Montana US Highway 93 South Wildlife Crossings Research
MDT # HWY – 308445-RP

2012 First Quarter Progress Report

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1. Study Area and Purpose

The Montana Department of Transportation (MDT) installed 16 large wildlife crossing structures along US Highway 93 South between Florence and Hamilton from 2004 to 2011. Three additional wildlife crossing structures will be completed in 2012. Details of the 16 wildlife crossing structures and the three wildlife crossing structure sites are presented in Table 1. A map of the study area is presented in Figure 1.

The purpose of this research is to determine the effectiveness of wildlife crossing structures by investigating:

1. white-tailed deer (*Odocoileus virginianus*) use of wildlife crossing structures and wildlife crossing sites,
2. white-tailed deer usage rates of wildlife crossing structures by type and across types (including height, width, length, and material),
3. relationships between usage rates of wildlife crossing structures and landscape variables,
4. changes in animal-vehicle collisions between pre-construction and post-construction of wildlife crossing structures within a twenty-five mile stretch of US Highway 93 South, mile post (mp) 74 to mp 49, and,
5. relationships between animal-vehicle collisions and wildlife crossing structures over time and space.

This research began in 2008 and will be completed in 2015. This research is approximately 50% complete. This report presents preliminary results which preclude discussion and conclusion sections. The project is on time and on budget for all tasks.

Table 1. Wildlife Crossings Structures and Wildlife Crossing Structure Sites, US Highway 93 South, Montana.

Structures	Year Completed	Approximate Mile Post	Structure Type
Bass Creek North	2005	71	Bridge
Bass Creek South	2005	70	Bridge
Bass Creek Fishing Access	2005	70	Round Corrugated Steel Culvert
Dawn's Crossing	2005	70	Bridge
Kootenai Creek	2009	66	Bridge
McCalla Creek North	2009	66	Bridge
McCalla Creek South	2010	65	Bridge
Kootenai Springs Ranch	2010	65	Concrete Box Culvert
Indian Prairie Loop	2010	63	Concrete Box Culvert
Big Creek	2011	61	Bridge
Axmen Propane	2010	61	Round Corrugated Steel Culvert
Sweathouse Creek	2011	60	Bridge
Mountain Gallery	2011	56	Concrete Box Culvert
Fun Park	2011	55	Concrete Box Culvert
Mill Creek	2011	55	Bridge
Blodgett Creek	2008	50	Bridge
Future Sites	**Expected Completion**	**Approximate Mile Post**	**Structure Type**
Bear Creek North	2012	58	Bridge
Bear Creek South	2012	57	Bridge
Lupine	2012	56	Concrete Box Culvert

