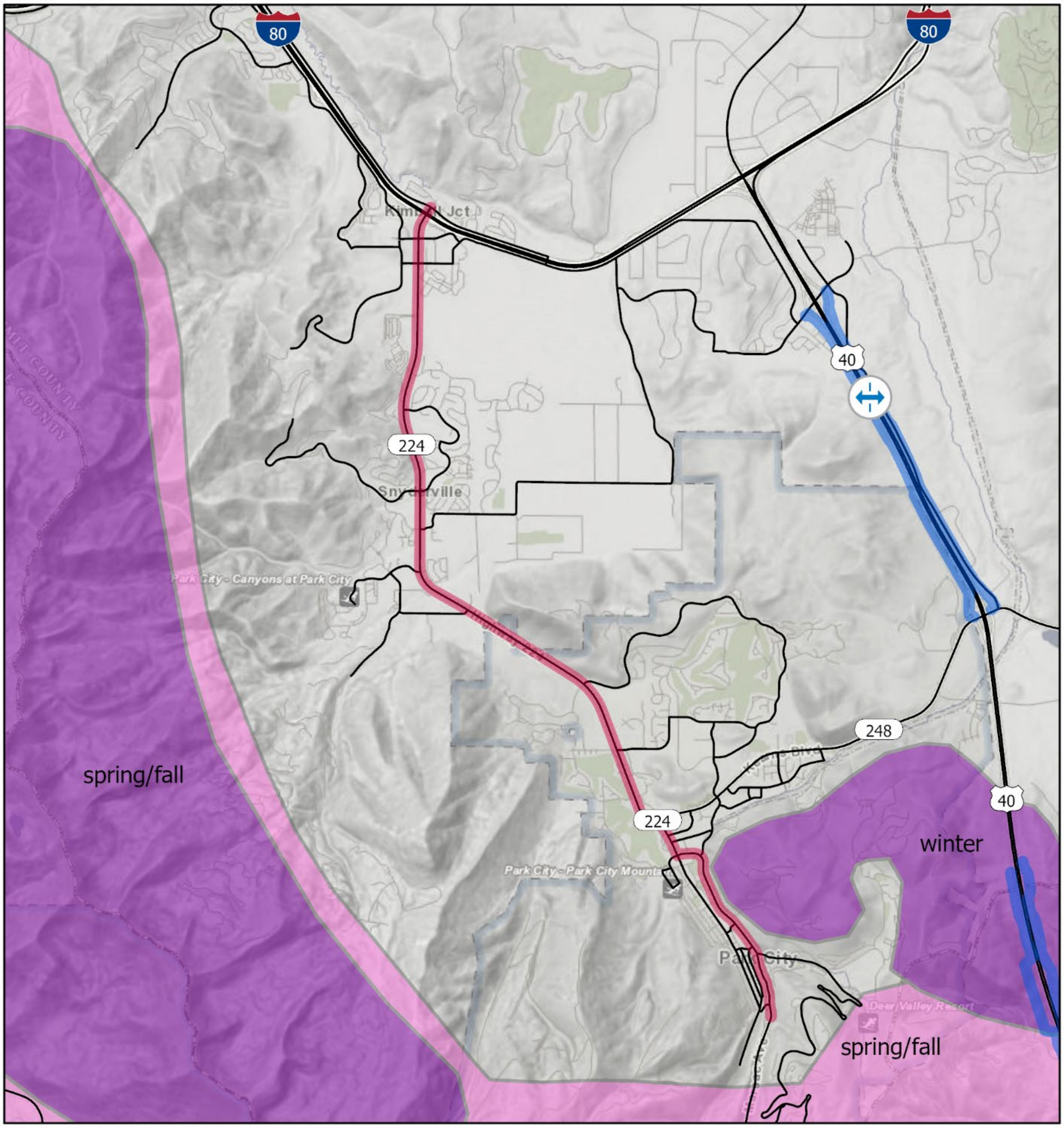
U.S. Bureau of Labor Statistics (USBLS). 2021. Consumer Price Index Inflation Calculator. Washington, DC Webpage. Accessed August 12, 2021. https://www.bls.gov/data/inflation_calculator.htm

Utah Department of Transportation (UDOT). 2010. Statewide Average Bid Price Calculation for 2010. Salt Lake City UT. Accessed: February 15, 2011

Utah Department of Transportation (UDOT). 2021. AASHTOWare Safety Historic Crash Database. Salt Lake City UT. Webpage. Accessed: April 04, 2021. https://udot.aashtowaresafety.com/

Utah Division of Wildlife Resources (UDWR). 2021. Utah Wildlife-Vehicle Collision Data Collector. Salt Lake City UT. Webpage. Accessed: April 04, 2021. https://mapserv.utah.gov/wvc/desktop/

