Montana US Highway 93 South Wildlife Crossings Research

MDT # HWY – 308445-RP

2012 Annual Report

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1. Study Area and Purpose

The Montana Department of Transportation (MDT) installed 19 large wildlife crossing structures along US Highway 93 South between Florence and Hamilton from 2004 to 2012. Wildlife exclusion fencing was installed during construction at 17 of these structures. This fencing is 8 feet high (2.3 meters) and extends various distances from the entrances of wildlife crossing structures. Fencing was not installed at Bass Creek North and Bass Creek South. Additional details of the 19 wildlife crossing structures 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 61% 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, 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
Bear Creek North	2012	58	Bridge
Bear Creek South	2012	57	Bridge
Mountain Gallery	2011	56	Concrete Box Culvert
Lupine	2012	56	Concrete Box Culvert
Fun Park	2011	55	Concrete Box Culvert
Mill Creek	2011	55	Bridge
Blodgett Creek	2008	50	Bridge

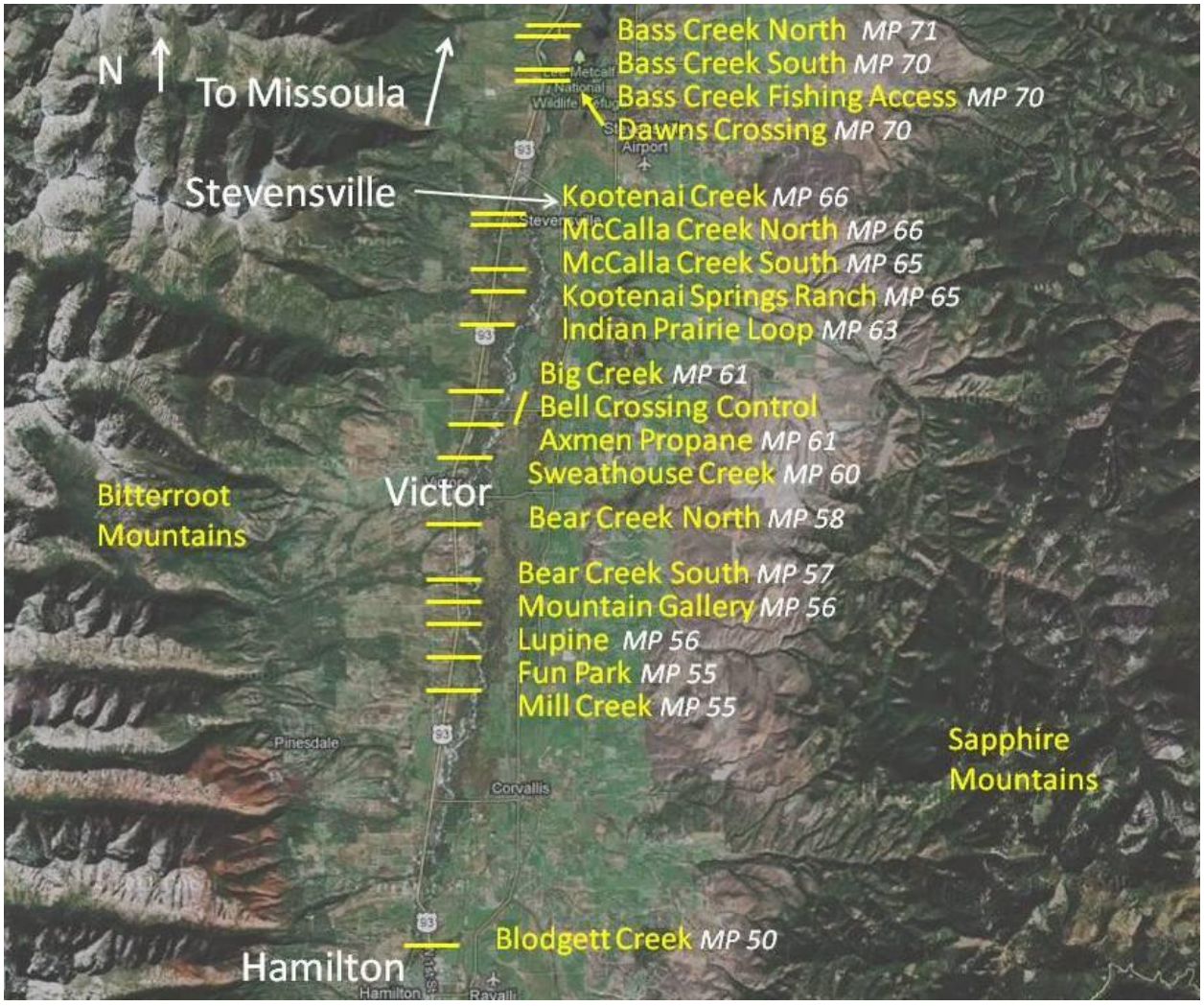


Figure 1. Map of US Highway 93 South Study Area, Montana.