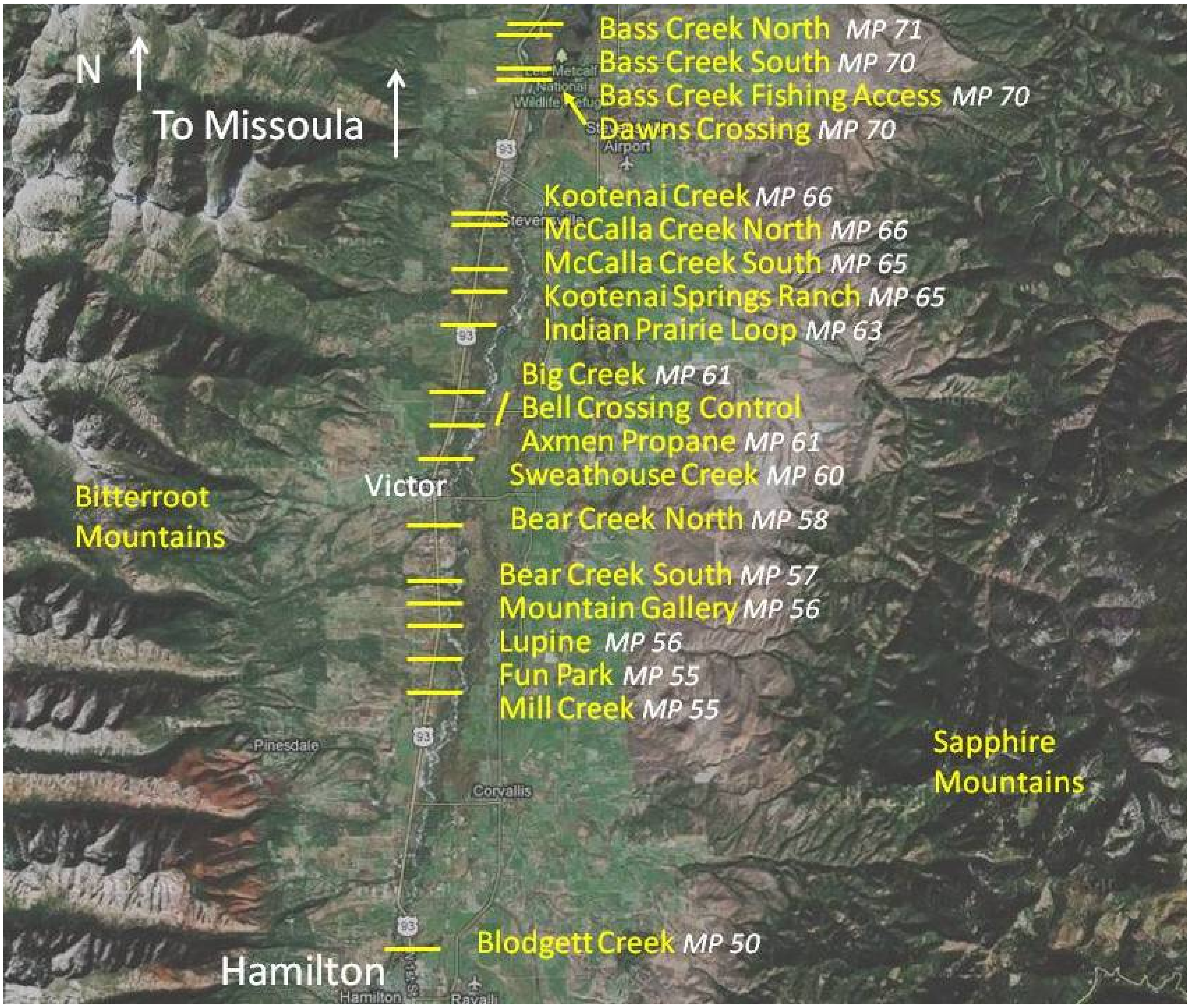

Figure 1. Map of US Highway 93 South Study Area, Montana.

2. White-tailed Deer Use of Wildlife Crossing Structure Sites and Wildlife Crossing Structures

2.1. Methods

White-tailed deer usage rates were determined by monitoring wildlife crossing structure sites and wildlife crossing structures with Reconyx Professional Cameras, Model PC85 and Model PC800. Cameras were triggered by motion and took pictures of large and small animals, day and night. Cameras were installed inside metal telephone-utility boxes or metal Reconyx Bear Boxes. Each telephone-utility box was secured by a cable locked to the camera on one end and buried in concrete at the other. Reconyx Bear Boxes were mounted on a large fence post or a large tree and secured with locked cables. All cameras were also secured by electronic code locks.

The following calculations were made for each camera location, where applicable:

- **deer per day** = the total number of deer observed divided by the number of days the camera was in operation
- **success per day** = the total number of deer observed successfully using a wildlife crossing structure divided by the number of days the camera was in operation
- **success rate** = the total number of deer moving through a wildlife crossing structure or onto the road right of way at a wildlife crossing structure site, divided by the total number of deer recorded at the structure or site
- **rate of repellency** = the total number of deer repelled at a wildlife crossing structure or the road right of way at a wildlife crossing structure site divided by the total number of deer recorded at the structure or site
- **parallel rate** = the total number of deer moving parallel to a structure or site right of way divided by the total number of deer recorded at the structure or site.

2.1.1. Pre-construction Monitoring

Two cameras were installed at each of the wildlife crossing structure sites. One camera was placed as near as possible to any original bridge, or the proposed location of the structure. These cameras were designated “structure cameras” if they recorded white-tailed deer use of the original bridges. A second camera was placed within 50 meters of the first camera at each site. These cameras were designated either “right of way cameras” or “habitat cameras.” Right of way cameras recorded animal movements as they approached or departed the road right of way. Habitat cameras recorded only parallel movements, calculated as deer per day. Pre-construction monitoring was completed in April, 2011.