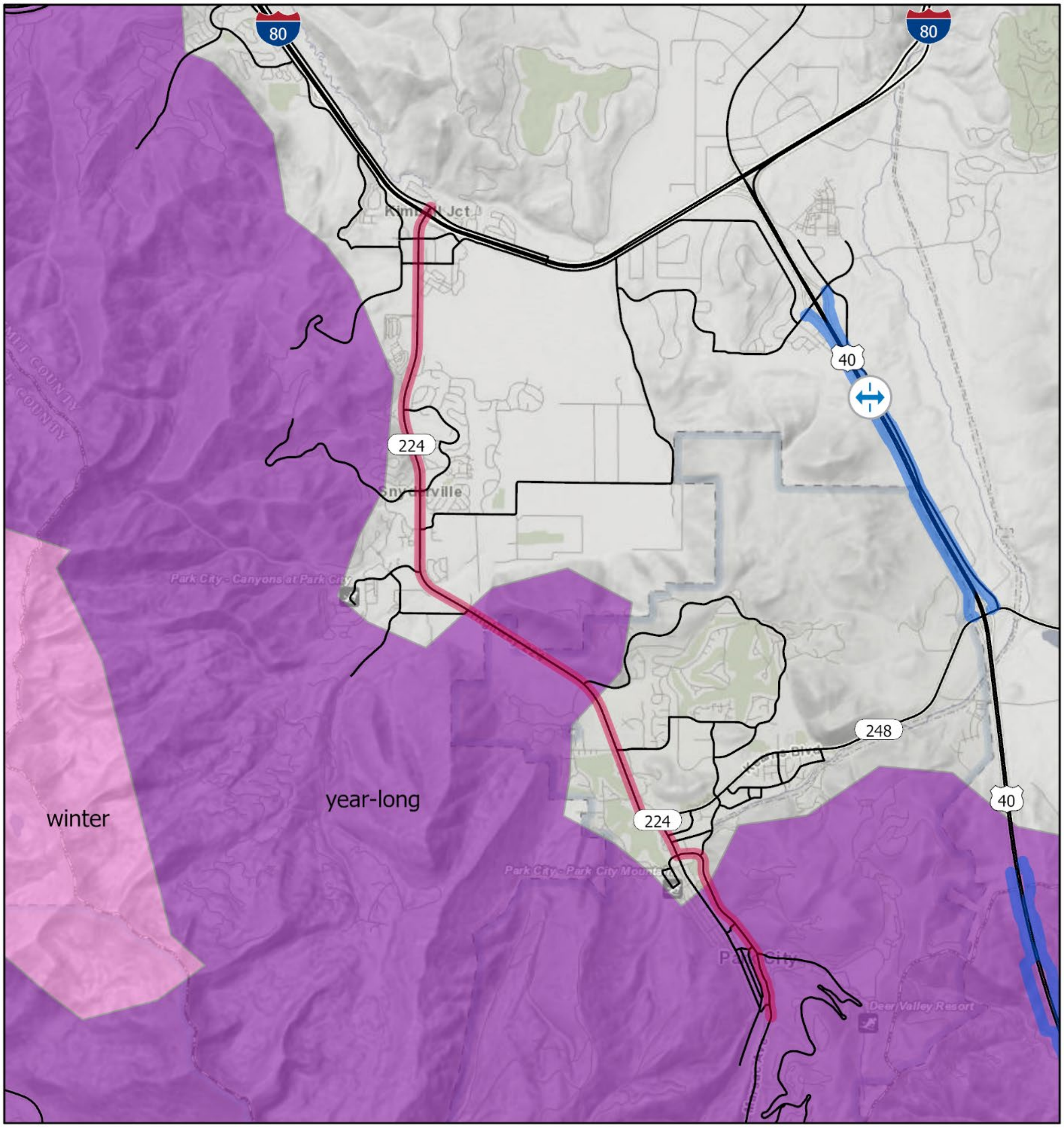
APPENDIX A - Wildlife Habitat Maps



SR-224 Wildlife-Vehicle Collision Study

DWR Elk Habitat

Spatial Data Source
Utah Division of Wildlife Resources, Elk Habitat, 2020



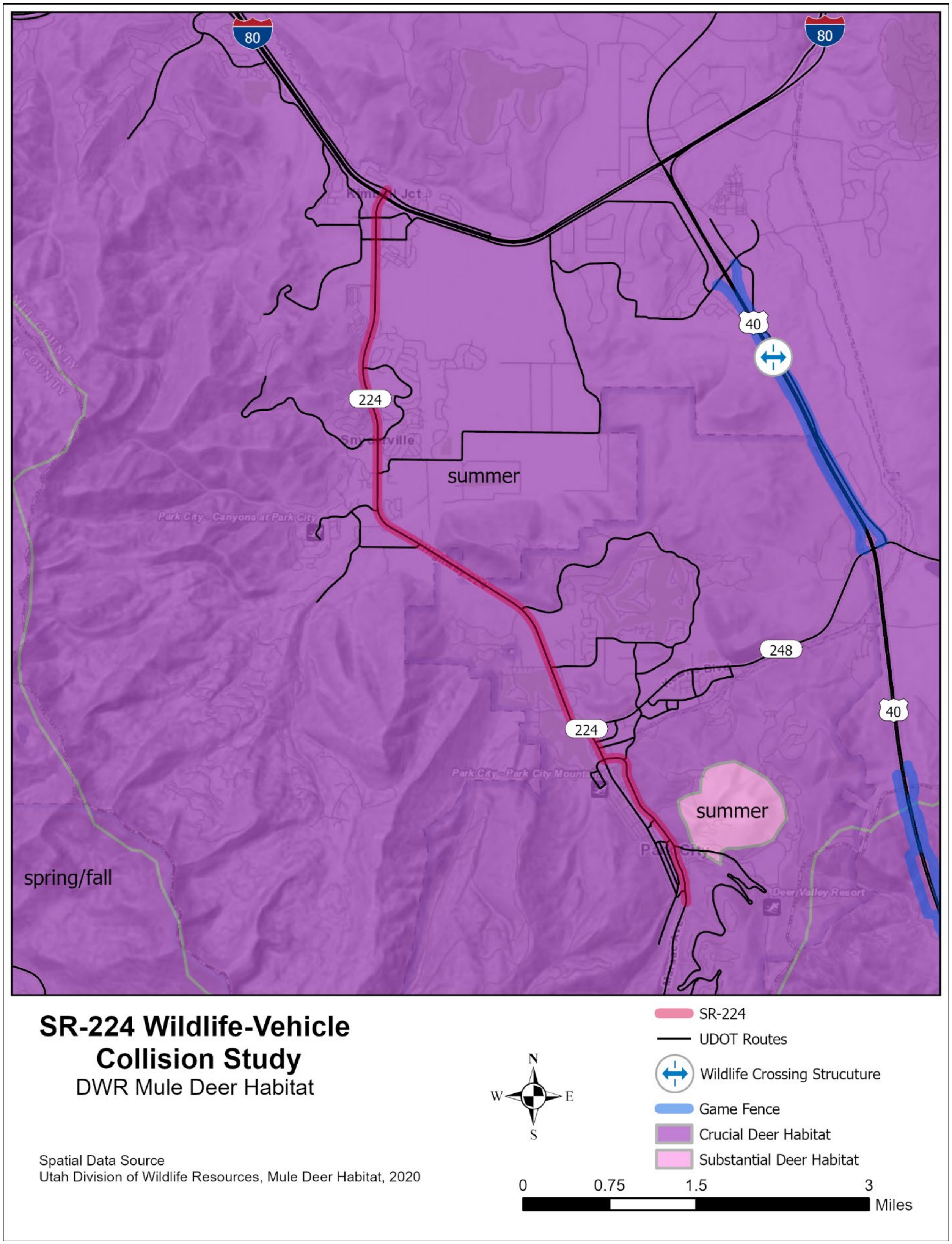
SR-224 Wildlife-Vehicle Collision Study

DWR Moose Habitat

Spatial Data Source
Utah Division of Wildlife Resources, Moose Habitat, 2021

SR-224
UDOT Routes
Wildlife Crossing Strucuture
Game Fence
Crucial Moose Habitat
Substantial Moose Habitat