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 large fence posts or trees and secured with locked cables. All cameras were also secured by electronic code locks.

The following calculations were made for each camera location or wildlife crossing structure, 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), 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), Axmen Propane (mp 61), Sweathouse Creek (mp 60), Bear Creek North (mp 58), Mountain Gallery (mp 56), Lupine (mp 56), Fun Park (mp 55), and Mill Creek (mp 55). Lupine (mp 56) was monitored with only one camera after September 13, 2012. Three cameras were installed at Bear Creek South (mp 57) and 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. Structures completed prior to this study were monitored with one camera (McCalla Creek North is an exception). Structures completed during this study were monitored with two or more cameras (Lupine (mp 56) is an exception). 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, wildlife crossing structure construction, and wildlife exclusion fencing 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 Year

During this year, approximately 285,000 images were collected and analyzed. 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 (southwest camera)	61	Aug 12, 2011
Big Creek (south camera, control)	61	Apr 21, 2009
Axmen Propane (east camera)	61	Sept 28, 2010
Axmen Propane (west camera)	61	April 25, 2012
Sweathouse Creek (east camera)	60	Dec 10, 2011
Sweathouse Creek (west camera)	60	Dec 10, 2011
Bear Creek North (east camera)	58	June 25, 2012
Bear Creek North (west camera)	58	June 25, 2012
Bear Creek South (east camera)	57	June 26, 2012
Bear Creek South (west camera)	57	June 26, 2012
Bear Creek South (birch camera)	57	Sept 14, 2012
Mountain Gallery (east camera)	56	April 25, 2012
Mountain Gallery (west camera)	56	Mar 2, 2012
Lupine (west camera)	56	June 26, 2012
Fun Park (east camera)	55	Mar 2, 2012
Fun Park (west camera)	55	April 25, 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 monitoring original bridges 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 deer successfully crossing US Highway 93 on 1,755 occasions 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 all 19 wildlife crossing structures is ongoing. White-tailed deer use of wildlife crossing structures is presented in Table 4. During this study, cameras recorded individual white-tailed deer successfully moving through wildlife crossing structures on 14,265 occasions (this number includes pre-construction data reported in Table 3). The order of camera locations is based on success per day. Camera data reported were analyzed through November 24, 2012.

Appendix A contains trend charts for camera locations at each of the 19 wildlife crossing structures. These charts indicate successful use and total number of deer on a monthly basis over the duration of the study at individual camera locations. Success is defined as the number of occasions that white-tailed deer successfully moved through a wildlife crossing structure. Total is defined as the number of individual deer captured by the camera. There are months where success is greater than total. This occurred when individual deer moved through the structure multiple times during individual events. These charts are preliminary. Seven structures have less than one year of monitoring.

Appendix B contains a table that summarizes the successful use of wildlife crossing structures by carnivores.

2.2.3. Control Monitoring

Control camera data were analyzed through November 24, 2012. At Bell Crossing (west camera, control) 3.3 deer per day were recorded. Deer successfully crossed County Road 370 on 2,655 occasions. The success rate was 65%, the rate of repellency was 6%, and the parallel rate was 29%. At Bell Crossing (east camera, control) 2.7 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 1.2 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 1.2 deer per day post-construction.

Table 4. White-tailed Deer Use of Wildlife Crossing Structures.

Camera Location	Mile Post	Success Per Day	Successful Crossings	Success Rate (%)	Rate of Repellency (%)	Parallel Rate (%)
Bear Creek South	57	4.5	635	94	1	5
Sweathouse Creek	60	2.3	775	92	3	5
Dawn's Crossing	70	2.0	2922	96	2	2
Kootenai Creek	66	1.7	2044	91	4	5
Big Creek	61	1.7	779	81	9	10
Bass Creek Fishing Access	70	1.5	2156	96	3	1
McCalla Creek North	66	1.3	1476	83	6	11
Blodgett Creek	50	0.7	675	95	2	3
Lupine	56	0.6	69	37	12	51
Indian Prairie Loop	63	0.5	286	20	8	72
Mill Creek	55	0.3	102	45	13	42
McCalla Creek South	65	0.2	210	40	16	44
Bass Creek North	71	0.16	228	52	7	41
Kootenai Springs Ranch	65	0.08	64	4	12	84
Mountain Gallery	56	0.08	18	26	14	60
Axmen Propane	61	0.07	27	4	12	84
Bear Creek North	58	0.04	5	15	21	64
Bass Creek South	71	0.01	13	52	16	32
Fun Park	55	0	0	0	8	92

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 data are compiled. Multivariate statistics will be used to analyze how variables such as height, width, length, shape, construction material, presence or absence of wildlife exclusion fencing, length of fencing and guardrails, and human presence or other disturbances may affect usage rates.

