

# RAC Preproposal

## Analysis of Interstate 80 as a barrier to migrating ungulates and identification of locations for potential crossing structures

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September 18, 2017

## **Problem Statement**

Wyoming's ungulates play a key role in Wyoming's economy and culture. Whether through tourists observing wildlife, hunters pursuing big game, or revenues generated through the sale of licenses, ungulates are an important part of Wyoming's economy. Mule deer, pronghorn, elk, and other ungulates rely on their ability to migrate and move across Wyoming's landscapes to obtain the food, shelter, and cover needed to survive in the highly seasonal habitats of Wyoming. Roadways are among the primary obstacles that impede ungulate migrations and also kill thousands of animals each year.

Interstate 80 (I-80) is of particular concern because it bisects important big game habitat along its entire 300- mile length. Agencies have known since the interstate was first constructed that it posed an impediment for ungulate crossings including, pronghorn, mule deer, and elk. In fact, right-of-way fences along the interstate were intentionally designed and built to eliminate pronghorn crossings and other sections of 8 foot "deer proof" fencing were built to eliminate the crossings of deer and elk in several areas.

Numerous GPS collar studies over the past two decades have shown that traffic volumes and associated human activity have effectively blocked most ungulate crossings of I-80. We note, that wildlife vehicle collisions remain problematic in several areas, causing wildlife mortalities and posing risks to Wyoming motorists. Specifically, along I-80 mule deer are the primary species affected and although undesirable from a wildlife and transportation perspective, this mortality is encouraging as it shows there remains some level of connectivity. As traffic volumes continue to increase and ungulate herds continue to decline, it will become more important to identify safe and effective ways for ungulates to cross I-80

Although there have been several GPS studies in recent decades to mark and monitor ungulates along the I-80 corridor there are still several regions where migration and movement data are unknown. In particular there are no studies in that portion of I-80 south and west of Green River. Additionally, there is a well know mule deer mortality hot spot along US Highway 189 and along the interstate in this area where baseline data is lacking.

This study will address these data gaps by placing GPS collars on pronghorn and mule deer along these portions of I-80. In addition, it will also comprehensively evaluate the potential for locating crossing structures to reestablish movements along the corridor.

This evaluation will identify and prioritize species affected, suitable structure types, and potential structure.

## Objectives

- 1.** Identify seasonal movements and migrations of pronghorn adjacent to I-80 in SW Wyoming.
- 2.** Identify seasonal movements, migrations, and distribution of mule deer in the areas west of Mountain View along the I-80 corridor and in the area of high road mortality along US Highway 189 north of its intersection with I-80.
- 3.** Evaluate the need for crossing structures and deer proof fencing along the I-80 corridor and prioritize potential locations of crossing structures based on a variety of biological and transportation metrics. Specifically, crossing structure locations will be evaluated using information on species abundance, herd economic value, topographic features, land ownership, grazing practices, and other relevant factors.

WYDOT's mission is to provide a safe, high quality, and efficient transportation system in Wyoming. WYDOT in order to help define its mission has established six goals. These goals are:

1. 1) Improve safety on the state transportation system
2. 2) Serve our customers
3. 3) Take care of all physical aspects of the state transportation system
4. 4) Improve agency efficiency and effectiveness
5. 5) Develop and care for our people
6. 6) Exercise good stewardship of our resources

We believe that our proposal will address goal number one by identifying and prioritizing crossing structures in locations that will facilitate movement across the interstate and therefore keep animals out of the roadway. Additionally the proposal allows WYDOT to exercise good stewardship of the wildlife resources that are affected by the current I-80 corridor addressing Goal 6. The I-80 corridor is currently negatively affecting movements and distributions of big game along its length and this may have long-term negative consequences to these effected populations. The proposed scope of work will identify which species and herds appear to be most affected by I-80 and will explore potential solutions to restore movement corridors and make recommendations for prioritization of these solutions. We believe our proposal also addresses goal 2, which is "Serve or Customers". We have seen great support for wildlife crossing structures where there is

demonstrated need because it provides a safer transportation corridor for people and wildlife. Wyoming's public strongly supports the maintenance of its big game populations and their long distance migrations and they are an important part of Wyoming's culture and history.

Lastly, we will be providing a prioritization for potential crossing structures and will provide better baseline data for pronghorn and mule deer allowing WYDOT to make more informed decisions and efficient use of available funds (Objective 4). We also believe information from this study will act as a catalyst for collaborative efforts to bring needed resources to make additional potential crossing structures a reality in Wyoming. In the long term these efforts will produce more healthy big game populations and a safer transportation corridor.

