Project Summary Report: 8208

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

http://www.mdt.mt.gov/research/projects/env/wildlife_crossing.shtml

Introduction

The US Highway 93 North reconstruction project on the Flathead Indian Reservation in northwest Montana is one of the most extensive wildlife-sensitive highway design efforts to date in North America. The reconstruction of the 56 mile (90 km) long road section included the installation of wildlife crossing structures at 39 locations and approximately 8.71 miles (14.01 km) of road with wildlife exclusion fences (Figure 1). The mitigation measures were aimed at improving human safety through reducing wildlife-vehicle collisions and allowing wildlife to continue to move across the road.

The wildlife mitigation measures along US 93 North were an integral part of the reconstruction of this highway because the Confederated Salish and Kootenai Tribes (CSKT) required the reconstructed highway to be respectful of the land, the people and their culture, and wildlife. The Federal, State, and Tribal governments agreed to reconstruct US 93 North based on the concept that "the road is a visitor" and that it should respond to and be respectful of the land and the "Spirit of the Place".

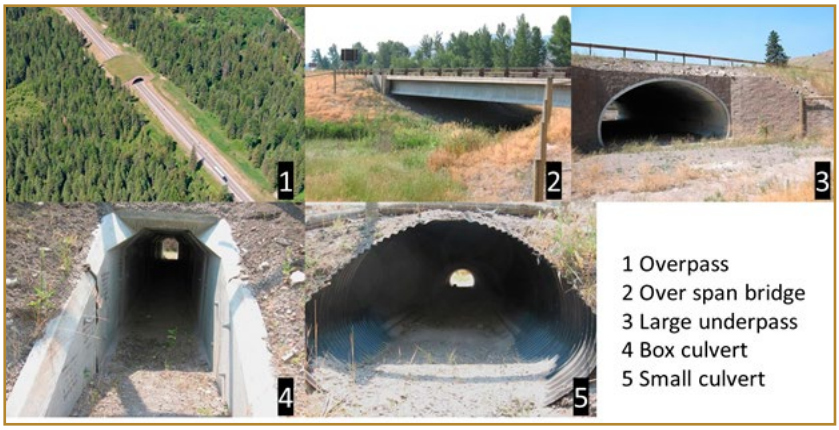

Figure 1: The five types of wildlife crossing structures along US 93 North.

What We Did

The researchers investigated the effectiveness of the mitigation measures in reducing collisions with large wild mammals based on crash and carcass removal data before and after highway reconstruction. The researchers also investigated wildlife use of 29 crossing structures. The research was concentrated in three main study areas (Evaro, Ravalli Curves, and Ravalli Hill) as well as three adjacent road sections that served as a control (no wildlife fence). The "before" highway crossings were estimated through monitoring of sand tracking beds adjacent to the highway. The "after" highway crossings were measured based on sand tracking beds and wildlife cameras at the wildlife crossing structures.

In addition, the researchers investigated the effectiveness of wildlife guards at access roads, wildlife use of jump-outs, and the functioning of a human access point (Figure 2). Wildlife guards are similar to cattle guards and are intended to keep wildlife,

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specifically white-tailed deer, mule deer, and elk, out of the fenced highway corridor. Wildlife jump-outs are earthen ramps within the fenced right-of-way. They allow wildlife caught in between the fences to walk up a slope at the fence line and then jump down to the safe side of the fence. The human access point consisted of a gap in the fence, large enough for people to walk through, but the configuration was such that the designers hypothesized that it would be a barrier to deer.

Finally, the researchers evaluated whether the measures of effectiveness as agreed upon by the Montana Department of Transportation, the Confederated Salish and Kootenai Tribes, and the Federal Highway administration were met.

Figure 2: Examples of a wildlife guard, a wildlife jump-out, and a human access point

What We Found

The mitigation measures in the three main study areas reduced collisions with large wild mammals by 71 percent (carcass removal data) and 80 percent (wildlife crash data) when the unmitigated "control" road sections were included in the analyses. Interestingly, collisions increased in the unmitigated "control" road sections. While wider lanes, wider shoulders, longer sight distances and more gentle curves improve human safety in general, wildlife-vehicle collisions are likely to increase unless mitigation measures are implemented.

