US 93 North Post-Construction Wildlife-Vehicle Collision and Wildlife Crossing Monitoring and Research on the Flathead Indian Reservation between Evaro and Polson, Montana

Quarterly Report 2010-4

by

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EXECUTIVE SUMMARY

This report contains a brief description of the progress on the tasks for the US 93 North wildlife mitigation evaluation project on the Flathead Indian Reservation between Evaro and Polson, Montana. The mitigation measures consist of wildlife fencing combined with wildlife underpasses and overpasses, jump-outs, and wildlife guards at access roads. The research objectives relate to investigating the effect of the mitigation measures on human safety (an expected reduction in wildlife-vehicle collisions), habitat connectivity for wildlife (wildlife use of the crossing structures), and a cost-benefit analysis for the mitigation measures. This report documents the work conducted 1 October 2010 and 31 December 2010.

In this quarter, additional camera traps were installed on the north bank of the Mission Creek underpass and at two wildlife guards in the Ravalli Curves section. Monitoring of the cameras at all locations (all types of locations) continued. Monitoring of the tracking beds outside and inside four structures and all jump-outs continued until 2 November 2011. Monitoring stops in the winter months because low temperatures and snow make for inconsistent tracking conditions. In addition an inventory was made of the information that was previously given to WTI-MSU by MDT regarding the costs of the wildlife mitigation measures.

1. INTRODUCTION

1.1. Background

The US Highway 93 North (US 93 N) reconstruction project on the Flathead Indian Reservation in northwest Montana represents one of the most extensive wildlife-sensitive highway design efforts in North America. The reconstruction of the 56 mile (90 km) long road section includes the installation of 41 fish and wildlife crossing structures, 2 underpasses for live-stock, 1 bicycle/pedestrian underpass, and approximately 8.3 miles (13.4 km) of road with wildlife exclusion fencing on both sides (excluding future mitigation measures in the Ninepipes wetland area). The mitigation measures are aimed at improving safety for the traveling public through reducing wildlife-vehicle collisions and allowing wildlife to continue to move across the landscape and the road. Other examples of relatively long road sections in North America with a high concentration of wildlife crossing structures and wildlife fencing are I-75 (alligator alley) in south Florida (24 crossing structures over 40 mi; Foster & Humphrey 1995), the Trans-Canada Highway in Banff National Park in Alberta, Canada (24 crossing structures over 28 mi (phase 1, 2 and 3A); Clevenger *et al.* 2002), State Route 260 in Arizona (17 crossing structures over 19 mi; Dodd *et al.* (2006)), and I-90 at Snoqualmie Pass East in Washington State (about 30 crossing structures planned over 15 mi; WSDOT 2007). Both the road length and number of wildlife crossing structures of US 93 N on the Flathead Indian Reservation makes it the most extensive mitigation project of its kind in North America to date. If the section of US 93 South (S) (south of Missoula, Bitterroot valley) is included, the mitigation measures along US 93 are even more substantial.

The magnitude of the US 93 N reconstruction project and associated mitigation measures provide an unprecedented opportunity to evaluate to what extent these mitigation measures help improve safety through a reduction in wildlife-vehicle collisions, maintain habitat connectivity for wildlife (especially deer (*Odocoileus* spp.) and black bear (*Ursus americanus*)), and what the monetary costs and benefits are for the mitigation measures. In addition, the landscape along US 93 N is heavily influenced by human use. This is in contrast to the more natural vegetation along most of the other road sections that have large scale wildlife mitigation in North America. As the roads with most wildlife-vehicle collisions are in rural areas, the results from the US 93 N project are expected to be of great interest to agencies throughout North America (Huijser *et al.* 2008).

In 2002, prior to US 93 N's reconstruction, the Western Transportation Institute at Montana State University-Bozeman (WTI-MSU) was funded by the Federal Highway Administration (FHWA) and the Montana Department of Transportation (MDT) to initiate a before-after field study to assess the effectiveness of the wildlife mitigation measures and to document events and decisions that shaped the process of planning and designing the mitigation measures. Preconstruction field data collection efforts were completed in the fall of 2005 and a final report on the preconstruction monitoring findings was published in January 2007 (Hardy *et al.* 2007).