## Appendix A. Draft Proposal

### Analysis of Interstate 80 as a barrier to migrating ungulates and identification of locations for potential crossing structures

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## **Problem Statement**

Wyoming's ungulates play a key role in Wyoming's economy and culture. Whether through tourists observing wildlife, hunters pursuing big game, or revenues generated through the sale of licenses, ungulates are an important part of Wyoming's economy. Mule deer, pronghorn, elk, and other ungulates rely on their ability to migrate and move across Wyoming's landscapes to obtain the food, shelter, and cover needed to survive in the highly seasonal habitats of Wyoming. Roadways are among the primary obstacles that impede ungulate migrations and also kill thousands of animals each year.

Interstate 80 (I-80) is of particular concern because it bisects important big game habitat along its entire 300- mile length (Figure 1 & 2.) Agencies have known since the interstate was first constructed that it posed an impediment for ungulate crossings including, pronghorn, mule deer, and elk. In fact, right-of-way fences along the interstate were intentionally designed and built to eliminate pronghorn crossings and other sections of 8 foot "deer proof" fencing were built to eliminate the crossings of deer and elk in several areas. Existing GPS movement data in figure 1 indicate the interstate is largely a barrier to ungulate movement. The one mule deer crossing in this map used a machinery underpass near Walcott Junction.

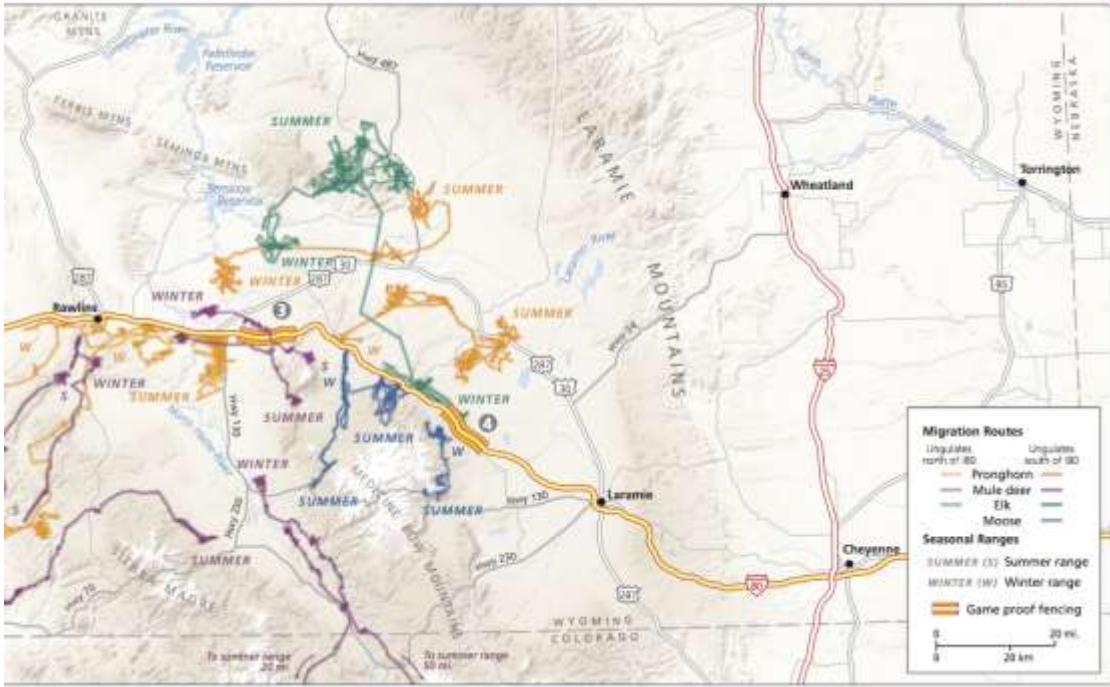


Figure 1. Eastern half of I-80 with selected GPS ungulate migrations.