2.1.2. Post-construction Monitoring

A single camera was installed near one entrance of the following wildlife crossing structures: Bass Creek North (mp 71), Bass Creek South (mp 70), Bass Creek Fishing Access (mp 70), Dawn’s Crossing (mp 70), Kootenai Creek (mp 66), Axmen Propane (mp 61), Mountain Gallery (mp 56), Fun Park (mp 55), and Blodgett Creek (mp 50). Two cameras were installed, one near each entrance, of the following wildlife crossing structures: McCalla Creek North (mp 66), McCalla Creek South (mp 65), Kootenai Springs Ranch (mp 65), Indian Prairie Loop (mp 63), Sweathouse Creek (mp 60), and Mill Creek (mp 55). Four cameras were installed at Big Creek (mp 61). Cameras were placed near the entrances of wildlife crossing structures in order to record the number of white-tailed deer successfully using, moving parallel to, and repelled from the crossing structures. As new wildlife crossing structures are constructed, additional cameras will be installed to monitor post-construction wildlife activity. Structures completed prior to this study were monitored with one camera (McCalla Creek North is an exception). Structures completed during this study will be monitored with two or more cameras. Pre-construction monitoring data will be compared with post-construction monitoring data, where applicable.

2.1.3. Control Cameras

Two cameras were installed at Bell Crossing (east and west cameras, control) near a bridge over an unnamed spring run on County Road 370, approximately one-quarter mile east of the Bitterroot River. The east camera is a “habitat camera” and the west camera is a road “right of way camera.” This location was selected as a long-term control site to monitor white-tailed deer population and activity in an area where road construction and wildlife crossing structure construction were not scheduled to occur. One camera was installed at McCalla Creek South (ramp camera, mp 65) to monitor the jump off ramp and to serve as a long-term control site. Big Creek (south camera, control, mp 61) was also selected as a long-term control site.

2.1.4. Work this Quarter

During this quarter, over 24,000 images were collected and analyzed. Three cameras were installed at the following locations: Mountain Gallery (west camera, mp 56), Fun Park (east camera, mp 55), and Mill Creek (west camera, mp 55) to monitor post-construction activity at these new culverts and bridge. Locations, approximate mile posts, and installation dates of cameras currently monitoring post-construction wildlife activity at wildlife crossing structures, and cameras at control sites are presented in Table 2.

Table 2. Cameras Currently Installed at Wildlife Crossing Structures on US Highway 93 South, Montana, and at Control Sites.

Camera Location	Approximate Mile Post	Date Installed
Bass Creek North	71	Oct. 10, 2008
Bass Creek South	70	Nov 22, 2008
Bass Creek Fishing Access	70	Nov 22, 2008
Dawn’s Crossing	70	Nov 23, 2008
Kootenai Creek	66	Apr 21, 2009
McCalla Creek North (east camera)	66	Apr 22, 2009
McCalla Creek North (west camera)	66	Apr 22, 2009
McCalla Creek South (east camera)	65	July 30, 2010
McCalla Creek South (west camera)	65	June 16, 2010
McCalla Creek South (ramp camera)	65	June 16, 2010
Kootenai Springs Ranch (east camera)	65	June 10, 2010
Kootenai Springs Ranch (west camera)	65	July 29, 2010

Indian Prairie Loop (east camera)	63	Oct 25, 2011
Indian Prairie Loop (west camera)	63	Sept 27, 2010
Camera Location	**Approximate Mile Post**	**Date Installed**
Big Creek (northeast camera)	61	July 28, 2011
Big Creek (southeast camera)	61	July 29, 2011
Big Creek (northwest camera)	61	July 28, 2011
Big Creek (southwest camera)	61	Aug 12, 2011
Big Creek (south camera, control)	61	Apr 21, 2009
Axmen Propane	61	Sept 28, 2010
Sweathouse Creek (east camera)	60	Dec 10, 2011
Sweathouse Creek (west camera)	60	Dec 10, 2011
Mountain Gallery (west camera)	56	Mar 2, 2012
Fun Park (east camera)	55	Mar 2, 2012
Mill Creek (east camera)	55	Dec 10, 2011
Mill Creek (west camera)	55	Mar 2, 2012
Blodgett Creek	50	Mar 15, 2010
Bell Crossing (east camera, control)	CR 370	May 29, 2009
Bell Crossing (west camera, control)	CR 370	May 29, 2009

2.2. Results

2.2.1. Pre-construction Monitoring

Pre-construction monitoring was completed in April, 2011. Twenty-six pre-construction data sets are summarized by camera designation in Table 3. The order of camera locations is based on the number of deer per day photographed at each camera site. The pre-construction Bear Creek South bridge was functioning as a successful wildlife crossing structure, even though it was not designed as one (success rate 98%). The success rate for the other five structure cameras averaged 11%. For road right of way cameras, the average success rate was 59% and the average rate of repellency was 8%

(n=10, excluding Lupine north right of way). The road right of way cameras recorded 1,755 deer successfully crossing US Highway 93 during pre-construction.