0 0.5 1 2 3 Miles


80
80
40
224
summer
Park City - Canyons at Park City
248
224
40
summer
Deer Valley Resort
spring/fall
SR-224 Wildlife-Vehicle Collision Study
DWR Mule Deer Habitat
Spatial Data Source
Utah Division of Wildlife Resources, Mule Deer Habitat, 2020
N
W
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SR-224
UDOT Routes
Wildlife Crossing Strucuture
Game Fence
Crucial Deer Habitat
Substantial Deer Habitat
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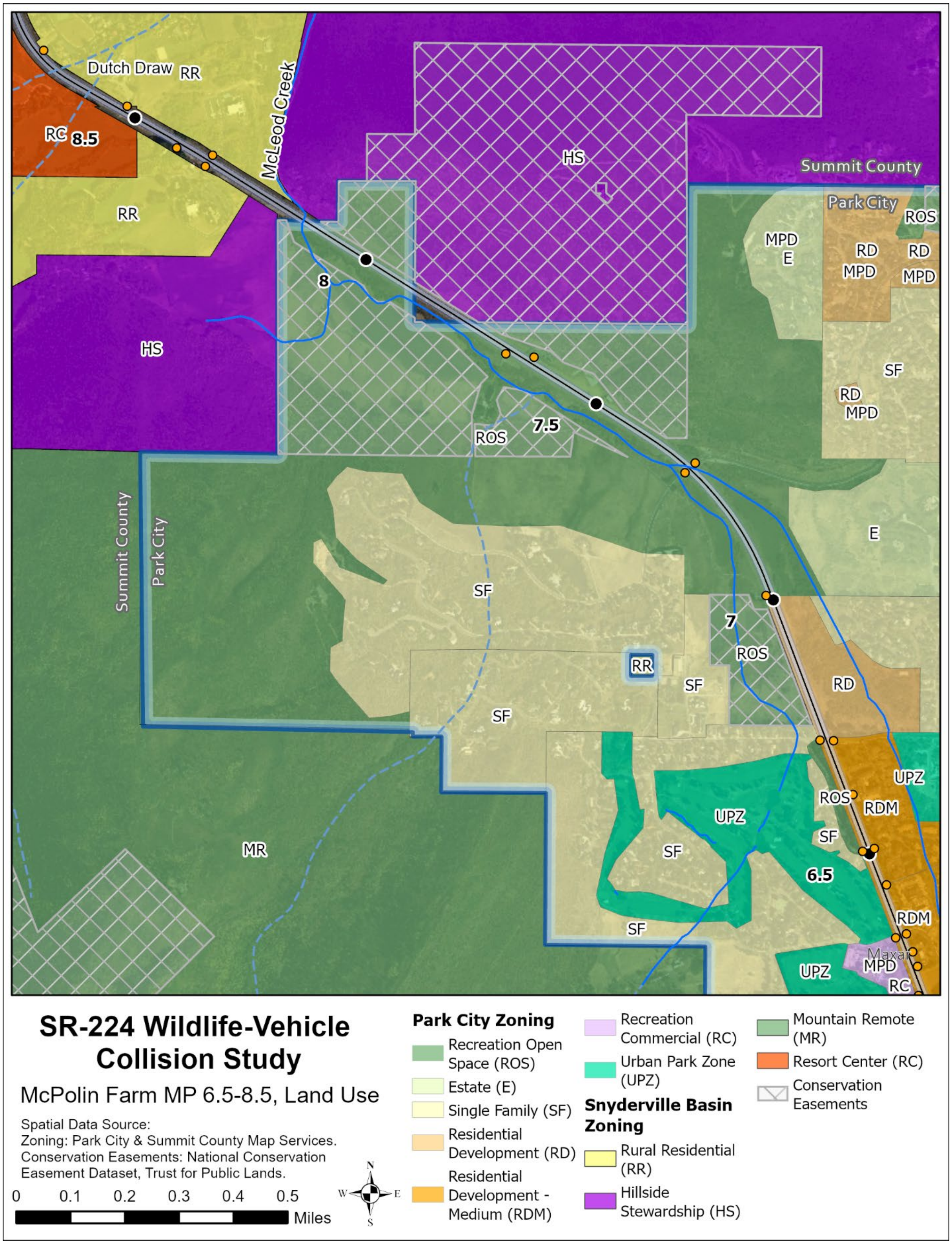
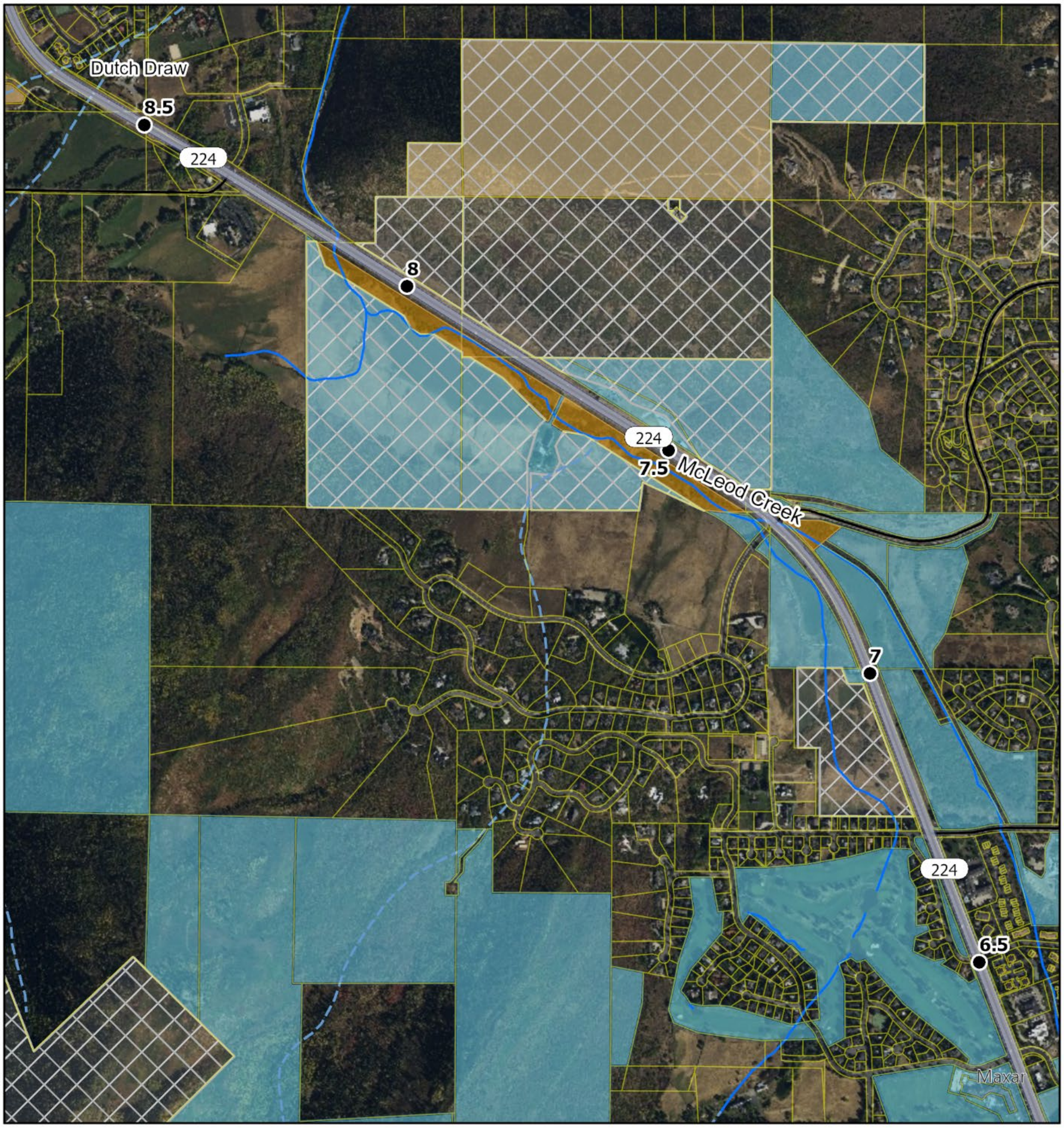
0.75
1.5
3
Miles