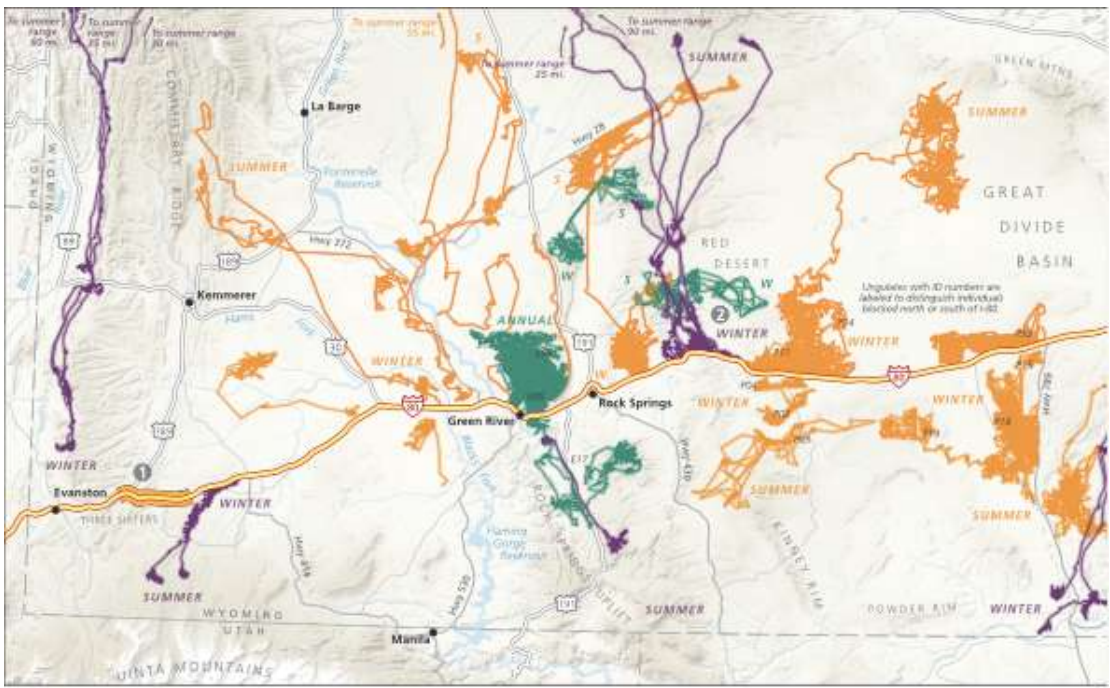


Figure 2. Western half of I-80 with selected GPS ungulate migrations.

Existing GPS movement data indicate the interstate is largely a barrier to ungulate movement. None of these individuals crosses the interstate.

Numerous GPS collar studies over the past two decades have shown that traffic volumes and associated human activity have effectively blocked most ungulate crossings of I-80. Indeed, wildlife vehicle collisions remain problematic in several areas, causing wildlife mortalities and posing risks to Wyoming motorists (Figure 3). Specifically, along I-80 mule deer are the primary species affected (Figure 4). Although undesirable from a wildlife and transportation perspective, this mortality is encouraging because it shows there remains some level of connectivity potential across I-80. As traffic volumes continue to increase and ungulate herds continue to decline, it will become more important to identify safe and effective ways for ungulates to cross I-80.