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 fecal pellets at wildlife crossing structures and sites. 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 construction activities. This year, landscape variables data was collected again at all 19 structures.

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. This year, 5 additional plots on each side of the structure were sampled (60 total plots).

Fecal pellets were counted in each plot at each structure or site as described above, and tabulated as number of piles (a pile was more than 10 pellets but less than 50 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. 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

Generalized Linear Models (GLM) and Generalized Additive Models (GAM) 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. Models 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.

Work continued this year building GLM and GAM. In order for models to best predict what the AVC would be in the future without wildlife crossings, existing data sets of deer density, traffic volume, and deer carcasses collected from AVC need to be as accurate

and complete as possible. On July 27, 2012, Kari Gunson and Patricia Cramer participated in a conference call with Mark Greenwood of Montana State University concerning data sets and statistical analyses. The accuracy of the three data sets and how the data would be read into statistical software programs were discussed.

In August, Dr. Cramer met with MDT maintenance supervisors Scott Reesman and Tom Marin, and MDT district biologist Pat Basting. When deer carcass data from 1998 through 2010 were plotted, a noticeable dip in the AVC numbers from 2005 through 2008 became a concern for the team. The hunter harvest data of white-tailed deer in this area for this period did not reflect a similar reduction. Scott and Tom informed the team that efforts in carcass data collection did not change over time.

This year, Kari Gunson prepared all available traffic volume data for traffic volume modeling. Dr. Greenwood analyzed the traffic volume data in order to make predictions during periods when individual traffic counters were not operating. Using existing data (Figure 2), a time series modeling approach was employed to provide reasonable predicted values for missing traffic volume data (Figure 3 and Figure 4). Dr. Greenwood will continue to assess these fitted values before they are included in final model. This quarter, Dr. Greenwood developed a GAM based on pre-construction AVC data. This model will be adapted to include predictor variables, traffic volume and deer density. When the best fitting GAM is complete it will predict what AVC would be under specific traffic volumes and deer densities without wildlife mitigation.

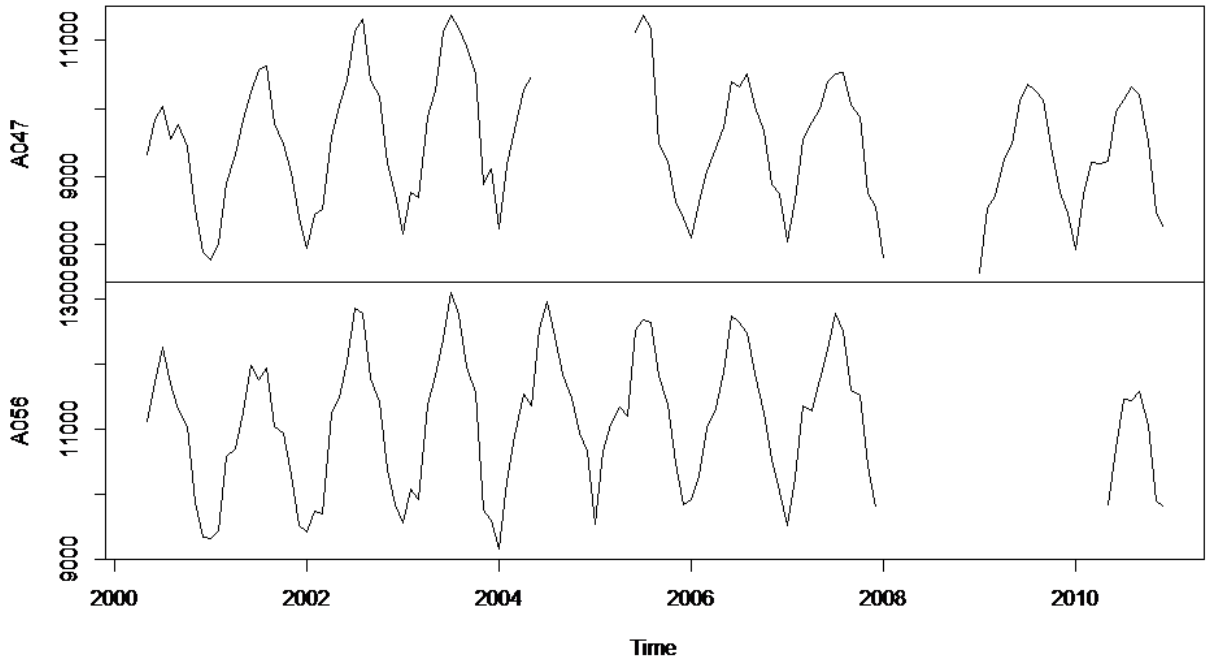


Figure 2. Plot of observed traffic time series. A047 is the traffic counter at mile post 72.5. A056 is the traffic counter at mile post 50.8.

