Montana US Highway 93 South Wildlife Crossings Research

MDT # HWY – 308445-RP

2011 First Quarter Progress Report

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Prepared for the Montana Department of Transportation

April 30, 2011

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1. Study Area and Purpose

The Montana Department of Transportation (MDT) installed 11 large wildlife crossing structures along US Highway 93 South between Florence and Hamilton from 2004 to 2010. Eight additional wildlife crossing structures will be installed over the coming years. Details of the 11 existing wildlife crossing structures and eight future wildlife crossing structure sites are presented in Table 1. A map of the study area showing the locations of existing wildlife crossing structures and future wildlife crossing structure sites is presented in Figure 1.

The purpose of this research is to determine:

1. white-tailed deer (*Odocoileus virginianus*) usage rates of existing wildlife crossing structures and future wildlife crossing structures,
2. white-tailed deer usage rates of wildlife crossing structures by type and across types (including height, width, and length),
3. relationships among wildlife crossing structures with landscape variables and crossing rates,
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 36% 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. Existing Wildlife Crossings Structures and Future Wildlife Crossing Structure Sites, US Highway 93 South, Montana.

Existing 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
Axmen Propane	2010	61	Concrete Box Culvert
Blodgett Creek	2008	50	Bridge
Future Sites	**Expected Completion**	**Approximate Mile Post**	**Structure Type**
Big Creek	2011	61	Bridge
Sweathouse Creek	2011	60	Bridge
Bear Creek North	2012	58	Bridge
Bear Creek South	2012	57	Bridge
Lupine	2012	56	Culvert
Mountain Gallery	2012	56	Culvert
Fun Park	2012	55	Culvert
Mill Creek	2011	55	Bridge