In 2010 MDT contracted with WTI-MSU to conduct the post-construction research with regard to the effectiveness of the mitigation measures. For this project, the Confederated Salish and Kootenai Tribes (CSKT) act as a subcontractor to WTI-MSU.

1.2. Objectives

Consistent with the direction provided by MDT, the project has the following objectives:

- Investigate the effect of the mitigation measures on human safety through an anticipated reduction in wildlife-vehicle collisions;
- Investigate the effect of the mitigation measures on the ability to maintaining habitat connectivity for wildlife (especially for deer (white-tailed deer [*Odocoileus virginianus*] and mule deer [*Odocoileus hemionus*] combined) and black bear (*Ursus americanus*) through the use of the wildlife crossing structures; and
- Conduct a cost-benefit analyses for the mitigation measures.

This document is the fourth in a series of quarterly reports detailing the progress on these tasks.

1.3. Milestones

This project covers a period of 5.5 years (15 January 2010 – 30 June 2015). The table below provides an overview of the most important milestones.

Table 1: Overview of Milestones.

Description Milestones	**Date accomplished**
Contract signed between MDT and WTI-MSU and in effect	15 January 2010
Kick-off and 1st technical panel meeting	2 February 2010
Subcontract signed between WTI-MSU and CSKT	13 May 2010
Subcontract in effect between WTI-MSU and CSKT	15 April 2010
Field visit and presentation preliminary data 2008-2010 for technical panel	24 June 2010

1.4. Related Activities

Student projects:

- "The effectiveness of wildlife guards and the use of wildlife crossing structures by deer and black bear" (Tiffany Allen, MSc. candidate at Department of Ecology, Montana State University, Bozeman, main advisor Dr. Scott Creel, 2008 - 2011). Tiffany's research focuses on the mitigation measures in Ravalli Curves and Ravalli Hill. Tiffany has prepared a draft manuscript for a scientific journal on the barrier effect of wildlife guards on deer and black bear. This manuscript will most likely be submitted early 2011. She expects to graduate before the summer of 2011.
- "Appropriate type and dimensions of wildlife crossing structures for various wildlife species, specifically deer and black bear" (Jeremiah Purdum, MSc. candidate at the Environmental Studies Program at University of Montana, Missoula, main advisor Dr.

Len Broberg, 2010-2012). The emphasis of Jeremiah's project is on investigating the appropriate type and dimension of crossing structures for selected species taking their presence and abundance in the surrounding landscape into consideration, as well as their behavior when approaching the crossing structures.

- "The effect of cover in and at crossing structures on the use by amphibians and small mammals" (Hayley Conolley-Newman, MSc. candidate at the Environmental Studies Program at University of Montana, Missoula, main advisor Dr. Len Broberg, 2011-2013). Selected crossing structures will be provided with cover. These structures will be monitored for the presence of amphibians and small mammals before and after cover has been provided. The expectation is that the presence of cover will not only benefit amphibians and small mammals but also invertebrates and reptiles.

Additional funding sources:

- WTI-MSU was awarded a $3,000 grant by Y2Y for education and outreach activities related to the US 93 N project. Kylie Paul is coordinating these activities through Defenders of Wildlife and has provided draft brochure for review by MDT on 23 September 2010. Comments from MDT on the draft brochure were received on 30 September 2010. The brochures were printed in November 2010 (see attachment A).
- CSKT received a Tribal Wildlife Grant (TWG) from the US Fish and Wildlife Service. About $40k of this grant will be dedicated to activities and materials related to the investigation of the effectiveness of the mitigation measures along US 93 N (personal communication Dale Becker, CSKT).

2. MITIGATION MEASURES AND HUMAN SAFETY

No activities regarding human safety data analyses took place in this quarter.