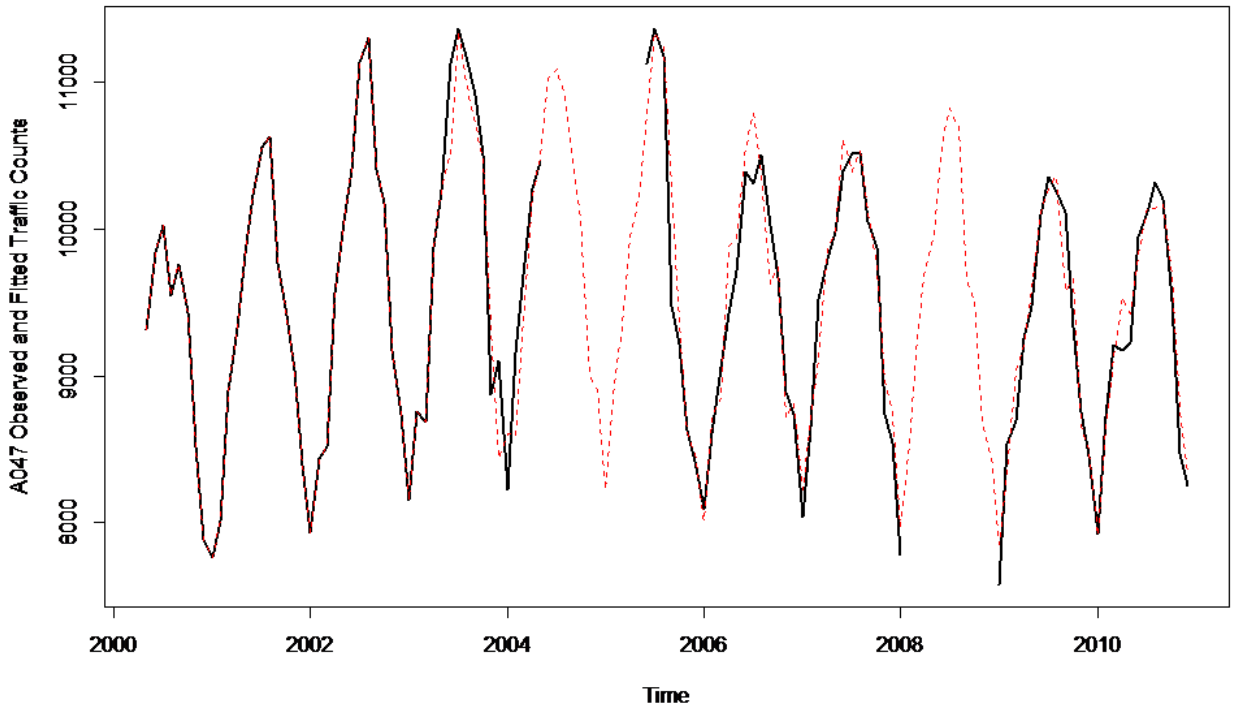


Figure 3. Predicted traffic volumes (in red dotted line) and collected traffic volumes (dark solid line) from traffic counter A047 (mp 72.5).