APPENDIX B – Land Use & Land Ownership Maps


Dutch Draw
RR
McLeod Creek
RC
8.5
HS
Summit County
Park City
ROS
MPD
E
RD
MPD
RD
MPD
RR
8
SF
RD
MPD
7.5
ROS
E
Summit County
Park City
SF
7
ROS
RR
SF
RD
SF
UPZ
ROS
RDM
UPZ
SF
MR
SF
6.5
RDM
SF
UPZ
MPD
RC
SR-224 Wildlife-Vehicle Collision Study
McPolin Farm MP 6.5-8.5, Land Use
Spatial Data Source:
Zoning: Park City & Summit County Map Services.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.
0
0.1
0.2
0.3
0.4
0.5
Miles
N
W
E
S
Park City Zoning
Recreation Open Space (ROS)
Estate (E)
Single Family (SF)
Residential Development (RD)
Residential Development - Medium (RDM)
Recreation Commercial (RC)
Urban Park Zone (UPZ)
Snyderville Basin Zoning
Rural Residential (RR)
Hillside Stewardship (HS)
Mountain Remote (MR)
Resort Center (RC)
Conservation Easements



SR-224 Wildlife-Vehicle Collision Study

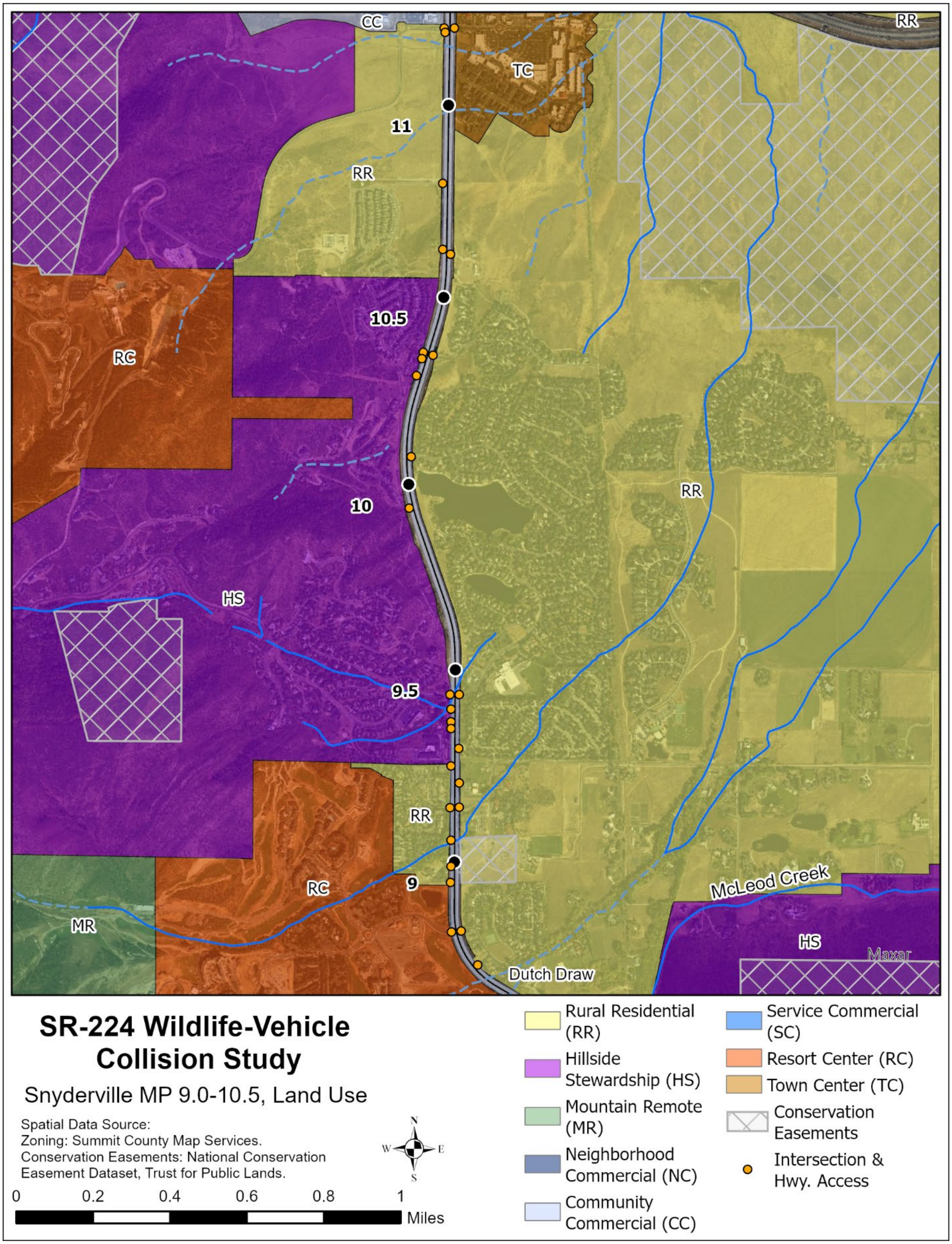
McPolin Farm MP 6.5-8.5, Ownership

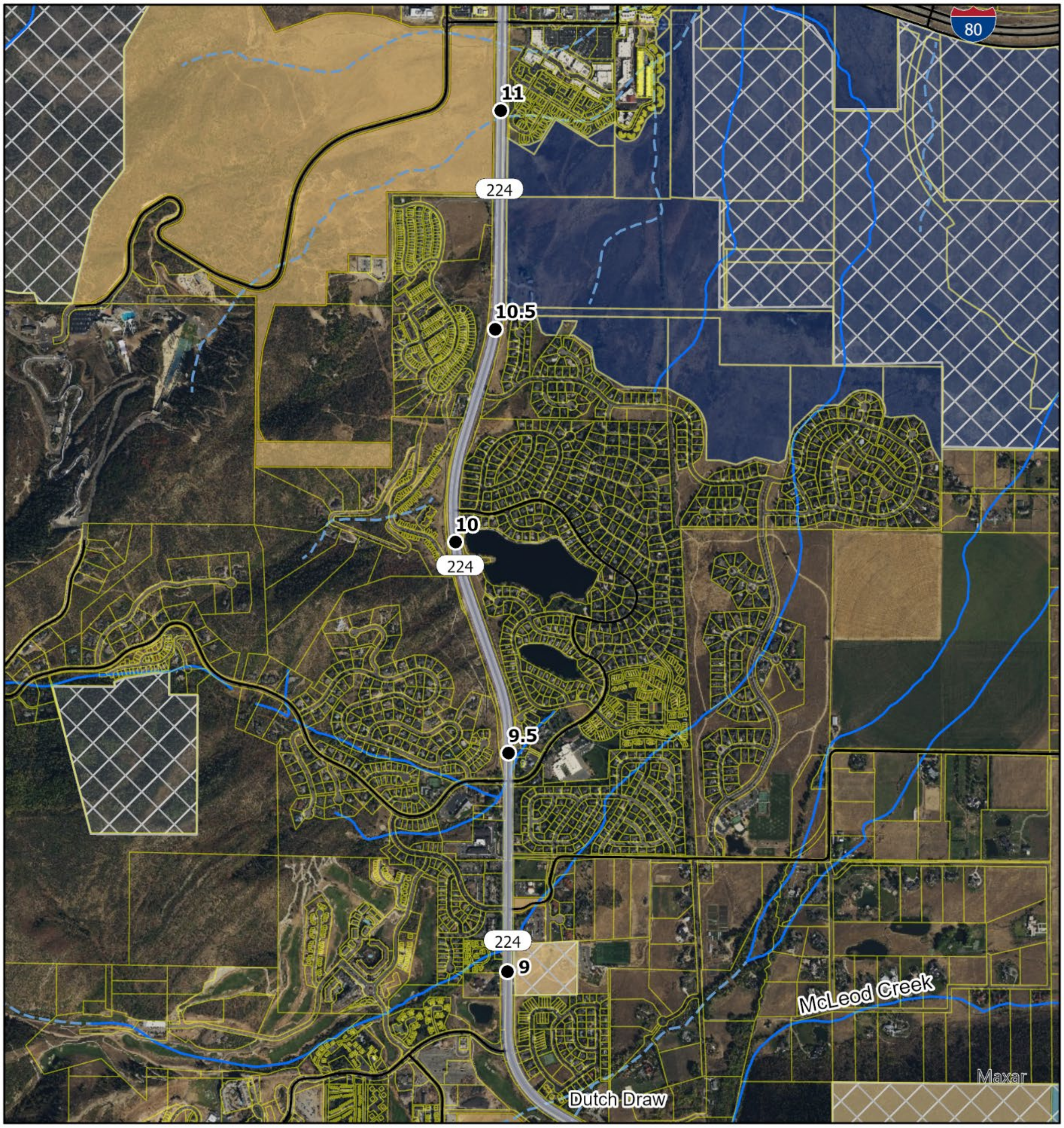
Spatial Data Source:
Ownership: Summit County Parcel Viewer Application.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.