WTI will request the new safety data from MDT by 1 March 2011. These data should include crash and carcass data through 2010, with additions for carcass data from the preceding years, especially 2008 and 2009 (see Huijser *et al.* 2010).

3. MITIGATION MEASURES AND HABITAT CONNECTIVITY FOR WILDLIFE

3.1. Road Sections with Continuous Fencing and Crossing Structures

The preconstruction research measured the number of animals, especially deer and black bear, that crossed the road before the road was widened and before the mitigation measures were put in place. For this purpose dozens of tracking beds (100 m long, 2 m wide) were installed along the road, covering about 30% of the road sections that would later be fenced. Now that the road has been widened and the fences and crossing structures are in place, the animals can only cross the road by using the crossing structures (although some animals may cross wildlife guards or climb fences). The wildlife use of the crossing structures are measured through camera traps. A camera trap consists of an automated camera that detects and then photographs wildlife. Because cameras may have a different detection probability for wildlife than sand tracking beds, a relationship between crossings measured through camera images and crossings measured through tracking beds must be established. Therefore four crossing structures have a tracking bed placed inside and outside the structures. The outside tracking beds are exposed to the elements, similar to pre-construction methods. The selected four crossing structures have a relatively high use by deer and black bear, which should result in a high enough sample size to establish this relationship.

There are several wildlife guards (similar to cattle guards) to discourage ungulates from entering the fenced road corridor at access roads. Wildlife guards that receive relatively little use by humans are monitored to measure how much of a barrier they really are to different wildlife species. Two structures were monitored starting in 2008. Additional structures for monitoring were selected in summer 2010.

Animals that do end up in the fenced road corridor may escape by using one of the jump-outs. These jump-outs allow animals to walk up to the height of the fence and then jump down to safety. Ideally, the jump-outs should be low enough so that animals readily jump down to safety but high enough to discourage them from jumping into the fenced road corridor. To investigate appropriate jump-out height, jump-outs in the Ravalli Curves (RC) and Hills (RH) sections have already been monitored through tracking beds since 2008 (summer only). Fortunately relatively few animals end up in the fenced road corridor, but this also means it takes time to collect a high enough sample size. In summer 2010 the jump-outs in the Evaro section (EV) were included in further monitoring. One of the jump-outs also has a camera trap installed. Note that many of the names for the structures consist of a two letter code (based on the area) followed by a number (based on the numbering of the 100 m road segments). Other structure names are based on the location, and then written in full, or on their specific purpose.

Activities this quarter:

- Reconyx cameras (PC 900 Hyperfire) were installed at the following wildlife guards: guard just north of RC 396 and guard north of RC 381 (both on east side of road).
- Continued monitoring of the crossing structures in Evaro, Ravalli Curves, and Ravalli Hill.

- Continued monitoring of the wildlife guards.
- Monitoring of the tracking beds outside and inside four structures 2010 (RC 396, RC 427, RC 432, RH 459) and the jump-outs (Evaro, Ravalli Curves, and Ravalli Hill)) continued until 2 November 2011. Monitoring stops in the winter months because low temperatures and snow make for inconsistent tracking conditions.

The status of the field work and the dates or periods that data were collected are summarized in Table 2.

Table 2: Activities Road Sections with Continuous Fencing and Crossing Structures.