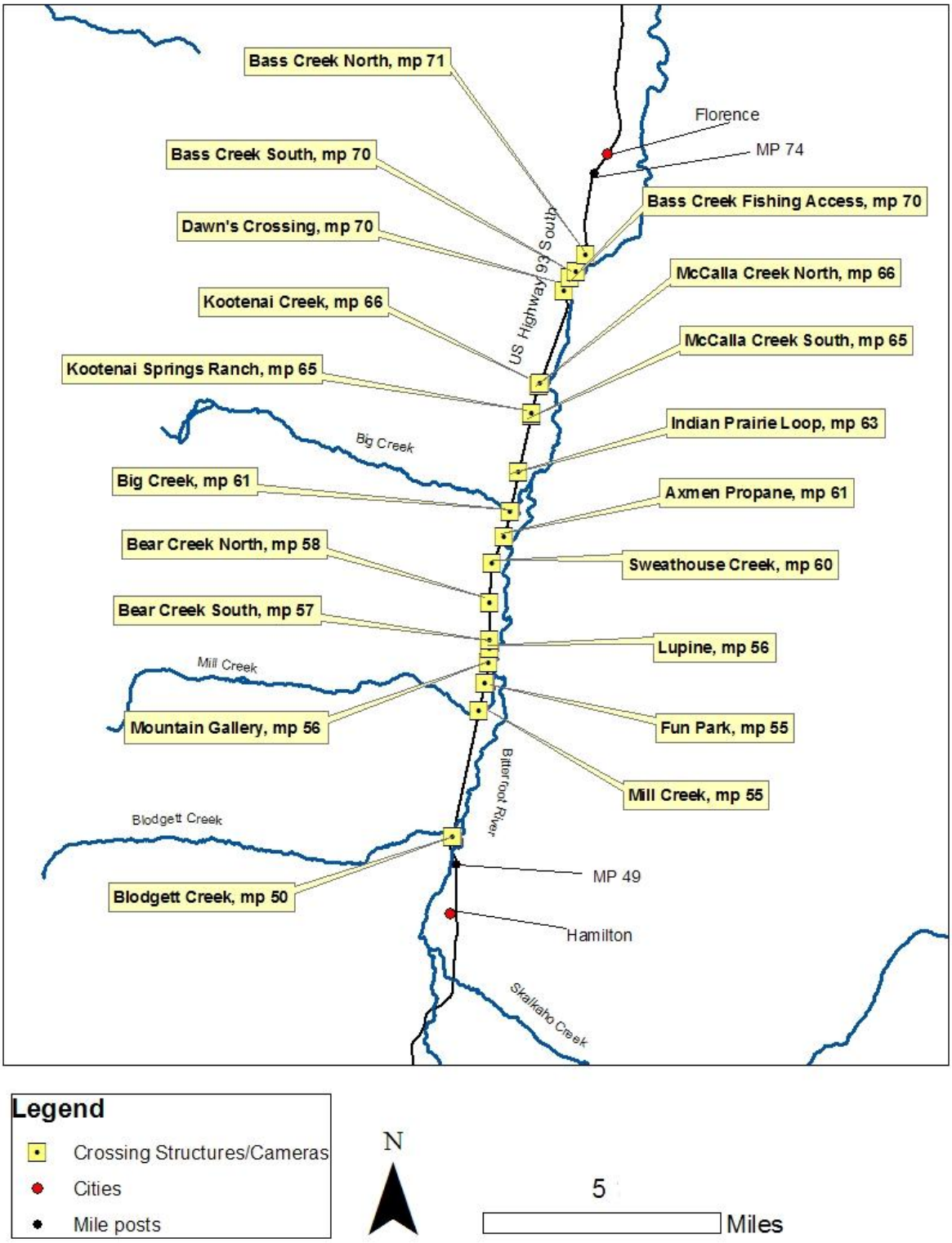

Figure 1. Map of US Highway 93 South Study Area and Locations of Existing and Future Wildlife Crossing Structures, Montana.

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

2.1. Methods

Wildlife usage rates were determined by monitoring existing wildlife crossing structures and future wildlife crossing structure sites with Reconyx Professional Cameras, Model PC85. Cameras are triggered by motion and take pictures of large and small animals, day and night. All cameras, with one exception, were installed inside metal telephone-utility boxes. Each box was secured by a cable, locked to the camera on one end and buried in concrete at the other. All cameras were also secured by electronic code locks. The camera at Kootenai Creek (mp 66) was locked in a metal Reconyx Bear Box mounted on a large fence post and secured with locked cables.

A single camera was installed near one entrance of the following existing 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), Indian Prairie Loop (mp 63), Axmen Propane (mp 61), and Blodgett Creek (mp 50). Two cameras were installed, one near each entrance, of the following existing wildlife crossing structures: McCalla Creek North (mp 66), McCalla Creek South (mp 65), and Kootenai Springs Ranch (mp 65). Cameras were placed near the entrances of existing 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.

Two cameras were installed at each of the future wildlife crossing structure sites. One camera was placed as near as possible to any current structures (existing culverts or bridges) or the location of the future wildlife crossing structure. A second camera was placed approximately 25 to 75 meters away. Cameras were positioned so that the first camera could capture animal usage of any current structure or other movements nearby, and the second camera could record animal movements as they approached or

departed the road way. As construction of new wildlife crossing structures is completed, pre-construction cameras will be removed or renamed.

Two cameras, Bell Crossing (east and west cameras) were also installed near a bridge over an unnamed spring run on County Road 370, approximately one-quarter mile east of the Bitterroot River. This site was selected as a control to help evaluate changes in the white-tailed deer population over time in a location where road construction is not scheduled to occur. Additional control sites may be selected in the future.

This reporting period, eleven cameras were removed from the following locations as construction activities progressed: Sweathouse Creek (north camera, mp 60), Bear Creek North (east and west cameras, mp 58), Bear Creek South (north and south cameras, mp 57), Mountain Gallery (north and south cameras, mp 56), Fun Park (east and west cameras, mp 55), and Mill Creek (north and south cameras, mp 55) Locations, approximate mile posts, and installation dates of currently installed cameras are presented in Table 2.

Table 2. Cameras Currently Installed at Existing Wildlife Crossing Structures and Future Wildlife Crossing Structure Sites on US Highway 93 South, Montana, and a Nearby Control Site.