State and Municipal Ownership

- State of Utah DNR
- Utah State University
- Summit County
- Park City Municipal Corporation
- Conservation Easements

0 0.1 0.2 0.3 0.4 0.5 Miles


CC
RR
TC
11
RR
10.5
RC
10
HS
9.5
RR
RC
9
MR
RR
McLeod Creek
HS
Maxar
Dutch Draw
SR-224 Wildlife-Vehicle Collision Study
Snyderville MP 9.0-10.5, Land Use
Spatial Data Source:
Zoning: Summit County Map Services.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.
N
W
E
S
0
0.2
0.4
0.6
0.8
1
Miles
Rural Residential (RR)
Hillside Stewardship (HS)
Mountain Remote (MR)
Neighborhood Commercial (NC)
Community Commercial (CC)
Service Commercial (SC)
Resort Center (RC)
Town Center (TC)
Conservation Easements
Intersection & Hwy. Access



SR-224 Wildlife-Vehicle Collision Study

Snyderville MP 9.0-10.5, Ownership

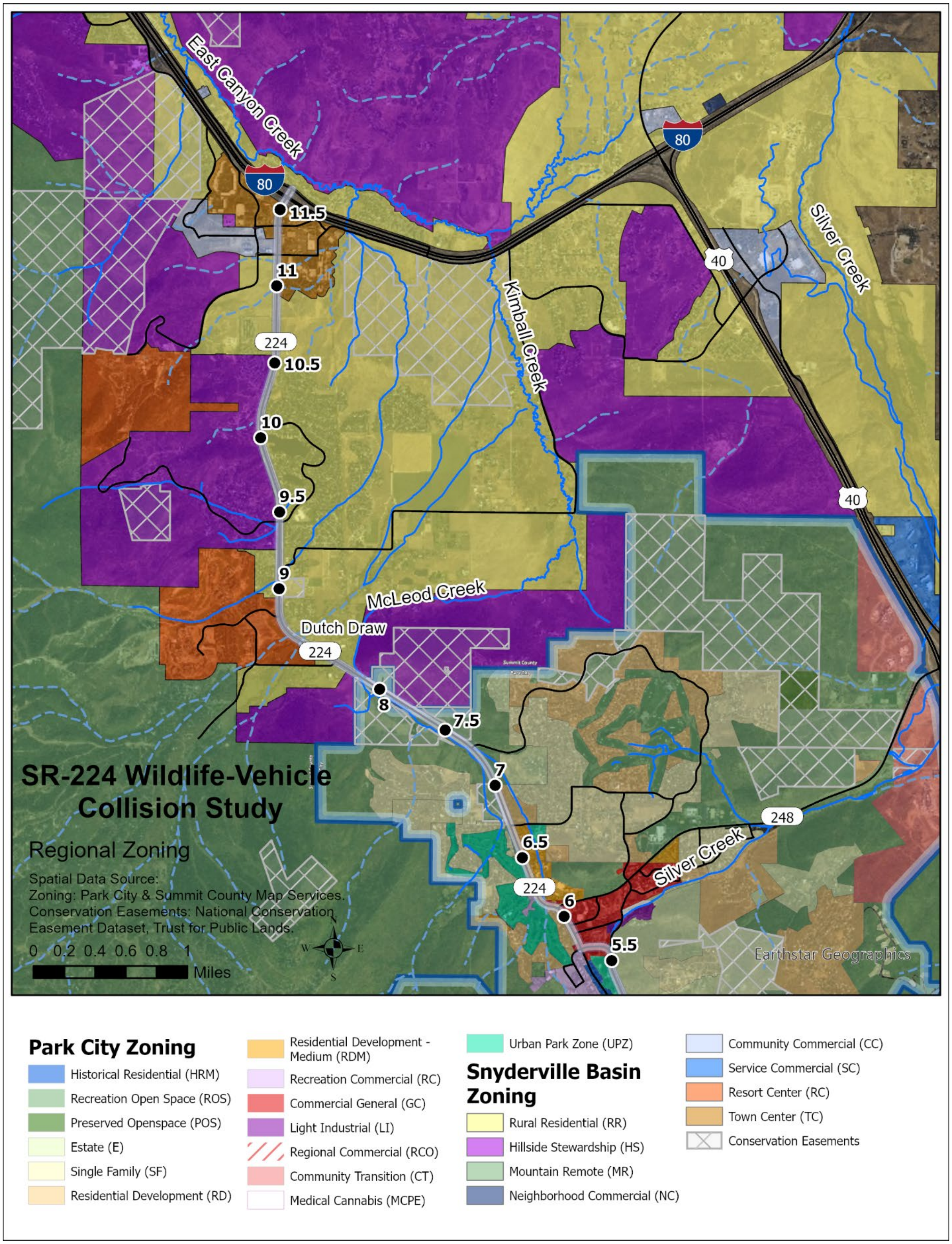
Spatial Data Source:
Ownership: Summit County Parcel Viewer Application.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.