Description Activities	**Date or period monitored**
Crossing Structures Ravalli Curves and Ravalli Hill	
Tracking on tracking beds in the wildlife crossing structures in Ravalli Curves (9 wildlife crossing structures) and Ravalli Hill (2 wildlife crossing structures) took place from May 2008 until 26 February 2010. These data were supplemented by images from a limited number of cameras.	23 May 2008 – 26 February 2010
Camera traps were installed at all remaining crossing structures in Ravalli Curves and Ravalli Hill. The cameras, battery status and memory card status were checked once a month from 26 February 2010 onwards. Tracking in the structures coincides with the camera checks, and is supplemental to the images from the cameras from this date onwards. Note: most of the cameras were positioned outside the structure to be able to collect data on animal behavior as they approach the crossing structures.	26 February 2010 - present
The structures RC 396, RC 427, RC 432, and RH 459 had a tracking bed installed outside the structures. Tracking, twice a week, on the beds outside as well as inside the structures took place between 9 August 2010 and 2 November 2010.	9 August 2010 - 2 November 2010.
Crossing Structures Evaro	
Partial coverage wildlife overpass (partial coverage with 4 cameras; 6-29 July) (full coverage 1 approach with 7 cameras; 29 July- 18 August, full coverage both approaches 8 August-present).	6 July 2010 – present
Montana Rail Link underpass (partial coverage with 2 cameras 8 September 2010) full coverage from 18 September 2010 onwards.	18 September 2010 - present
The other structures in the road section with continuous fencing in Evaro had cameras installed 3 September 2010 with full coverage from 8 September 2010 onwards	8 September 2010 - present

Continued - Table 2: Activities Road Sections with Continuous Fencing and Crossing Structures.

Wildlife guards	
Maintenance of the two camera traps at two wildlife guards in Ravalli Curves section took place on a biweekly basis from July 2008 until 26 February 2010.	July 2008 – 26 February 2010
Maintenance of the two camera traps at two wildlife guards in Ravalli Curves section continued on a monthly basis from 26 February 2010 onwards.	26 February 2010 - present
Camera traps at two additional wildlife guards were installed on 20 October 2010 (guard just north of RC 396) and 31 October 2010 (guard north of RC 381 on east side).	20 October 2010- present
Jump-outs	
Tracking beds in Ravalli Curves and Ravalli Hill were monitored from May 2008 until September 2009 (summer only).	July 2008 – September 2009
Tracking beds were restored (removal weeds, fluffing sand on tracking bed) in Ravalli Curves and Ravalli Hill (29 jump-outs in total) on 13 June 2010. Monitoring continued on a weekly basis until 2 November 2010. Further monitoring to start in May 2011.	13 June 2010 – 2 November 2010
Tracking beds were installed in the Evaro section on 20 July 2010. Monitoring took place on a weekly basis between 4 August 2010 and 2 November 2010. Further monitoring to start in May 2011.	4 August 2010 - 2 November 2010.
Maintenance of the one camera trap at one jump-out continued on a biweekly basis until 26 February 2010.	July 2008 – 26 February 2010
Maintenance of the one camera trap at one jump-out continued on a monthly basis from 26 February 2010 onwards.	26 February 2010 - present
Pellet group counts	
Pellet group counts were conducted in the Ravalli Curves and Ravalli Hill section between 23 August and 15 September 2010	23 August 2010 - 15 September 2010

3.2. Road Sections with Isolated Underpasses

A large part of North America consists of landscapes heavily altered and used by humans. Such areas can nonetheless be important for nature conservation and large wild ungulates such as deer may even be abundant. Wildlife-vehicle collisions may also occur in such landscapes, but because of the human use and presence certain types of mitigation measures such as long sections of wildlife fencing are not always possible or appropriate. While crossing structures may still allow for safe crossings by wildlife, there may only be limited fencing, or sometimes no fencing, associated with such structures. Ten of such “isolated” structures are monitored for this project to evaluate their effectiveness. The structures and periods they were monitored are listed in Table 3.

Activities this quarter:

- Additional camera trap was installed on the north bank of Mission Creek
- Continued monitoring of the isolated structures.

Table 3: Isolated Structures Monitored.