Table 3. Summary of Complete Pre-construction Data Sets.

Structure Camera Location	Mile Post	Camera Days	Deer Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Bear Creek South (structure)	57	629	2.6	1662	98	1	1
McCalla Creek South (structure)	65	109	2.3	21	9	7	84
Sweathouse Creek (structure)	60	452	1.1	65	13	1	86
Big Creek (structure)	61	277	0.8	33	14	14	72
Mill Creek (structure)	55	599	0.07	1	3	0	97
Bear Creek North (structure)	58	536	0.03	2	14	14	72
Right of Way Camera Location	**Mile Post**	**Camera Days**	**Deer Per Day**	**Successful Crossings**	**Success Rate (%)**	**Rate of Repellency (%)**	**Parallel Rate (%)**
Kootenai Springs Ranch (east right of way)	65	107	2.1	78	32	8	60
Fun Park (east right of way)	55	490	1.5	606	79	11	10
Mill Creek (right of way)	55	566	1.2	525	70	15	15
Kootenai Springs Ranch (west right of way)	65	55	0.9	26	54	10	36
Sweathouse Creek (right of way)	60	503	0.8	219	52	4	44
Bear Creek South (right of way)	57	509	0.4	140	68	7	25
Mountain Gallery (north right of way)	56	440	0.3	64	45	4	51
Fun Park (west right of way)	55	556	0.2	57	52	3	45

Right of Way Camera Location	**Mile Post**	**Camera Days**	**Deer Per Day**	**Successful Crossings**	**Success Rate (%)**	**Rate of Repellency (%)**	**Parallel Rate (%)**
Lupine (south right of way)	56	172	0.1	16	80	15	5
Mountain Gallery (south right of way)	56	587	0.06	24	61	3	36
Lupine (north right of way)	56	204	0.005	0	0	100	0
Habitat Camera Location	**Mile Post**	**Camera Days**	**Deer Per Day**				
McCalla Creek South (habitat)	65	93	5.0				
Indian Prairie Loop (north habitat)	63	78	4.7				
Indian Prairie Loop (south habitat)	63	150	4.5				
Big Creek (habitat)	61	260	2.2				
Axmen Propane (north habitat)	61	212	1.5				
Lupine (west habitat)	56	382	1.3				
Bear Creek North (habitat)	58	454	0.6				
Lupine (east habitat)	56	385	0.6				
Axmen Propane (south habitat)	61	176	0.4				

2.2.2. Post-construction Monitoring

Post-construction monitoring of wildlife crossing structures is ongoing. White-tailed deer use of wildlife crossing structures at individual camera locations is presented in Table 4. During this study, cameras recorded individual white-tailed deer successfully moving through wildlife crossing structures on 9,351 occasions (this number includes data from Bear Creek South, structure, reported in Table 3). The order of camera locations is based on success per day. Camera data reported were analyzed through March 3, 2012.

2.2.3 Control Monitoring

At Bell Crossing (west camera, control) 2.7 deer per day were recorded. Deer successfully crossed County Road 370 on 1,719 occasions. The success rate was 63%, the rate of repellency was 5%, and the parallel rate was 32%. At Bell Crossing (east camera, control) 2.6 deer per day were recorded. At Big Creek (south camera, control), there were 2.2 deer per day during pre-construction monitoring, 1.3 deer per day during construction, and 1.0 deer per day post-construction. At McCalla Creek South (ramp camera) 5 deer per day were recorded during pre-construction, 0.5 deer per day during construction, and 1.4 deer per day post-construction.

2.3. Anticipated Work

- Install post-construction cameras at Axmen Propane (west camera, mp 61), Bear Creek North (east and west cameras, mp 58), Bear Creek South (east and west cameras, mp 57), Mountain Gallery (east camera, mp 56), Lupine (east and west cameras, mp 56), and Fun Park (west camera, mp 55),
- Reposition cameras at McCalla Creek South (east and ramp cameras, mp 65) and Kootenai Springs Ranch (east camera, mp 65), and
- Ongoing monitoring and data analysis.

Table 4. White-tailed Deer Use of Wildlife Crossing Structures at Individual Camera Locations.