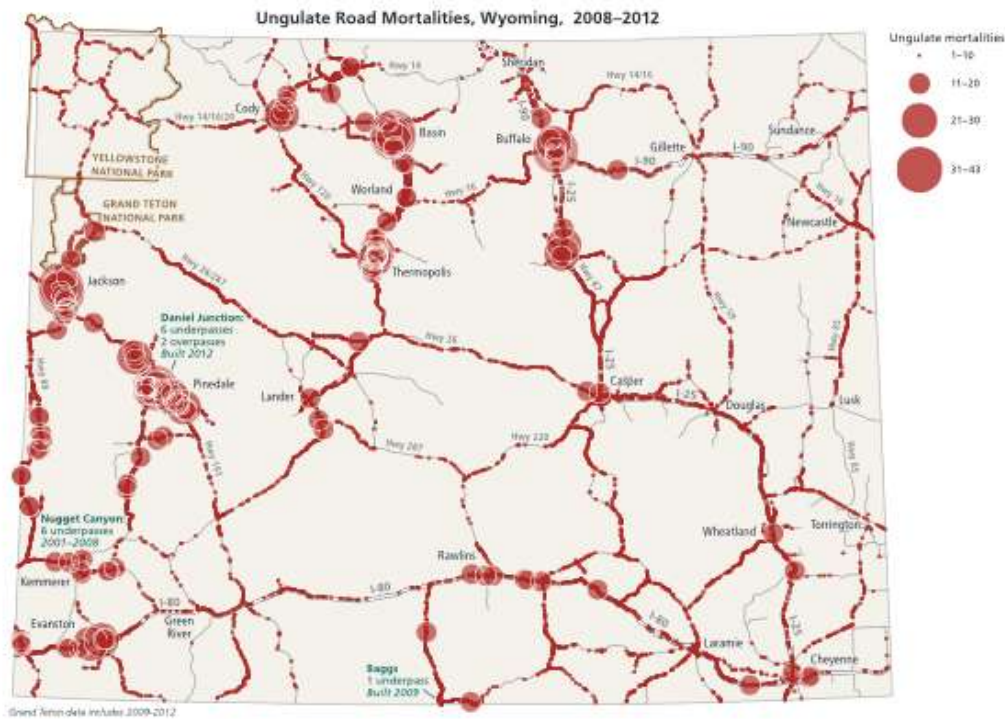


Figure 3. Vehicle related ungulate mortalities in Wyoming 2008-2012 reveal several hotspots of road mortality. Data provided by WYDOT (Riginos 2015)



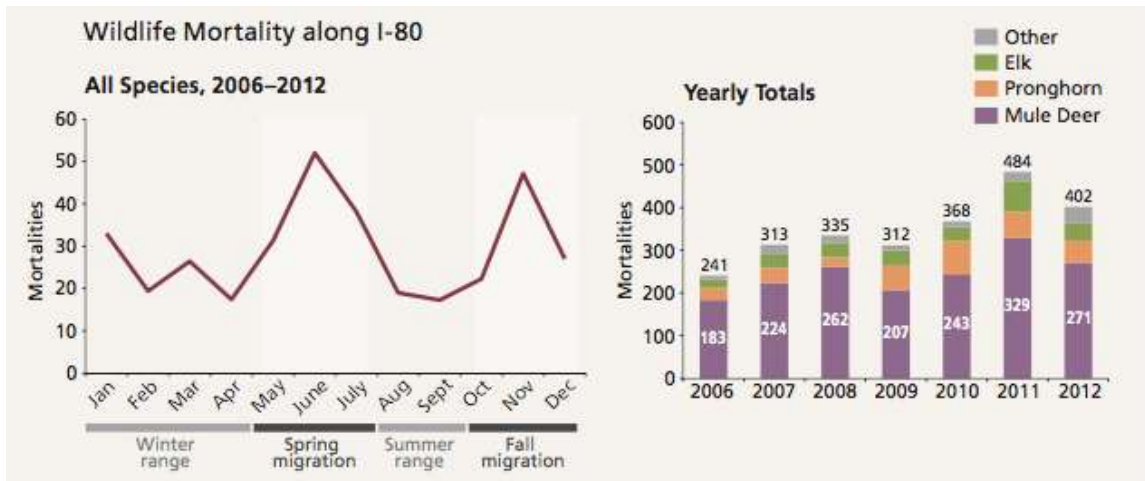


Figure 4. Number of ungulates killed and reported along I-80 between 2006 and 2102 Mortalities peak during spring and fall migrations.

Although there have been several GPS studies in recent decades to mark and monitor ungulates along the I-80 corridor there are still several regions where migration and movement data are lacking. In particular there are no studies in the portion of I-80 south and west of Green River (Figure 5). Additionally, there is a well known mule deer mortality hot spot along US Highway 189 and along the interstate in this area (Figure 3).

This study will address these data gaps by placing GPS collars on pronghorn and mule deer along these portions of I-80. In addition, it will comprehensively evaluate the potential for locating crossing structures to reestablish movements across along the corridor. This evaluation will identify and prioritize species affected, suitable structure types, and potential structure locations.