Structure name	**Date or period monitored through December 2009**	**Date or period monitored from 1 Jan 2010 onwards**
North Evaro	None	6 July 2010 – present
Schley creek	None	29 June 2010 – present
Pistol creek 1 (station 498+55.7)	November 2007-1 January 2008 27 August 2009- 31 December 2009	1 January 2010 – present
Pistol creek 2 (station 501+63)	August 2009- 31 December 2009	1 January 2010 – present
Mission creek (station 528+90)	September 2009 – 31 December 2009	1 January 2010 – present (south bank) 13 October 2010 – present (north bank)
Post creek 1 (station 550+56.6)	November 2007 - May 2009	29 June 2010 – present
Post creek 2 (station 555+06)	November 2007 – October 2008 January 2009 – May 2009 August 2009 – 31 December 2009	1 January 2010 – present
Post creek 3 (559+98.4)	November 2007 – 31 December 2009	1 January 2010 – present
Spring creek 1 (774+00)	May 2009 - December 2009	1 January 2010 – present
Spring creek 2	None	11 March 2010 – present
Mud creek	23 June 2009 – 23 July 2009	None
Polson Hill	None	11 October 2010 - present

3.3. Anticipated Activities 1st Quarter 2011

1. Install camera traps at selected fence ends, soil conditions permitting.
2. Install 1 camera trap at human access point, soil conditions permitting.
3. Install camera traps at the bicycle/pedestrian underpass, the rest area underpass, and at two livestock underpasses, soil conditions permitting.

4. COST-BENEFIT ANALYSIS

Activities this quarter:

- An inventory was made of the information that was previously given to WTI-MSU by MDT.

Anticipated activities next quarter:

- WTI-MSU anticipates obtaining and collecting new data on the costs for planning, construction, and maintenance from MDT in the 1st quarter of 2011. WTI-MSU recognizes that not all data may be available at that time yet, and additional data will be collected later during the course of the project.

5. OTHER FINDINGS

No specific other findings to report.

6. SCHEDULE AND BUDGET

The planned and the actual schedule through 2011 are shown in Table 4. The percentage completion for each task is shown in Table 5.

Table 4: Planned Schedule through 2011.

	2010				2011			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Deer and black bear vehicle collisions								
Summary crash and carcass data through 2009								
2. Wildlife use of underpasses								
Cameras operational structures RC and RH								
Cameras operational structures EV								
Cameras operational isolated structures								
Tracking beds operational outside 4 structures								
Cameras operational fence ends								
Cameras operational 2 guards RC								
Cameras operational additional guards								
Camera operational at people access point RC								
Camera operational 1 jump-out								
Tracking beds operational jump-outs RC and RH								
Tracking beds operational jump-outs EV								
Deer pellet group counts								
3. Cost-benefit analyses								
Obtain cost data from MDT								

Legend
- planned
- on schedule
- ahead
- behind

Table 5: Percentage Complete.

Task	Planned Percentage complete	Actual Percentage complete
1. Deer and black bear vehicle collisions	20%	20%
2. Wildlife use of underpasses	20%	20%
3. Cost-benefit analyses	20%	5%

The monitoring of fence ends and the people access point was not a priority compared to monitoring the structures in the three areas with continuous fencing and the 10 isolated structures. Time was taken to select suitable locations for the fence ends (minimize theft and vandalism risks). Soil conditions in 4th quarter did not allow for installation (frozen soil).

Through 31 December 2010 the total amount spent (15 January 2010 – 31 December 2010) on the MDT account for the project was $41,111 (Figure 1). This was less than budgeted. The difference is mostly explained by bills that have not been received yet (e.g. from CSKT) and student involvement.