Camera Location	Mile Post	Camera Days	Number of Deer	Success Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Kootenai Creek	66	971	1929	1.9	1846	91	4	5
Dawn's Crossing	70	1197	2117	1.8	2115	96	2	2
Bass Creek Fishing Access	70	1188	1412	1.2	1394	96	3	1
Blodgett Creek	50	682	565	0.8	548	95	2	3
McCalla Creek North (east camera)	66	911	775	0.8	699	87	3	10
Big Creek (southwest camera)	61	205	143	0.6	117	79	16	5
Big Creek (northeast camera)	61	219	129	0.6	121	92	5	3
McCalla Creek North (west camera)	66	873	588	0.5	455	76	12	12
Big Creek (northwest camera)	61	219	57	0.3	55	96	0	4
Big Creek (southeast camera)	61	219	55	0.2	45	78	18	4
McCalla Creek South (east camera)	65	567	230	0.2	124	54	8	38
McCalla Creek South (west camera)	65	606	242	0.2	128	52	16	32
Bass Creek North	71	1136	345	0.1	164	46	7	47
Kootenai Springs Ranch (west camera)	65	510	709	0.08	39	5	11	84
Kootenai Springs Ranch (east camera)	65	568	557	0.07	40	7	7	86
Indian Prairie Loop (west camera)	63	524	620	0.03	14	2	7	91

Camera Location	Mile Post	Camera Days	Number of Deer	Success Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Axmen Propane	61	515	381	0.01	6	2	10	88
Sweathouse Creek (east camera)	60	83	2	0.04	2	100	0	0
Bass Creek South	71	1128	13	0.004	5	36	14	50
Indian Prairie Loop (east camera)	63	128	48	0	0	0	17	83
Mill Creek (east camera)	55	84	0	0	0	0	0	0
Sweathouse Creek (west camera)	60	83	0	0	0	0	0	0

3. White-Tailed Deer Usage Rates of Wildlife Crossing Structures by Type and Across Types

A detailed statistical analysis of white-tailed deer usage rates of wildlife crossing structures by type and across types will be reported when construction of future wildlife crossing structures is completed and data are compiled. Success rates, parallel rates, and rates of repellency may be compared between:

- bridges and culverts
- big bridges and big culverts
- small bridges and small culverts
- big bridges and small bridges
- tall bridges and short bridges
- big culverts and small culverts, and
- concrete box culverts and round corrugated steel culverts.

Multivariate statistics will be used to analyze how variables such as height, width, length, shape, construction material, and human presence or other disturbances may affect usage rates.

3.1. Trends

Seven wildlife crossing structures with the highest success per day values are listed in Table 5. Values for success per day are for the overall structure (successes that were recorded by more than one camera were only counted once). Size descriptions are qualitative, not exact, and are for comparative purposes. This is neither a complete analysis, nor a statistical analysis. The following trends are preliminary and may change:

- Six of the seven wildlife crossing structures in Table 5 are bridges. The average success rate of these six bridges is 83%. At this point in the study, these six bridges appear to facilitate the movement of white-tailed deer.

- Both tall bridges (greater than 2 meters (7 ft.) high) and short bridges (less than 2 meters (7 ft.) high) have high success per day values. All six bridges listed in Table 5 are greater than 5 meters (16 ft.) wide.
- The Bass Creek Fishing Access culvert has a high success per day value and a high success rate. It is greater than 5 meters (16 ft.) high and greater than 5 meters (16 ft.) wide. It has been used by both puma and black bear.
- There are three other culverts (not listed in Table 5) that have success per day values of less than 0.1 and an average success rate of 3%. All three of these culverts are less than 4 meters (13 ft.) high and less than 4 meters (13 ft.) wide.
- There are three bridges (not listed in Table 5) with success per day values of less than 0.1.
- Other species such as puma, red fox, bobcat, and coyote use wildlife crossing structures. Black bear were photographed using six of the seven structures listed in Table 5.
- The majority of the successful wildlife crossing structures was completed before 2010.
- Structures listed in Table 5 have wildlife fencing.

Table 5. Wildlife Crossing Structures with the Highest Success Per Day Values.

Crossing Structure	Success Per Day	Success Rate (%)	Type	Size Description
Kootenai Creek (mp 66)	1.9	91	Bridge	< 2 meters (7 ft.) high > 7 meters (23 ft.) wide
Dawn's Crossing (mp 70)	1.8	96	Bridge	> 3 meters (10 ft.) high > 10 meters (33 ft.) wide
Big Creek (mp 61)	1.3	78-96	Bridge	> 2 meters (7 ft.) high > 10 meters (33 ft.) wide
Bass Creek Fishing Access (mp 70)	1.2	96	Round Corrugated Steel Culvert	> 5 meters (16 ft.) high > 5 meters (16 ft.) wide
McCalla Creek North (mp 66)	1.2	76-87	Bridge	< 2 meters (7 ft.) high > 6 meters (20 ft.) wide
Blodgett Creek (mp 50)	0.8	95	Bridge	> 3 meters (10 ft.) high > 7 meters (23 ft.) wide
McCalla Creek South (mp 65)	0.3	52-54	Bridge	< 2 meters (7 ft.) high > 5 meters (16 ft.) wide