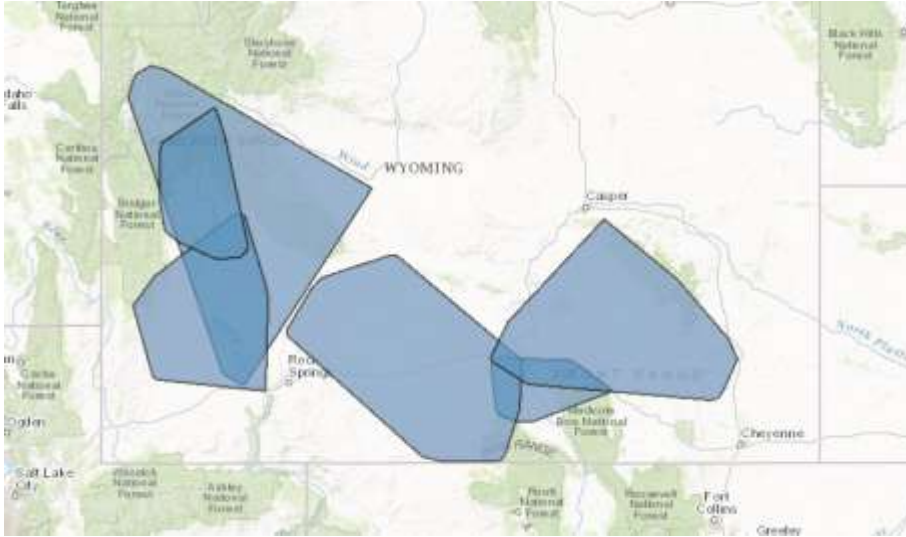


Figure 5. Geographic Extent of Pronghorn GPS Studies along the I-80 Corridor in Wyoming. (some data lacking)

## Background Statement

Interstate 80 is the major interstate highway in Wyoming crossing 403 miles of southern Wyoming from Pine Bluffs west to Evanston. Construction on I-80 began in 1967 and the interstate opened to traffic in 1970. During its first few years of existence, daily traffic averaged just under 4,000 vehicles. By 2007, that number had grown to more than 13,000 vehicles per day. I-80 has become a permanent barrier to most movements of ungulates in Wyoming.

Lorin Ward studied the effects of I-80 on deer migrations as early as 1970. In his study of I-80 east of Walcott Junction he documented from 37 to 60 deer/ vehicle collisions annually in a short stretch of the interstate that intersected a deer migration of more than 1,000 mule deer annually. As mitigation for these losses an eight-foot high “deer proof” ROW fence was installed along the interstate with several small underpasses in attempt to eliminate mortality. Ward observed over 4,000 instances of deer using these structures with the majority being recorded at two existing machine underpasses. Most of the smaller underpasses were not used while most use was of some larger machine underpasses used by deer in this area. Ward resorted to baiting the crossing structure with

alfalfa and apple mash to encourage deer use.

Additional deer underpasses were also installed along I-80 near the junction of US Highway 189 east of Mountain View and in a location west of Laramie. This was pioneering work in regards to wildlife crossing structures, but unfortunately a study by Gordon (2002) suggested little use of the Walcott structures. As with Ward's work at the same location, most of her documented deer crossings were at the larger machine overpass. Subsequent studies in Nugget Canyon and elsewhere (Sawyer,,,) have confirmed the need for deer crossing structures that are larger and with a greater openness ratio.

If we compare deer crossings in the Ward versus Gordon studies the results are discouraging. Whereas Gordon only observed about 508 crossings per year among all structures suggesting at best about 250 deer were still migrating through this area in 2001 and 2002; this is roughly one quarter of the 1,000 deer that Ward estimated were migrating in the early 1970's. Additionally, numerous GPS studies have been conducted in recent years along portions of the I-80 corridor where numerous animals with home and seasonal ranges near I-80 were monitored but these studies have all documented very few crossings of I-80.

Sawyer and Rudd (2005) present a review of existing literature for ungulate use of crossing structures with an emphasis on the effects of fencing and roads on pronghorn movements and migrations. They also recommend potential crossing structures that might be used to facilitate pronghorn movements across highways with an emphasis on span bridges as a recommended technique. Sawyer has since documented pronghorn use of the Trappers Point Overpasses thus demonstrating their effectiveness in maintaining migrations and connectivity for this species. Work at Nugget Canyon and Trappers Point have also demonstrated the success of crossing structures for mule deer in Wyoming with tens of thousands of crossings now documented.

More recently, the Wyoming Migration Initiative has begun to collate GPS data and map routes in I-80 corridor (Fig. 1). Relatedly, graduate student Benjamin Robb is working with Dr. Matt Kauffman to fill in some of the gaps in pronghorn data and to model pronghorn movements to identify locations where crossings could be restored.