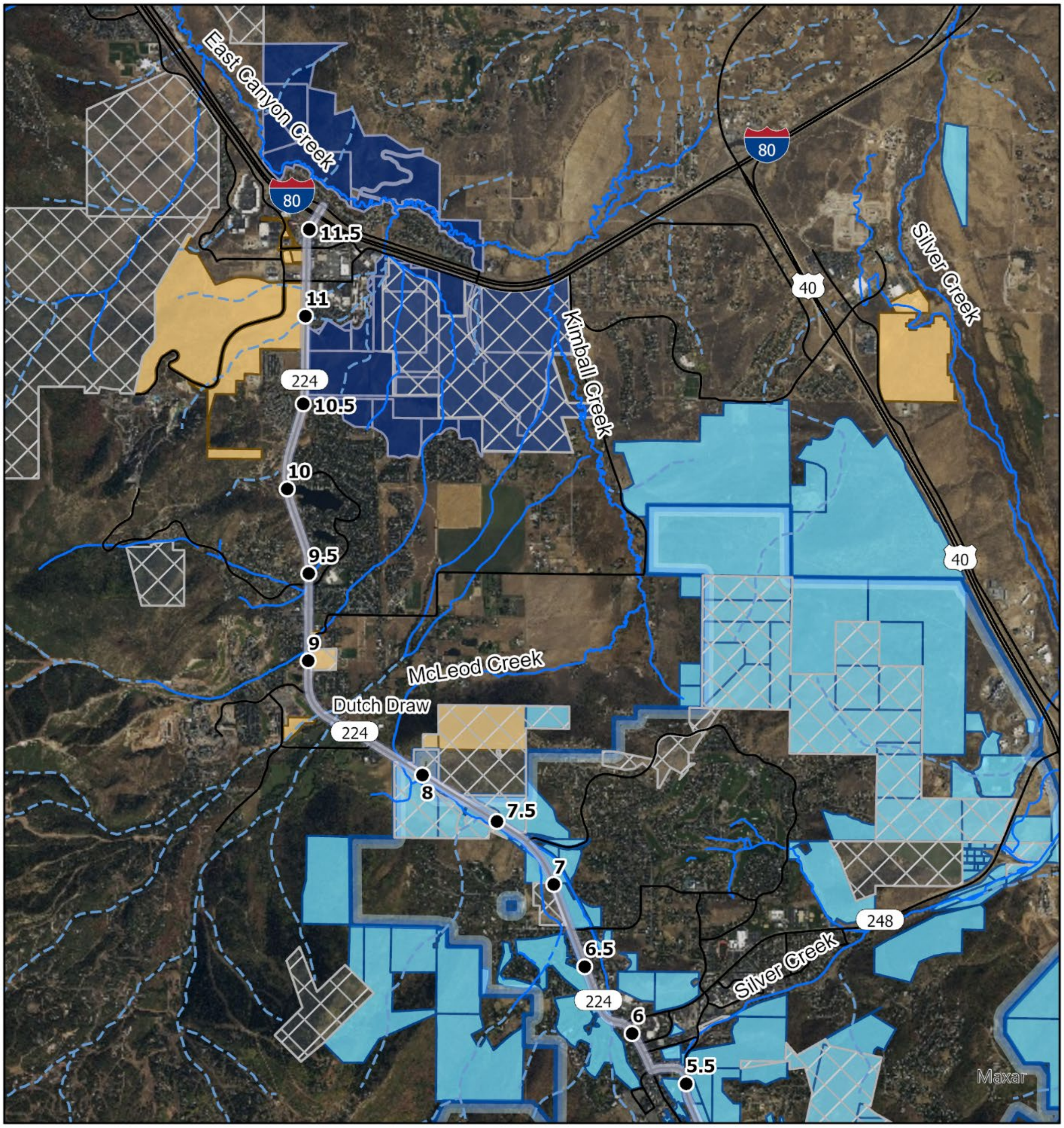
State and Municipal Ownership

- State of Utah DNR
- Utah State University
- Summit County
- Park City Municipal Corporation
- Conservation Easements

N W E S

0 0.2 0.4 0.6 0.8 1 Miles


SR-224 Wildlife-Vehicle Collision Study
Regional Zoning
Spatial Data Source:
Zoning: Park City & Summit County Map Services.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.
0 0.2 0.4 0.6 0.8 1
Miles
N
S
E
W
East Canyon Creek
Kimball Creek
Silver Creek
McLeod Creek
Dutch Draw
80
40
224
248
11.5
11
10.5
10
9.5
9
8
7.5
7
6.5
6
5.5
Earthstar Geographics
Park City Zoning
Historical Residential (HRM)
Recreation Open Space (ROS)
Preserved Openspace (POS)
Estate (E)
Single Family (SF)
Residential Development (RD)
Residential Development - Medium (RDM)
Recreation Commercial (RC)
Commercial General (GC)
Light Industrial (LI)
Regional Commercial (RCO)
Community Transition (CT)
Medical Cannabis (MCPE)
Urban Park Zone (UPZ)
Snyderville Basin Zoning
Rural Residential (RR)
Hillside Stewardship (HS)
Mountain Remote (MR)
Neighborhood Commercial (NC)
Community Commercial (CC)
Service Commercial (SC)
Resort Center (RC)
Town Center (TC)
Conservation Easements



SR-224 Wildlife-Vehicle Collision Study

Regional Land Ownership

Spatial Data Source:
Ownership: Summit County Parcel Viewer Application.
Conservation Easements: National Conservation Easement Dataset, Trust for Public Lands.

State and Municipal Ownership
- Summit County
- Utah State University
- Park City Municipal Corporation
- Conservation Easements

N S E W

0 0.5 1 1.5 2 Miles