4. Relationships among Wildlife Crossing Structures with Landscape Variables and Crossing Rates

A methodology was developed to quantify landscape variables such as road, traffic, vegetation, topography, and deer pellets at wildlife crossing structures and sites. A Wildlife Crossing Data Collection Sheet is included in Appendix A. Data was collected in 2010 at wildlife crossing structures, wildlife crossing structure sites, and control sites, except for the following: Indian Prairie Loop, Big Creek, and Axmen Propane. Construction activities were occurring at these three locations; and landscape variables there were drastically changed by the recent construction activities. Data will be collected at all structures and sites in 2012.

Vegetation data were collected in 25 plots in a 25 meter grid, on each side of the structure or site (50 total plots, each 25 meters apart). Each plot was a circle with a 2 meter radius. Vegetation was categorized as trees, shrubs, or grasses/non-woody and the percentage cover (density) of each category was visually estimated.

Pellets were counted in the 50 plots at each structure or site as described above, and tabulated as number of piles (a pile was more than 10 pellets) and number of scatters (a scatter was less than 10 pellets). Pellet counts will be analyzed to determine if they can be used as an index or estimate of deer density. Statistical analyses will also explore if pellet data correlate with vegetation and number of deer photographed at the structure or site.

Vegetation characteristics and deer density at each structure and control site may be analyzed in an Akaike Information Criterion (AIC). AIC-based statistics allow multiple statistical models to be built. The AIC software selects the most appropriate model that explains deer presence as related to the different landscape variables. Megan Schwender, a graduate student at Utah State University under the direction of Dr. Cramer, conducted vegetation and pellet count analyses in Utah using the same methods as those in this study described above. The AIC model found that mule deer presence was negatively correlated with grass presence, and that the presence of bare ground was the best predictor of mule deer presence within 200 meters of a wildlife crossing structure. The researchers will conduct a literature search to determine how other studies have used this analysis to predict animal presence. This is but one of several statistical analyses to be used.

5. Changes in Animal-Vehicle Collisions between Pre-construction and Post-construction of Wildlife Crossing Structures

5.1 Methods

Generalized Linear Models (GLM) will be used to analyze changes in animal-vehicle collisions (AVC) between pre-construction and post-construction of wildlife crossing structures. A direct comparison of pre-construction and post-construction AVC would be incomplete because deer density and traffic volume change over time. GLM developed for this study will determine how deer density and traffic volume influence AVC and may predict future AVC if there were no wildlife crossing structures, based on pre-construction data. The predicted AVC can be compared to actual AVC once wildlife crossing structures and fencing are completed.

Pre-construction deer density, traffic volume, and AVC data were compiled and summarized. Deer density data sets included aerial abundance surveys and hunter harvest numbers conducted by Montana Fish, Wildlife & Parks (MFWP) in hunting district 260. Aerial surveys were not conducted in 1990, 1994 through 2000, and after 2005. Hunter harvest data were conducted from 1981through 2011. A correlation analysis between aerial survey data and hunter harvest data was conducted because of the incomplete aerial survey data set. Traffic volume was collected by MDT at counters A-047 (mp 72.5) and A-056 (mp 50.8). Counter A-047 did not collect data from June 2004 to August 2005; and counter A-056 did not collect data from May 2008 to May 2010. AVC carcass data to the nearest one-tenth mile was collected by MDT from 1998 to the present.

5.2 Results

Hunter harvest data was significantly correlated to aerial survey data (Pearson's correlation, p=0.86). A plot of annual hunter harvest, traffic volume from counter A-056, and AVC from 1999 to 2007 is presented in Figure 2. A GLM (Poisson distribution and log link function) was used to determine if annual hunter harvest and traffic volume measured by counter A-056 statistically influenced annual AVC from 1999 to 2005. AVC values from 2006 and 2007 were excluded from the GLM because they appear to be outliers (Figure 2). The GLM revealed a positive, significant influence of annual traffic volume (as estimated from counter A-056) on annual AVC ($Z=4.22$, $p<0.0001$) from

1999 to 2005. Deer density as estimated by annual hunter harvest did not significantly influence annual AVC from 1999 to 2005.