## **Objectives**

WYDOT's mission is to provide a safe, high quality, and efficient transportation system in Wyoming. WYDOT in order to help define its mission has established six goals. These goals are:

7. 1) Improve safety on the state transportation system
8. 2) Serve our customers
9. 3) Take care of all physical aspects of the state transportation system
10. 4) Improve agency efficiency and effectiveness
11. 5) Develop and care for our people
12. 6) Exercise good stewardship of our resources

We believe that our proposal will address goal number one by identifying and prioritizing crossing structures in locations that will facilitate movement across the interstate and therefore keep animals out of the roadway. Additionally our proposal allows WYDOT to exercise good stewardship of the wildlife resources that are affected by the current I-80 corridor, which addresses Goal 6. The I-80 corridor is currently negatively affecting movements and distributions of big game along its length and this may have long-term negative consequences to these affected populations. Our proposed scope of work will identify which species and herds appear to be most affected by I-80 and will explore potential solutions to restore movement corridors and make recommendations for prioritization of these solutions. We believe our proposal also addresses goal 2, which is "Serve our Customers". We have seen great support for wildlife crossing structure where there is demonstrated need because it provides a safer transportation corridor for people and wildlife. Wyoming's public strongly supports the maintenance of its big game populations and their long distance migrations and these movements are an important part of Wyoming's culture and history.

Lastly, we will be providing a prioritization for potential crossing structures and will provide better baseline data for pronghorn and mule deer allowing WYDOT to make more informed decisions and efficient use of available funds (Objective 4). We also believe information from this study will act as a catalyst for collaborative efforts to bring needed resources to make additional potential crossing structures a reality in Wyoming. In the long term these efforts will produce more healthy big game populations and a safer transportation corridor.

**Objective 1.** Identify seasonal movements and migrations of pronghorn adjacent to I-80.

We will capture 25 pronghorn along I-80 in southwest Wyoming and equip them with GPS collars. The selection of study animals will be designed to fill current data gaps for pronghorn along the interstate. This data will supplement an ongoing study that examines pronghorn GPS movement both north and south of I-80 near Rock Springs.

**Objective 2.** Identify seasonal movements, migrations, and distribution of mule deer in the areas west of Mountain View along the I-80 corridor and in the area of high road mortality along US Highway 189 north of its intersection with I-80.

We will capture 25 mule deer in the area west of Mountain View specifically focusing on those portions of US Highway 189 where road related mortalities are high. This will allow us to;

- get a better understanding of which mule deer population segments are being affected by the road mortality along US Highway 189,
- understand if mule deer are still crossing I-80 in this area and whether existing underpasses are being used by mule deer or other ungulates
- identify migrations and movements of mule deer in relation to I-80 and US Highway 189

**Objective 3.** Evaluate the need for crossing structures and deer proof fencing along the I-80 corridor and prioritize potential locations of crossing structures based on a variety of biological and transportation metrics. Specifically, crossing structure locations will be evaluated using information on species abundance, herd economic value, topographic features, land ownership, grazing practices, and other relevant factors.

## **Benefits**

Crossing structures are expensive, long-term investments that should only be proposed where there is an identified need and demonstrated benefit. Our analysis will provide justification for and a prioritization list of potential crossing structures based on the best available science. This information will allow WYDOT to make informed decisions as it relates to the wildlife permeability and motorist safety along the I-80 corridor. Further, such prioritization can be used to attract potential partners for funding and ensure mitigation funds are allocated effectively.

Some portions of Interstate 80 still lack basic data on animal movements and our study will help fill these gaps. The placement of GPS collars on deer and pronghorn is intended to provide detailed animal movements and distributions to fill these data gaps. In particular there has been a high degree of mule deer mortality along portions of Highway 189 near its intersection with I-80 and this study will provided GPS data to better understand the relationship between deer movements and vehicle collisions in this area. This data should help WYDOT understand how to best address ways to reduce collisions in this area.

Ungulates (big game) are highly valued by Wyoming residents and past crossing structures in Nugget Canyon, Trappers Point and Baggs have received a high degree of support. The recent Wildlife Summit held in Pinedale in May of 2017 was well attended and the participants demonstrated their interest in having wildlife and highways coexist in Wyoming. This study provides important data for one of the priority recommendations of the Summit of having more crossing structures to address the biggest connectivity concerns in Wyoming. This study will provide the appropriate Regional Working Groups with important baseline information and a prioritized list of structures.

## **Work Plan/Scope**

### **Review of past I-80 Studies**

Review and summarize results of past studies of ungulate movements and vehicle wildlife mortalities within the I-80 corridor. The summary will be included in the final report along with all literature citations. The purpose is to summarize past efforts to understand the effects of I-80 on ungulates and to present a historical review of these efforts.