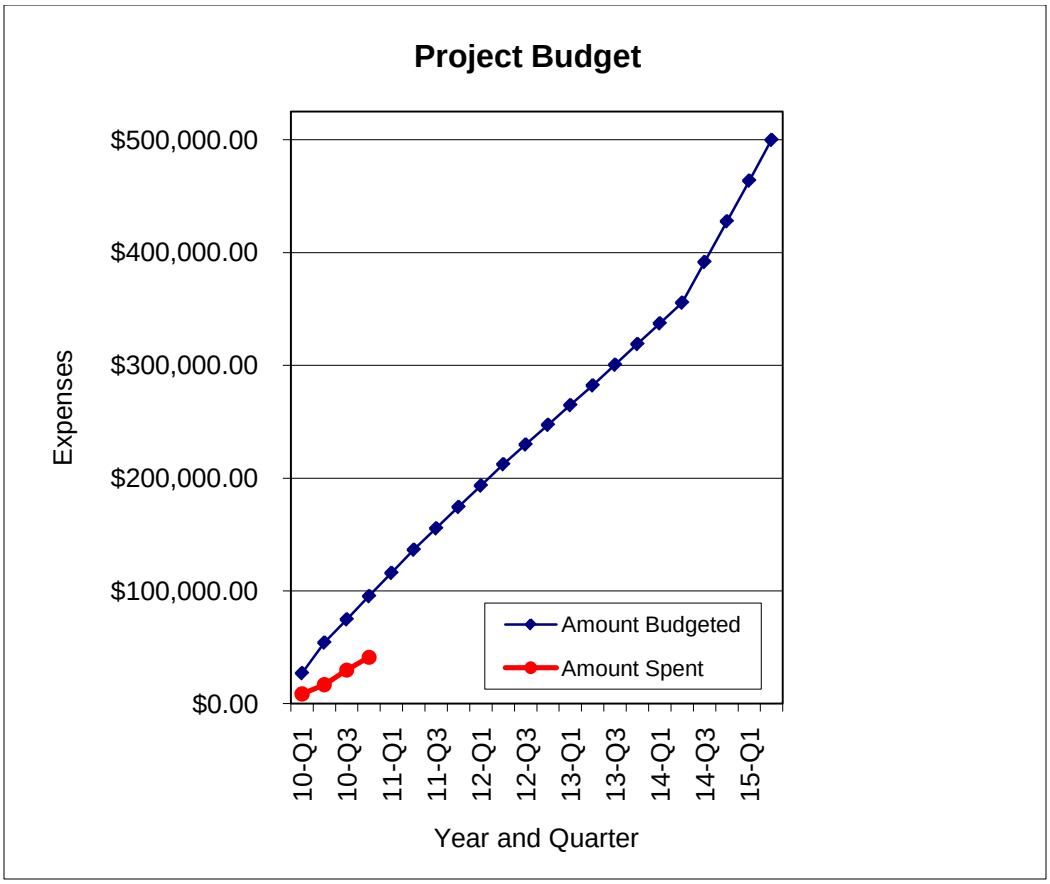

Figure 1: Project budget MDT account; cumulative expenses, with a distinction between the amount that was budgeted (blue line) and the amount that was actually spent (red line) through 30 June 2015. Note that the budgeted amount and the actual amount spent are cumulative. For example, the expenses for the quarter that this report relates to have been added to the total expenses incurred through the previous quarter (red line).

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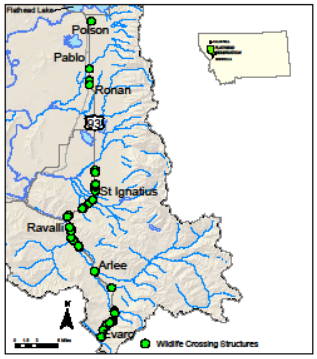
8. ATTACHMENT A: BROCHURE

WHY MITIGATION ON US 93?

In the 1990s, with U.S. Highway 93 vehicle accident percentages above national highway levels, the Montana Department of Transportation (MDT) proposed an expansion of the highway. This area was entirely within the boundaries of the Flathead Indian Reservation (FIR), home to the Salish, Pend d'Oreille, and Kootenai people under the title of Confederated Salish and Kootenai Tribes (CSKT). In December 2000, the CSKT, MDT, and Federal Highway Administration (FHWA) signed a memorandum of agreement that enabled the construction of sections of partial two-lane highway and partial four-lane divided highway. It included wildlife mitigation measures such as underpasses, an overpass, wildlife fencing, jumpouts, and wildlife crossing guards across over 56 miles of highway.

These mitigations help address the CSKT's concerns over potential adverse effects on wildlife and wetlands through wildlife mortality and increased fragmentation of the reservation's wildlife habitat. Research is underway to determine the effectiveness of the mitigation (see http://www.mdt.mt.gov/research/projects/env/wildlife_crossing.shtml).