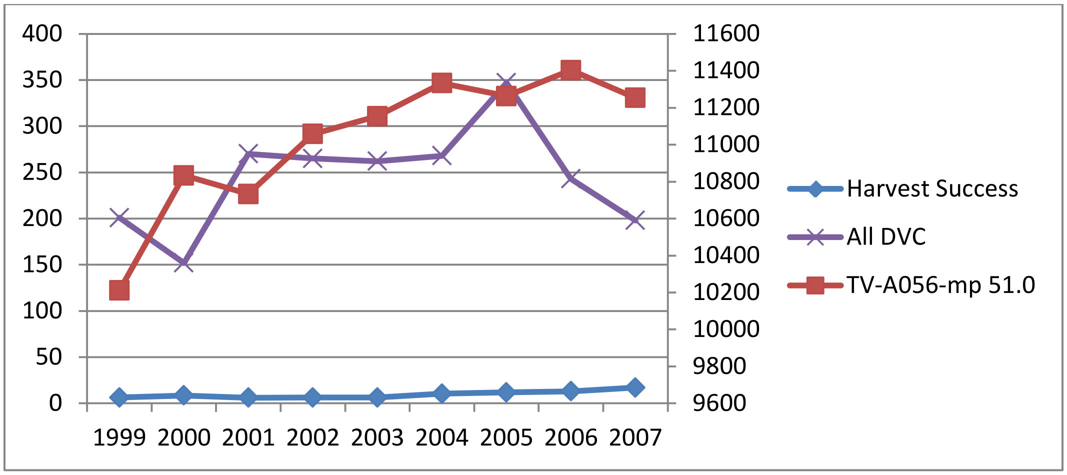

Figure 2. Annual hunter harvest (Harvest Success), animal-vehicle collisions (All DVC), and traffic volume (TV-A056-mp 51.0) on Highway 93 between mile posts 50 and 72 from 1999 to 2007.

5.3 Anticipated Work

The scale of the analysis above is coarse. Future fine scale GLM will explore how monthly deer density and monthly traffic volume influence monthly AVC within one mile of wildlife crossing structure sites that were monitored during pre-construction (mp 54 through 65). Deer density estimates will utilize pre-construction monitoring camera data summarized as deer per month recorded by cameras at each site. These detailed models will account for mixed effects and many zeros in the data. These models will then be used to predict AVC for the study post-construction.

6. Relationships between AVC Numbers and Wildlife Crossing Structures over Time and Space, Kernel Density Analysis

Additional kernel density analysis will continue as new wildlife crossing structures are completed and AVC data are collected.

7. The Wildlife Society Meeting

We presented a slide show at the Montana Chapter of The Wildlife Society meeting in Great Falls on March 2, 2012.

Major Task Progress

Task	Description	Estimated Span of calendar years Estimated after kickoff	Cost	Total billed to date	Percentage complete: based on percentage complete & billed this report as a % of original budget
1	Task 1 Purchase equipment	Oct 1, 08 - Aug 31, 09	$49,650	43,968	89%
2	Task 2 Install equipment…	Oct 9, 08 – Aug 31, 09	6,300	6,300	100%
3	Task 3 Monitor wildlife movement	Nov 1 08 – May 1, 09, 6 months	18,105	18,105	100%
4	Task 4 Obtain & analyze current a-v-c	Fall, 08 - Aug 31, 09	8,520	8,520	100 %
5	Task 5 Hold public meeting	Summer 09	Not applicabl e	Not applicable	Not applicable
6	Task 6 Create a-v-c prediction models	Spring/ Summer/ Fall 09	9,880	989	10%
7	Task 7 Monitor wildlife movement	May 1, 09- April 30 '10 = 12 months	41,810	41,810	100%
8	Task 8 Create Interim Report	Aug 09	3,720	3,720	100%
9	Task 9 Hold public meeting	Summer '10	2,760	2,760	100%
10	Task 10 Monitor wildlife movement	May 1 10 – April 30 '11 = 12 months	40,560	40,560	100%
11	Task 11 Create Interim Report	Jan 1 '10- Dec 31 '10	3,720	3,720	100%