### **Analysis of Animal Movements in Relation to I-80**

This study will evaluate the movements of over a dozen past GPS radio-collared studies in relation to the I-80 corridor. In addition it will utilize data from an exiting study of pronghorn along the corridor being conducted by graduate student Benjamin Robb a student of Dr. Matt Kauffman's who is monitoring the movements of 40 radio-collared pronghorn along the interstate corridor. The proposed study will compliment Robb's data by capturing and collaring another 25 pronghorn and 25 mule deer. Animals will be

selected in such a manner to obtain as representative sample as possible for the number of collars placed. The analysis is intended to gain insights as to whether animal home ranges, seasonal distributions, and migrations are being affected by I-80.

Collars will collect locational data via satellite and all data will be archived with the Wyoming Migration Initiative online viewer (Viewer). Study locations will be shared via the Viewer once the study is complete and results published.

### **Inventory existing and potential crossing structures and deer proof fencing along I-80**

We will inventory, summarize, and map the locations of historical structures that were built to facilitate movements of ungulates and existing structures built for other purposes but that could (or potentially are) providing connectivity for ungulates. Deer proof fences will also be included and mapped.

### **Monitor existing structures for potential ungulate use with trail cameras**

Trails cameras will be placed at existing wildlife structures and other structures with potential for crossing ungulates (i.e. span bridges, machine underpasses, bridge crossings, etc. Results will be summarized and reported. Results will be used to help determine if structures have potential to facilitate ungulate crossings and if they warrant consideration for retrofitting for this purpose.

### **Review of Wyoming Game and Fish Population Data adjacent to I-80**

Herd Unit data will be summarized and evaluated to present the economic importance, status, and trends of each herds along the I-80 corridor. In addition we will evaluate if crucial winter range locations are influenced by the interstate. Results will be summarized and presented in the final report.

### **Determination of Ecological Risk to Pronghorn, Mule Deer and Elk along I-80**

Make a qualitative determination of long term and short term ecological risk for each herd based on the review of population status and trend, movements, isolation of

population segments, and other data inventoried for each ungulate herd along I-80.

### **Other Data Inventory for I-80 Corridor**

Numerous data layers will be reviewed and evaluated in relation to ungulate herd status, GPS collared animal studies, and physical and social parameters to determine if and where crossing structures for ungulates may be warranted. These layers will include but are not be limited to;

- Private land status and use
- Topography
- Ecological risk to ungulate populations
- Current use of structures by ungulates
- Allotments Inventory adjacent to I-80

### **Recommendations for and Prioritization of Potential Crossing Structures**

Once baseline data as outlined above have been summarized and potential for ecological risk determined, these will be analyzed along with other GPS movement data, herd unit data and other study data to develop recommendations for potential crossing structures along I-80. This may be a combination of recommended modifications to existing structures and construction of new structures along the I-80 corridor. Results from the ongoing study of pronghorn movements and modeling efforts to determine optimum placement will be incorporated as part of the analysis leading to the recommendations for location and priority.

### **Statement of Work**



**Table 1. Work schedule Objectives 1 and 2**

<b>Project Component</b>	<b>Dates</b>	<b>Work plan</b>
Place GPS radio-collars on pronghorn and mule deer	March 2018	Design sampling scheme, purchase collars, hire capture crew
Collect data from collared animals	Quarterly from time of capture through winter 2020*	Download and update general mapping data quarterly with final detailed analysis in 2020
Mapping of movement and migrations data	Spring 2020	Map movement patterns in relation to I-80

\*only a small subsample of locations available quarterly until collar drops off

**Table 2. Work schedule Objective 3**

<b>Project Component</b>	<b>Completion Dates</b>	<b>Work Plan</b>
Review of past I-80 Studies	Winter 2019	<ul style="list-style-type: none"> <li>a. Review of past wildlife studies of I-80</li> <li>b. Evaluation of past attempts to provide connectivity. Including the location of deer proof fences and</li> </ul>