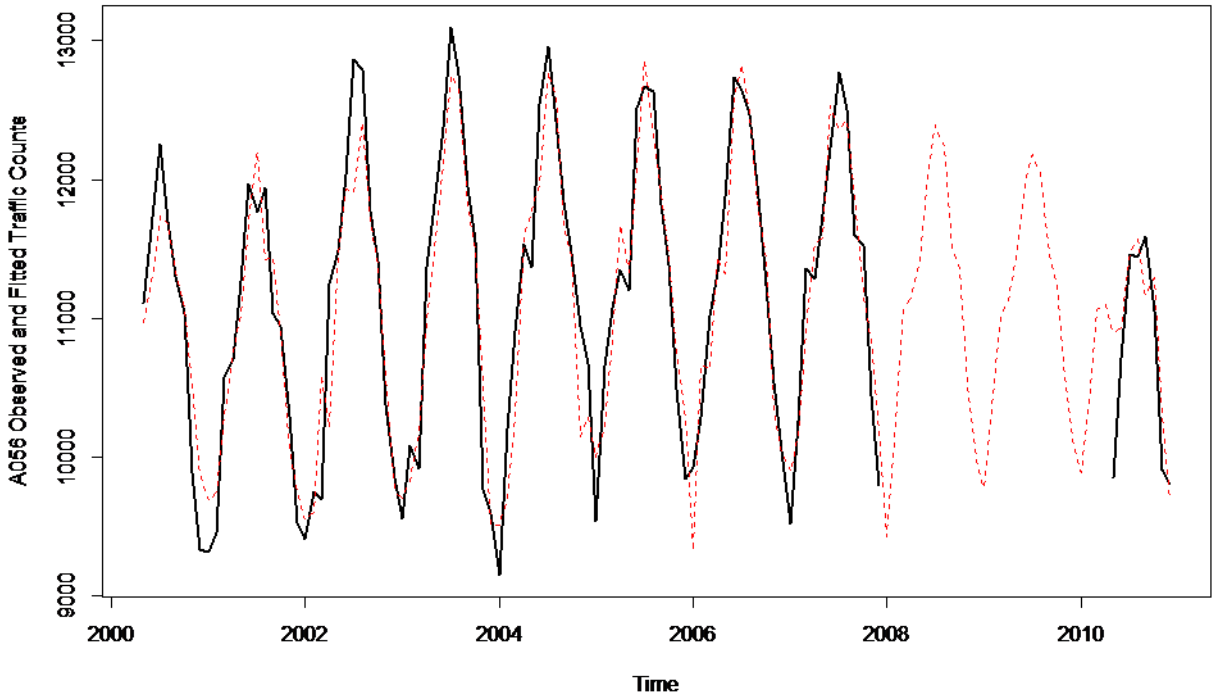


Figure 4. Predicted traffic volumes (in red dotted line) and collected traffic volumes (dark solid line) data at traffic counter A056 (mp 50.8).

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

Ms. Gunson conducted an updated Kernel Density Analysis that indicates AVC numbers over time and space (Figure 5). Wildlife crossing structure type, location, date installed, wildlife fencing, and the names of key areas with high AVC concentrations are indicated. This analysis will continue.