Camera Location	Approximate Mile Post	Date Installed
Bass Creek North	71	Oct. 10, 08
Bass Creek South	70	Nov 22, 08
Bass Creek Fishing Access	70	Nov 22, 08
Dawn's Crossing	70	Nov 23, 08
Kootenai Creek	66	Apr 21, 09
McCalla Creek North (east camera)	66	Apr 22, 09
McCalla Creek North (west camera)	66	Apr 22, 09
McCalla Creek South (west camera)	65	June 16, 10
McCalla Creek South (ramp camera)	65	June 16, 10
McCalla Creek South (east camera)	65	July 30, 10
Kootenai Springs Ranch (east camera)	65	June 10, 10
Kootenai Springs Ranch (west camera)	65	July 29, 10
Indian Prairie Loop (west camera)	63	Sept 27, 10
Big Creek (north camera, construction)	61	Mar 1, 10
Big Creek (south camera, construction)	61	Mar 1, 10
Axmen Propane (east camera)	61	Sept 28, 10
Lupine (east camera)	56	Mar 15, 10
Lupine (west camera)	56	Mar 15, 10
Blodgett Creek	50	Mar 15, 10
Bell Crossing (east camera)	CR 370	May 29, 09
Bell Crossing (west camera)	CR 370	May 29, 09

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

- deer per day = the total number of deer observed at a future wildlife crossing structure site divided by the number of days the camera was in operation
- success per day = the total number of deer observed successfully using an existing wildlife crossing structure divided by the number of days the camera was in operation
- success rate = the total number of deer moving through the structure or onto the roadway at future structures, divided by the total number of deer recorded at the structure or site
- rate of repellency = the total number of deer repelled at existing crossing structures or repelled at future crossing sites divided by the total number of deer recorded at the structure or site
- parallel rate = the total number of deer moving parallel to structures or sites divided by the total number of deer recorded at the structure or site.

2.2. Results

Twenty-four complete pre-construction data sets are summarized in Table 3. The order of camera locations is based on the number of deer per day photographed at each camera site.

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

Camera Location	Mile Post	Camera Days	Deer Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
McCalla Creek South (south camera)	65	93	5.0	44	9	3	88
Indian Prairie Loop (north camera)	63	78	4.7	0	0	0	100
Indian Prairie Loop (south camera)	63	150	4.5	0	0	0	100
Bear Creek South (north camera)	57	629	2.6	1662	98	1	1
McCalla Creek South (north camera)	65	115	2.2	21	9	7	84
Big Creek (south camera)	61	260	2.2	0	0	0	100
Kootenai Springs Ranch (east camera)	65	107	2.1	78	32	8	60
Fun Park (east camera)	55	490	1.5	606	79	11	10
Axmen Propane (north camera)	61	212	1.5	0	0	0	100
Mill Creek (south camera)	55	566	1.2	525	70	15	15
Sweathouse Creek (north camera)	60	481	1.1	65	12	1	87
Kootenai Springs Ranch (west camera)	65	55	0.9	26	54	10	36
Sweathouse Creek (south camera)	60	503	0.8	219	52	4	44
Big Creek (north camera)	61	277	0.8	33	14	14	72
Bear Creek North (east camera)	58	454	0.6	29	11	2	87
Bear Creek South (south camera)	57	509	0.4	140	68	7	25
Axmen Propane (south camera)	61	176	0.4	4	6	3	91
Mountain Gallery (north camera)	56	440	0.3	64	45	4	51

Camera Location	Mile Post	Camera Days	Deer Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Fun Park (west camera)	55	556	0.2	57	52	3	45
Lupine (south camera)	56	172	0.1	16	80	15	5
Mill Creek (north camera)	55	568	0.07	1	3	0	97
Mountain Gallery (south camera)	56	587	0.06	24	61	3	36
Bear Creek North (west camera)	58	506	0.03	2	14	14	72
Lupine (north camera)	56	204	0.005	0	0	100	0

Nine complete construction data sets are summarized in Table 4. The order of camera locations is based on the number of deer per day photographed at each camera site.

Table 4. Summary of Complete Construction Data Sets.

Camera Location	Mile Post	Camera Days	Deer Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
McCalla Creek South (ramp camera, construction)	65	93	0.5	20	44	22	34
Axmen Propane (north camera, construction)	61	52	0.4	0	0	0	100
Axmen Propane (south camera, construction)	61	49	0.4	0	0	0	100
Kootenai Springs Ranch (west camera, construction)	65	152	0.2	5	18	4	78
Kootenai Springs Ranch (west structure camera, construction)	65	46	0.2	0	0	0	100
Kootenai Springs Ranch (east camera, construction)	65	146	0.2	4	17	0	83
Sweathouse Creek (north camera, construction)	60	115	0.2	0	0	39	61
McCalla Creek South (west camera, construction)	65	199	0.1	16	67	8	25
Kootenai Springs Ranch (east structure camera, construction)	65	47	0.06	0	0	0	100

White-tailed deer use of existing wildlife crossing structures is compiled in Table 5. Cameras recorded white-tailed deer successfully moving through existing wildlife crossing structures on nearly 6,600 occasions (this number includes data from Bear Creek South, north camera, reported in Table 3). The order of camera locations is based on success per day. Camera data reported were analyzed through February 28, 2011.