		<p>underpass structures.</p> <p>c. Review Tiger 2 grant application as it relates to I-80 crossing structures</p>
Analysis of Animal Movements in Relation to I-80	Fall 2021	<p>a. Map movements and distribution of ungulates in relation to I-80</p> <p>b. Analysis and summary of effects on movement and migrations in proximity to I-80.</p> <p>c. Predict Implications of severed migrations and connectivity</p>
Inventory existing and potential crossing structures and deer proof fencing along I-80	Summer 2019	Identify locations, types of structures, species to benefit
Monitor existing structures for potential ungulate use with trail cameras	Winter 2021	Placement of trail cameras at existing structures that have potential for crossing ungulates or were designed for this purpose.
Determination of Ecological Risk to Pronghorn, Mule Deer and Elk along I-80	Fall 2021	<p>Our analysis of ecological risk will consider the following factors;</p> <ul style="list-style-type: none"> <li>• which species/herds are most affected by Interstate</li> <li>• Which herds are most important to Wyoming</li> <li>• Which species/herds may contribute the most risk to I-80 drivers</li> </ul>

		<ul style="list-style-type: none"> <li>• Are migrations still intact</li> <li>• Winter range locations appear to be influenced by interstate</li> </ul>
Collection and Summary of Relevant Data for I-80 Corridor and Recommendations for and Prioritization of Potential Crossing Structures	Winter 2021	Summarize relevant important physical and sociological information related to determine potential placement of structures including but not limited to recommend locations where new underpasses and overpasses may be beneficial evaluate and identify the influence of study factors (see Other Data Inventory) and provide recommendations for prioritization and justification of new crossing structures by species, herds, and locations.

### Draft Proposed Budget for I-80 Ungulate Analysis

Category	Projected Cost		
	FY17	FY18	FY19
<b>Personnel</b>			
Project Director Salary	\$12,000	\$32,000	\$20,000
Fields Support Oversight for capture ,final report write up, and field assistance	\$5000	\$6000	\$5000
GIS Technician Salary	\$5,000	\$10,000	\$5,000
Additional Technical support			
<i>Annual Stipend M.S. Candidate*</i>	<i>\$25,200</i>	<i>\$25,200</i>	
<b>Equipment</b>			
25 GPS Radio Collars PA @1400 each	\$30,000		
25 GPS Radio Collars MD @1400 each	\$30,000		
<i>40 GPS Collars existing I-80 study*</i>	<i>\$72,000</i>		
Cameras for Underpasses @\$200 X 30		\$6,000	
Office supplies	\$200	\$400	\$200
Misc Supplies field supplies (trapping, mapping, etc.)	\$200	\$400	\$200
<b>Contracted Services</b>			

Helicopter Capture			
(\$600 per animal X 50)	\$30,000		
<b>Travel</b>			
Mileage (I-80 mapping, project meetings, capture etc.)	\$1000	\$2000	\$1000
Per Diem (I-80 mapping, project meetings, capture etc.)	\$1000	\$2,000	\$1,000
<b>Report Development and Distribution</b>	\$500	\$500	\$1000
<i>Partner Contributions *</i>	<i>\$97,200</i>	<i>\$25,200</i>	
Direct Cost WYDOT	\$114,900	\$59,300	\$33,400
UW Indirect Costs (20%)	\$22,980	\$11,860	\$6,680
<b>Total Cost WYDOT</b>			

*\*Partner Contributions include \$122,400 in cost associated with ongoing research on pronghorn. In addition there is in kind contributions associated with maintaining offices and related equipment as well as other trapping related assistance.*

## **Implementation /Technology Transfer**

Project results will be presented in the Final Report and results will be shared with key WGFD and WYDOT personnel. Additionally, we will share the results with the public and other interested parties through additional reports, presentations, and use of public outreach through the Wyoming Migration Initiative website and social media efforts including twitter and Facebook.

Findings will also be shared via the State Chapter of the Wildlife Society Annual meeting, annual coordination meetings with the Wyoming Game and Fish Department, through RAC updates and presentations, and other appropriate scientific meetings.

Recommendations being developed from the Road Summit in Pinedale (May, 2017) include the formation of regional working groups made up of WYDOT, WGFD, and interested nongovernment organizations. These groups are tasked with setting priorities for wildlife mitigations and will work together to seek funding for priority projects including crossing structures. The study findings and recommendations will be share with the appropriate regions for their consideration and implementation.

## **Data Management Plan**

All locational data from GPS collared animals will be archived and made available to WYDOT and WGF D personnel and others interested parties via the Wyoming Migration Initiative online Data archive and viewer. This will occur after the research is complete and data are published. General movements will be mapped and described in the final report. All recommended crossing structures will be described, prioritized, and located on maps in the final report.

All camera monitoring data collected at potential or existing crossing structures will be summarized and included in the appendices in the final report.