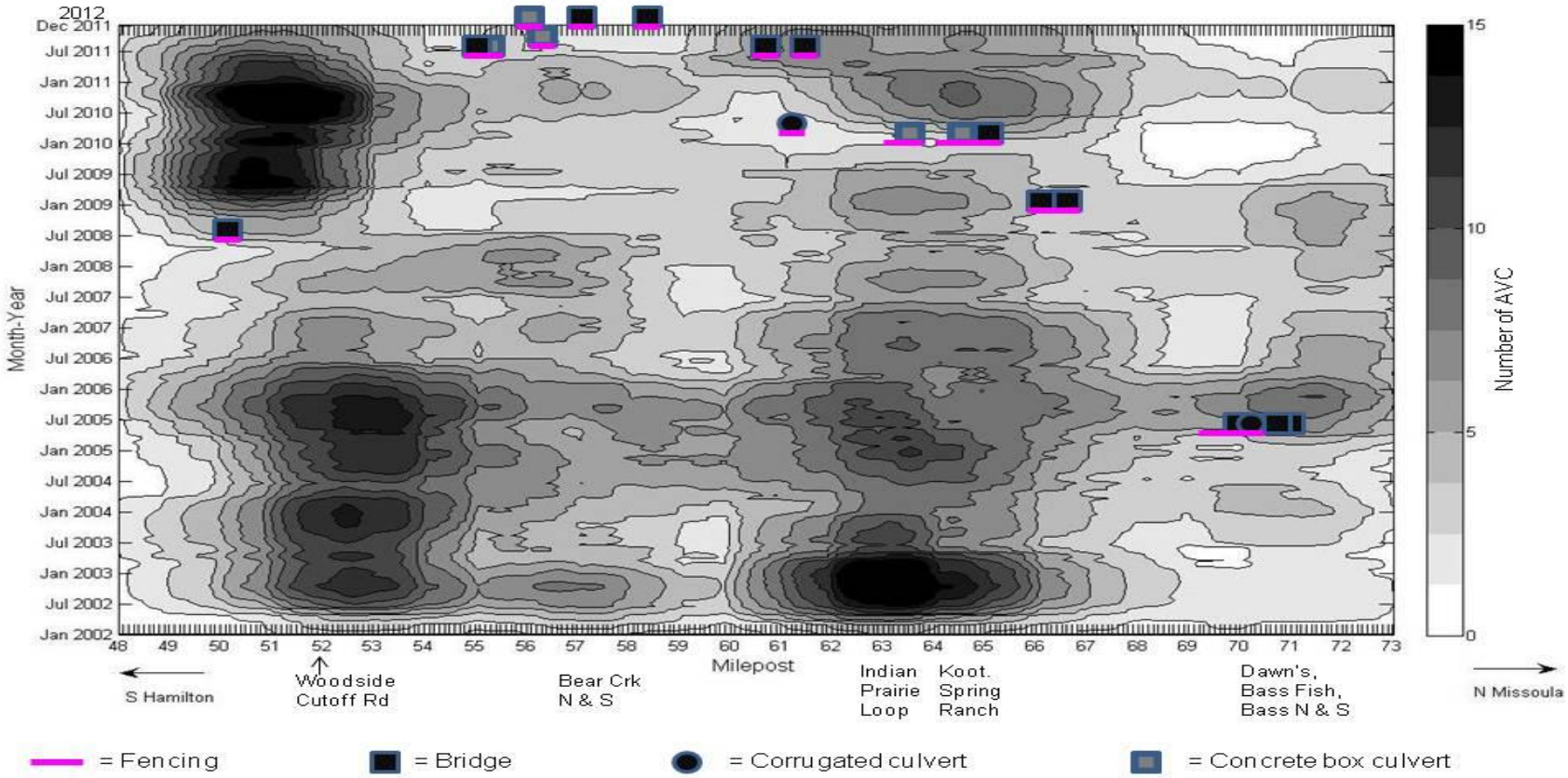


Figure 5. Kernel Density Analysis of AVC carcass data along US 93 South, mp 48 through 73. Darker spots reflect higher carcass counts at specific mile posts at six month intervals. Wildlife crossing structure type, location, date installed, and wildlife fencing are indicated.

Major Task Progress

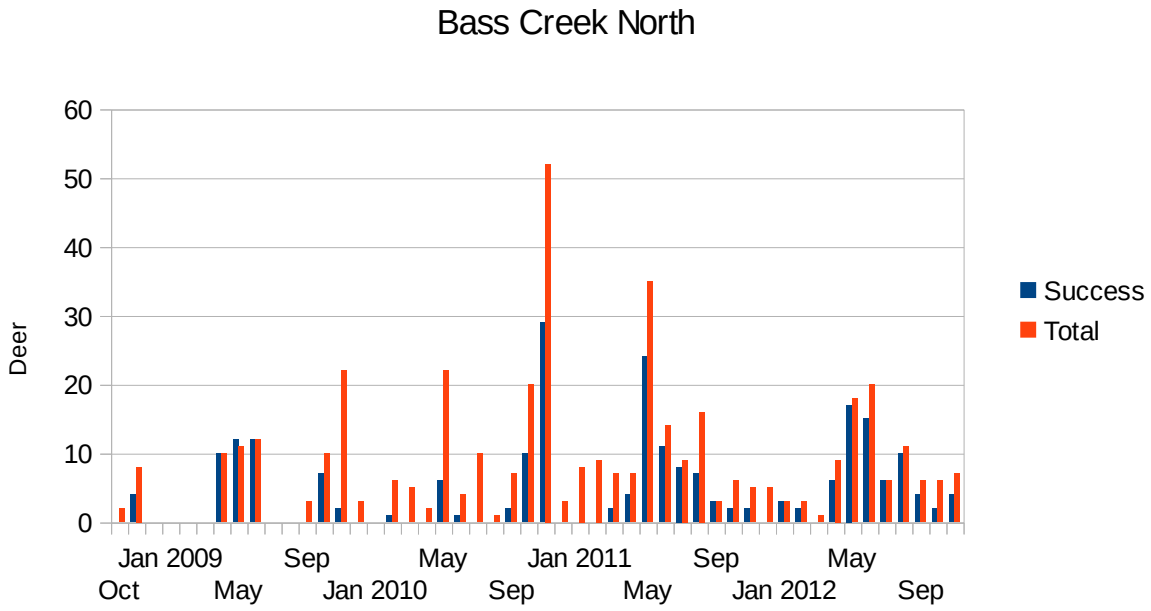
Task	Description	Estimated Span of calendar years Estimated after kickoff	Cost	Total billed to date	Percentage complete: based on percentage complete & billed this report as a % of original budget
1	Task 1 Purchase equipment	Oct 1, 08 - Aug 31, 09	$49,650	48,432	98%
2	Task 2 Install equipment…	Oct 9, 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 applicable	Not applicable	Not applicable
6	Task 6 Create a-v-c prediction models	Spring/ Summer/ Fall 09	9,880	1,842	19%
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	6,051	45%
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	40,560	100%
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	0	0
17	Task 17 Hold public meeting-Changed to re-install cameras	2012	3,690	3,690	100%
18	Task 18 Monitor wildlife movement	May 1, 2012- April 30, 2013	40,560	27,040	67%
19	Task 19 Create Interim Report	Jan 1 2012 – Dec 31 2012	3,720	3,720	100%
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	0	0
22	Task 22 Create Interim Report	Jan 1 2013 – Dec 31	2,080	0	0