Table 5. White-tailed Deer Use of Existing Wildlife Crossing Structures.

Camera Location	Mile Post	Camera Days	Number of Deer	Success Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Kootenai Creek	66	601	1390	2.2	1348	93	3	4
Dawn's Crossing	70	827	1488	1.8	1450	96	2	2
Bass Creek Fishing Access	70	818	942	1.1	905	94	5	1
McCalla Creek North (east camera)	66	616	464	0.7	441	90	3	7
Blodgett Creek	50	324	250	0.7	241	96	1	3
McCalla Creek North (west camera)	66	502	381	0.6	295	76	15	9
McCalla Creek South (west camera)	65	236	116	0.2	53	45	19	36
McCalla Creek South (east camera)	65	198	86	0.2	38	44	8	48
Bass Creek North	71	766	230	0.1	96	40	7	53
Indian Prairie Loop	63	155	253	0.1	12	5	10	85
Kootenai Springs Ranch (east camera)	65	260	307	0.1	27	9	7	84
Kootenai Springs Ranch (west camera)	65	164	247	0.1	23	9	7	84
Bass Creek South	71	802	10	0.005	4	36	9	55
Axmen Propane	61	154	84	0	0	0	12	88

White-tailed deer use of future wildlife crossing structure sites is compiled in Table 6. Lupine (east and west cameras, mp 56) is the only site where pre-construction monitoring is still occurring. Big Creek (north and south cameras, construction, mp 61) is the only site where construction monitoring is still occurring. The order of camera locations is based on the number of deer per day at each camera location. Camera data reported were analyzed through February 28, 2011.

Table 6. White-tailed Deer Use of Future Wildlife Crossing Structure Sites.

Camera Location	Mile Post	Camera Days	Deer Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Big Creek (north camera, construction)	61	350	1.8	0	0	0	100
Lupine (west camera)	56	347	1.5	0	0	0	100
Big Creek (south camera, construction)	61	364	1.5	0	0	0	100
Lupine (east camera)	56	334	0.7	0	0	0	100

2.3. Anticipated Work

- Install, remove, and/or rename cameras as needed during and after construction
- Ongoing monitoring and data analysis.

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 completed as construction of future wildlife crossing structures is completed and data are compiled. As future wildlife crossing structures are installed and additional photographic data are collected this analysis will be completed, and will include variables such as height, width, and length.

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

A methodology to measure and quantify variables such as structure, road, traffic, landscape, vegetation, and deer pellet counts at existing and future wildlife crossing structures was developed. Data was collected in 2010 at existing wildlife crossing structures and future wildlife crossing structure 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 these three locations after construction is completed. Collected data and usage rates will then be analyzed using multivariate statistics.

5. Changes in Animal-Vehicle Collisions Between Pre-Construction and Post-Construction of Wildlife Crossing Structures

Generalized Linear Models (GLMs) will be used to analyze changes in AVC between pre-construction and post-construction of wildlife crossing structures. GLMs will include multiple continuous predictors such as traffic volume and deer density in addition to categorical co-variate pre-construction and post-construction AVC data. GLMs will be completed when future wildlife crossing structures are completed and post-construction AVC data, traffic volume, and deer density data are analyzed.

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

Additional kernel density analysis will continue in 2011 as new wildlife crossing structures are completed and AVC data are collected.

Major Task Progress

Note: Only first 11 tasks of 30 total submitted to MDT pre-study are presented at this time.

Task	Description	Estimated Span of calendar years Estimated after kickoff	Cost	Total billed to date	Percentage complete based on original budget
1	Task 1 Purchase equipment	Oct 1, 08 - Aug 31, 09	$49,650	40,379.91	81.3%
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	7,669.5	90 %
5	Task 5 Hold public meeting	Summer 09	Not applicable	Not applicable	Not applicable
6	Task 6 Create a-v-c prediction models	Spring/ Summer/ Fall 09	9,880	680	6.9%
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	37,180	91.6%
11	Task 11 Create Interim Report	Jan 1 ’10- Dec 31 ‘10	3,720	3,720	100%