Based on data from this project and the literature, wildlife fences proved most effective in reducing collisions with large mammals (almost always >80 percent reduction) if the fences and associated measures were installed over road lengths of at least 3.1 mi (5 km). Wildlife fences implemented over relatively short road lengths (< 3.1 mi (<5 km)) reduced collisions with large mammals by about 50 percent on average. The effectiveness of the wildlife fences was highly unpredictable for any specific mitigated road section shorter than 3.1 mi (5 km) in length. The reduced effectiveness of short fenced road sections was related to fence-end effects that resulted in a concentration of collisions at and near fence ends.

Additional analyses were conducted to investigate the effectiveness of the mitigation measures in reducing collisions for black bear and grizzly bear. Black bear carcasses along US 93 North continued to be recorded after highway reconstruction and there was no evidence that the mitigation measures in Evaro, Ravalli Curves, and Ravalli Hill reduced the number of reported black bear carcasses. This was likely related to the relatively short road lengths equipped with mitigation measures, the design of the wildlife fence, and the gaps in the wildlife fence at access roads and steep slopes.

The wildlife cameras recorded 22,648 successful crossings per year in the 29 crossing structures. Twenty different species of medium sized or large sized terrestrial wild mammals used the crossing structures successfully (Figure 3). Most of the crossings were by white-tailed deer (69 percent). Mule deer and domestic dogs and cats each represented about 5 percent of the successful crossings. Black bear represented 1.6% (1,531 successful crossings).

Depending on the type and dimensions of alternative crossing structures in an area, white-tailed deer used bridges, overpasses, and large culverts more than expected. Small culverts were not used or barely used by both white-tailed and mule deer. Mule deer also used bridges and large culverts more than expected. Black bear used a wider variety of structures (bridges, large culverts, and small culverts) more than expected. Grizzly bears exclusively used large culverts, the most common type of structure within the area known to be used regularly by grizzly bears. Elk and moose mostly or exclusively used the wildlife overpass.

The data also showed that there was a learning curve for deer (white-tailed deer and mule deer combined) and black bear. These species used the structures more frequently with increasing age of the structures. While deer and black bear use can be considered high one year after construction, both species showed an increase in successful crossings for at least five years after construction.

Deer highway crossings (white-tailed deer and mule deer combined) either remained similar or increased after highway reconstruction in the three main study areas. Black bear highway crossings remained similar after highway reconstruction. Since there was no indication of an increase in deer population size after reconstruction compared to preconstruction, the researchers conclude that the highway reconstruction and the associated mitigation measures did not reduce habitat connectivity for deer. Instead, when the learning curve is considered, habitat connectivity for deer across the highway increased in the mitigated road sections. The researchers did not have data on potential changes in black bear population size before and after highway reconstruction. Assuming

there were no substantial changes in the black bear population size, habitat connectivity for black bear across the highway was at least similar before and after reconstruction in the mitigated road sections.

Large mammal use of large underpasses varied greatly, independent of the fence length associated with the underpasses. This suggests that large mammal use of underpasses is heavily influenced by other factors. These factors likely include the location of the structure in relation to the surrounding habitat, wildlife population density, and wildlife movements.

Wildlife guards were found to be a very substantial barrier to deer (1.3 percent permeability for white-tailed deer and 0.5 percent permeability for mule deer). On the other hand, the wildlife guards were quite permeable for mountain lion (94 percent), bobcat (73 percent), and black bear (53 percent).

Wildlife use of the jump-outs was very low. Only about 7 percent of the white-tailed deer that walked up to the top of the jump-outs jumped down to the safe side of the wildlife fence. Mule deer were more able or willing to use the jump-outs (about 32 percent use). No deer were observed jumping up into the fenced road corridor. While the human access point received relatively little use by humans (only 9 human crossings in 3.5 years), white-tailed deer crossed frequently through the human access point over the same period (140 times), providing them easy access to the fenced road corridor.