FOR MORE INFORMATION ON US 93 MITIGATION, PLEASE SEE THESE WEBSITES:

CSKT:
www.cskt.org/wlc.htm

MDT:
www.mdt.mt.gov/pubinvolve/us93info/

WESTERN TRANSPORTATION INSTITUTE:
www.westerntransportationinstitute.org/research/roadecology/

This is an effort from the People's Way Partnership. The Partnership includes: CSKT, Western Transportation Institute, and Defenders of Wildlife. The brochure is funded by grants from: Yellowstone to Yukon Conservation Initiative.

US HIGHWAY 93 WILDLIFE MITIGATION

Wildlife considerations in highway design reduce animal-vehicle collisions and allow wildlife to cross the highway safely

WHAT IS WILDLIFE MITIGATION?

Mitigation, in relation to highway reconstruction efforts, are efforts intended to reduce known impacts to wildlife species or their habitat (such as a stream or wetland). US 93 wildlife mitigation efforts are directed at reducing the impacts on the natural environment, reducing wildlife-vehicle collisions and providing safe crossing opportunities for wildlife.

Mitigation measures include 41 fish and wildlife-crossing structures, including 40 underpasses of various dimensions and types, as well as one overpass.

Eight miles of road with 8-foot high wildlife fencing on both sides keeps wildlife from entering the highway and directs them towards crossing structures.

Dozens of "jump outs" allow wildlife to jump to the other side of the fence safely should they somehow be caught in the fenced road corridor.

Wildlife crossing guards modeled after cattle guards or "Texas gates" discourage deer and other hoofed mammals from entering the fenced road corridor at access roads.

WHY IS MITIGATION IMPORTANT HERE?

The FIR is home to a rich diversity of wildlife species, including large mammals such as deer, elk, moose, black bears, and grizzly bears, and a range of amphibian, reptile, and bird species, many of which have been hit by vehicles. Between 1998 and 2010, four grizzly bears were killed on US 93. Crashes with deer are the most common wildlife-vehicle collision along this stretch of road. Western painted turtles have also suffered high mortality (300-400 killed annually) with breeding ponds and feeding ponds located on both sides of US 93.

DOES THE MITIGATION WORK?

Between May 2008 and December 2009, eleven underpasses were monitored for wildlife use. Wildlife use of the structures was substantial with 3,000 deer crossings, 1,500 coyote crossings, 300 bobcat crossings, 200 raccoon crossings, and 200 black bear crossings. Other species that used the crossings include mountain lion, elk, grizzly bear, moose, badger, river otter, muskrat, beaver, skunk, rabbit, and various bird species. For the wildlife mitigation measures to be considered successful, goals have been set by the CSKT, MDT, and FHWA, and more data need to be collected and analyzed before the researchers can conclude whether the mitigation measures have indeed reached those goals.

HOW WERE THE LOCATIONS SELECTED?

Crossing structures were placed in areas that have a history of wildlife crossings and wildlife mortality, and/or locations where the surrounding landscape and land use was best suited for the crossing structures. Structures were typically located at stream crossings and areas with protected habitat on both sides of the road.

WERE THEY EXPENSIVE?

Wildlife mitigation measures cost money. However, a goal of the mitigation is to reduce wildlife-vehicle collisions; beyond the value of enhanced human safety, collisions can be very expensive. A mitigation measure is an investment that may pay for itself over time in reduced wildlife-vehicle collisions.

IS WILDLIFE MITIGATION FOR HIGHWAYS USED ELSEWHERE?

The most recognizable wildlife crossings in the world are found in Banff National Park in Alberta, Canada, where dozens of wildlife crossings were constructed since the 1980s. Numerous European countries have used crossing structures to reduce wildlife and roads conflict for several decades, and many other countries around the world have built structures.

In the United States, hundreds of wildlife crossings have been built in the past 30 years in over 13 states. The US 93 mitigations have the most structures in the shortest stretch of highway - making it the most densely mitigated stretch in the US.