Task	Description	Estimated Span of calendar years Estimated after kickoff	Cost	Total billed to date	Percentage complete: based on percentage complete & billed this report as a % of original budget
12	Task 12 Analyze pre-construction data	July ‘09 – June ‘10	13,360	5,568	42%
13	Task 13 Reinstall Equipment	June ‘10 – July ‘11	2,760	2,760	100%
14	Task 14 Monitor Wildlife Movement	May ‘11 – April ‘30 12	40,560	37,180	92%
15	Task 15 Create Interim Report	Jan 1 ’11 – Dec 31 ‘11	3,720	3,720	100%
16	Task 16 Analyze pre-construction data & compare to predicted	June 1 ’12 – Dec 31 ‘13	14,800		
17	Task 17 Hold public meeting-Changed to re-install cameras	2012	3,690	1,845	50%
18	Task 18 Monitor wildlife movement	May 1, 2012- April 30, 2013	40,560		
19	Task 19 Create Interim Report	Jan 1 2012 – Dec 31 2012	3,720		
20	Task 20 Hold public meeting	2013	2,760	na	na
21	Task 21 Monitor wildlife movement	May 1, 2013- April 30, 2014	40,560		
22	Task 22 Create Interim Report	Jan 1 2013 – Dec 31	2,080		

Task	Description	Estimated Span of calendar years Estimated after kickoff	Cost	Total billed to date	Percentage complete: based on percentage complete & billed this report as a % of original budget
		2013			
23	Task 23 Hold public meeting	2014	2,760	na	na
24	Task 24 Monitor wildlife movement	May 1, 2014- April 30, 2015	40,560		
25	Task 25 Create Interim Report	Jan 1 2014 – Dec 31 2014	2,080		
26	Task 26 Analyze avc data and compare results with expected	2014 - June 30, 2015	18,800		
27	Task 27 Hold public meeting	2015	2,760	na	na
28	Task 28 Submit draft final report	June 30 2015	16,520		
29	Task 29 Meet with MDT officials	Summer 2015	3,680		
30	Task 30 Submit final report	Sept 30 2015	27,040		
	Total		467,795		

* na = not applicable

Appendix A

Wildlife Crossing Data Collection Sheet

Road	**Site – Mile Post**	**Camera #**
GPS: Elevation	**Coordinates**	

Structure Variables

Type of Structure:		
Divided Bridge with median		Box culverts – 2 with median
Single Bridge 4 lane		Box culvert one continuous
		Corrugated Steel pair with median
		Corrugated Steel continuous
Sidewalks?	**Width of sidewalk**	**Sidewalk substrate**
Stream present?	**Width of stream** With High flow With Low flow	**River Speed** High volume – high speed Medium volume – medium flow Low speed – low volume
	River Substrate: Sand/ Rocks/ Boulders	

Height	**Width**	**Length**

Road Variables

# Road Lanes	**Road width**	
Guard rails present?	Guard rail length – NW corner	Guard rail length – NE corner
	Guard rail length – SW corner	Guard rail length – SE corner
Fencing – wildlife Fencing present?	**Length of fence** West side or North side:	**Length of fence** East or South side:

Rail Way Track Present Nearby?	How many tracks?

Distance to tracks from structure:	

Traffic Volume

Time of day:	Number of vehicles in 15 minutes:
Average # vehicles per hour	
Time of day:	Number of vehicles in 15 minutes:
Average # vehicles per hour	

Landscape Variables

Topography

Road raised above landscape
Road is level with landscape
Road is below landscape – hills on both sides
Road has hill on one side and is either level or below landscape on other
Comments

Land cover – Dominant Type

West-North Side

Open meadow – bare ground	Water-wetland-stream-lake
Open forest mix	Coniferous forest
Deciduous forest	Pinyon-Juniper

East-South Side

Open meadow – bare ground	Water-wetland-stream-lake
Open forest mix	Coniferous forest
Deciduous forest	Pinyon-Juniper

Water Body Presence

Is there a water body –feature within 100 m? Describe:

Vegetation Categories

Four vegetation classes: grass; forb; shrub; tree

Percentage classes: 0%; 1-6%; 7-25%; 26-50%; 51-75%; 76-93%, 94-99%, 100%

Vegetation Transects

Transect 1A – Road right of way

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				

Shrubs				
Trees				

Transect 1B

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 1C

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 1D

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 2A

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 2B

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 2C

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Transect 2D

	Plot 1	Plot 2	Plot 3	Plot 4
Grasses				
Shrubs				
Trees				

Pellet Counts

Side of Road:

Transect #	Plot 1	Plot 2	Plot 3	Plot 4

Side of Road:

Transect #	Plot 1	Plot 2	Plot 3	Plot 4

Side of Road:

Transect #	Plot 1	Plot 2	Plot 3	Plot 4

Side of Road:

Transect #	Plot 1	Plot 2	Plot 3	Plot 4