Almost all the measures of effectiveness agreed upon by the three governments (Federal, State and Tribal) were met, specifically those that related to habitat connectivity for deer and black bear, and the functioning of the wildlife crossing structures. Some of the measures of effectiveness that related to human safety were met, but others were not. This was because road reconstruction projects that include wider lanes, wider shoulders, longer sight distances, but that lack wildlife mitigation, are associated with an increase in wildlife-vehicle collisions. In addition, short road sections with wildlife fences (which characterize US 93 North) were, on average, less effective in reducing collisions with large mammals than long fenced road sections (> 3 mi (> 5 km) in road length). This is new knowledge that was partially based on the results of this research project.

What the Researchers Recommend

Based on the results of this research project and the current state of knowledge, the researchers formulated recommendations for the implementation of mitigation measures aimed at reducing wildlife-vehicle collisions and at providing safe crossing opportunities for large mammals. In addition, the researchers formulated specific recommendations for the maintenance and retrofits of the mitigation measures along US 93 North. These include:

- Putting a wildlife fence inspection and maintenance program in place.
- Increasing the length of the fenced highway sections.
- Implementing effective fence-end treatments.
- Implementing specific measures to reduce grizzly bear-vehicle collisions between St. Ignatius and Ronan and surrounding areas (i.e. longer fences and possibly electric mats (not wildlife guards) at access roads).
- Removing the human access point that currently allows white-tailed deer to enter the fenced road corridor.
- Retrofitting the wildlife guards so that the concrete ledges are no longer accessible to wildlife when they attempt to access the fenced road corridor.
- Retrofitting the connections between fences and wing walls of certain crossing structures and the retaining walls of certain jump-outs that have trapped and caused the death of large mammals on occasion.
- Conducting vegetation maintenance at the top and bottom of the jump-outs to physically allow wildlife to escape the fenced road corridor.
- Carefully reducing the height of the jump-outs to increase the use by deer, especially white-tailed deer.
- Initiating research into a potential hazard of wildlife guards for ungulates (e.g. potential for broken legs).
- Initiating research aimed at developing better functioning jump-outs for ungulates while not jeopardizing human safety.
- Initiating research into the effectiveness of electric mats at deterring wildlife at access roads and fence ends, specifically with regard to keeping grizzly bears from accessing the fenced road sections.

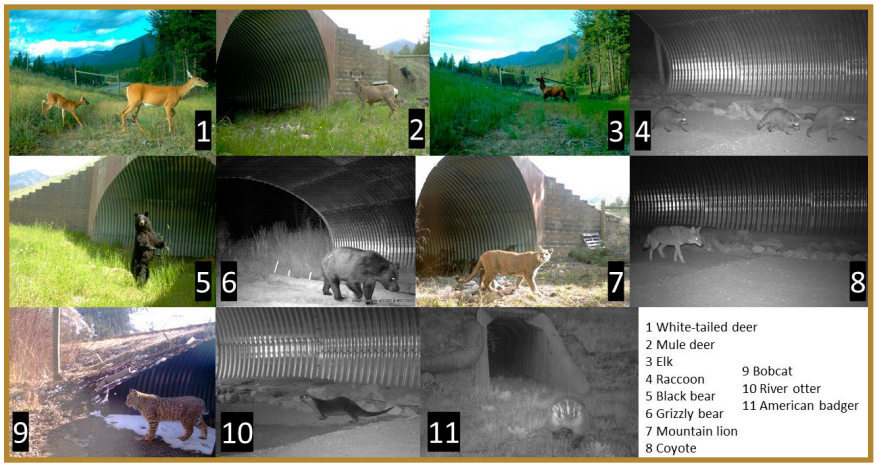

Figure 3: Examples of different wildlife species using the crossing structures along US 93 North.

For More Details . . .

The research is documented in Report FHWA/MT-16-009/8208, http://www.mdt.mt.gov/research/projects/env/wildlife_crossing.shtml.

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MDT Implementation Status: December 2016

Most recommendations are currently being implemented.

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