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	0	0
25	Task 25 Create Interim Report	Jan 1 2014 – Dec 31 2014	2,080	0	0
26	Task 26 Analyze avc data and compare results with expected	2014 - June 30, 2015	18,800	0	0
27	Task 27 Hold public meeting	2015	2,760	na	na
28	Task 28 Submit draft final report	June 30 2015	16,520	0	0
29	Task 29 Meet with MDT officials	Summer 2015	3,680	0	0
30	Task 30 Submit final report	Sept 30 2015	27,040	0	0
	Total		467,795	263,310	56%

* na = not applicable

Appendix A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Deer
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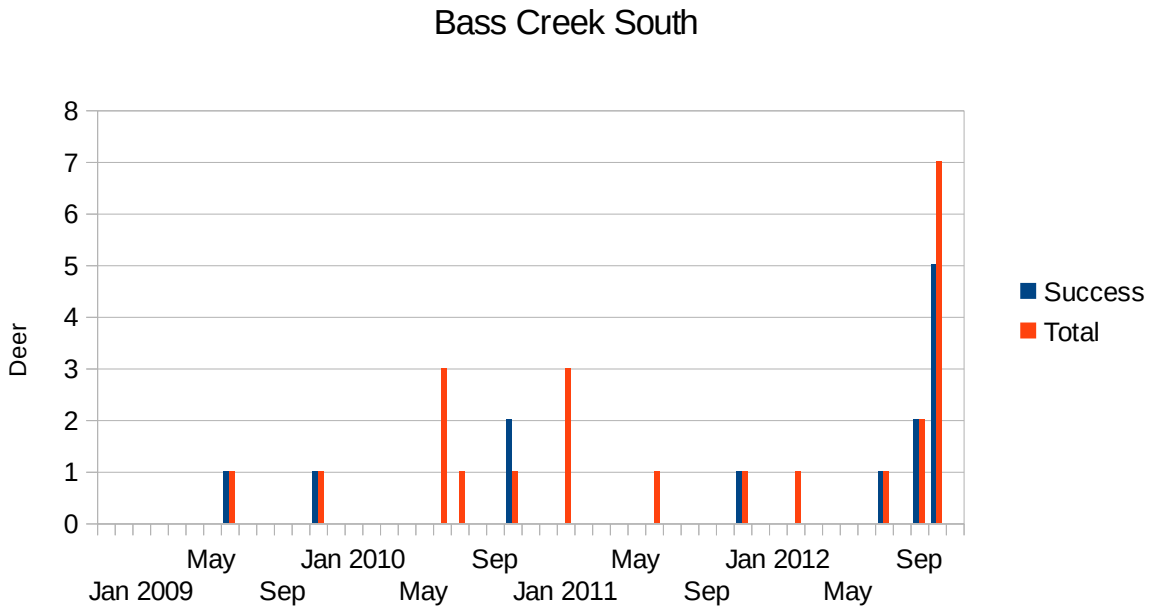
Bass Creek South
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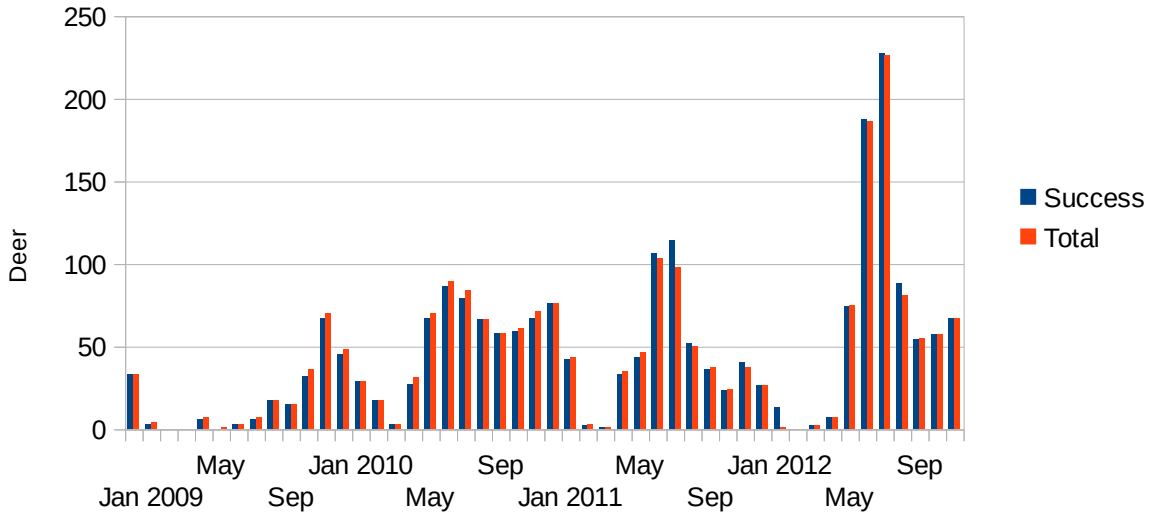
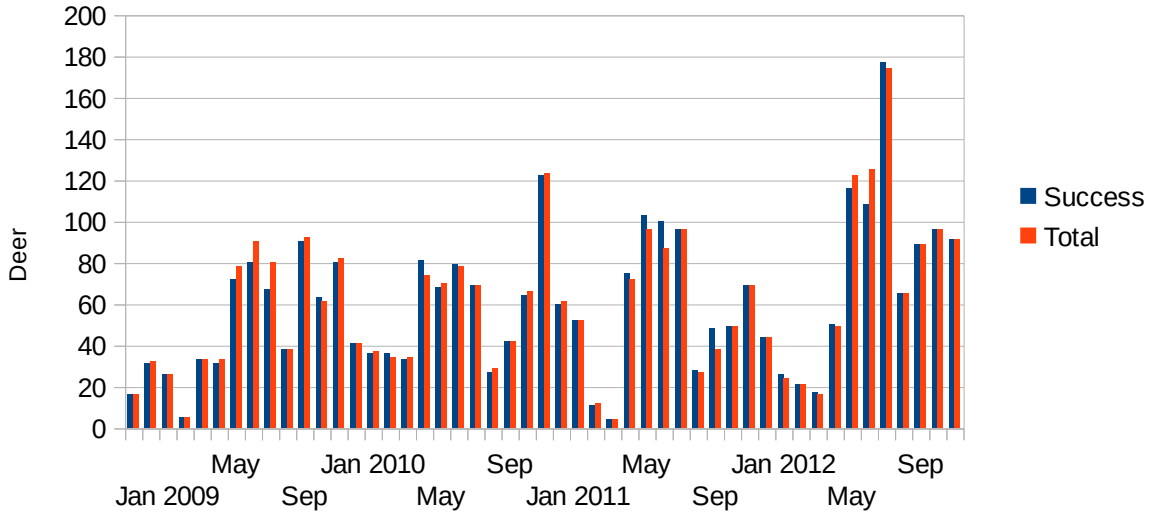
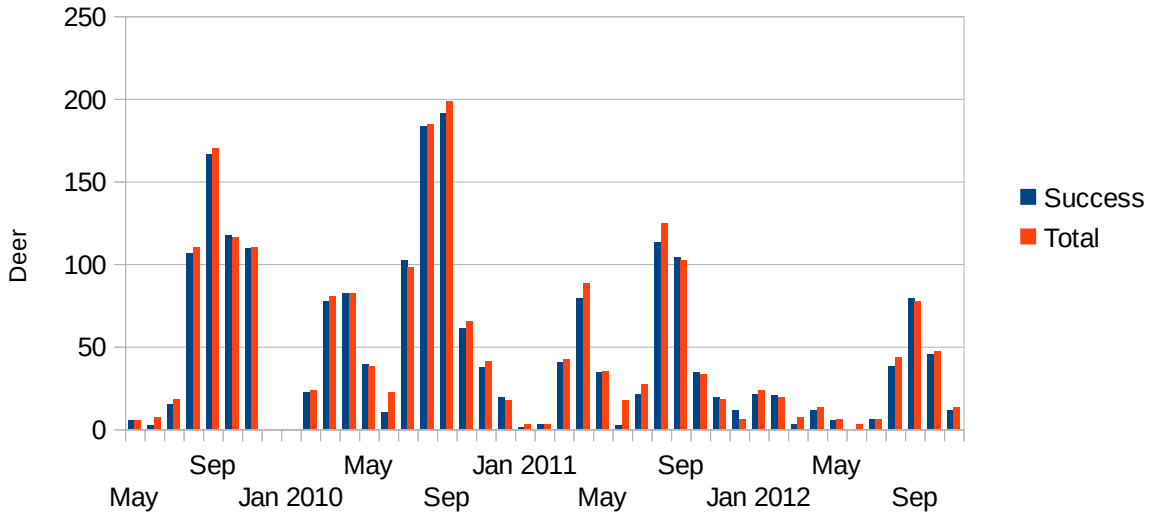
Bass Creek Fishing Access



Dawns Crossing

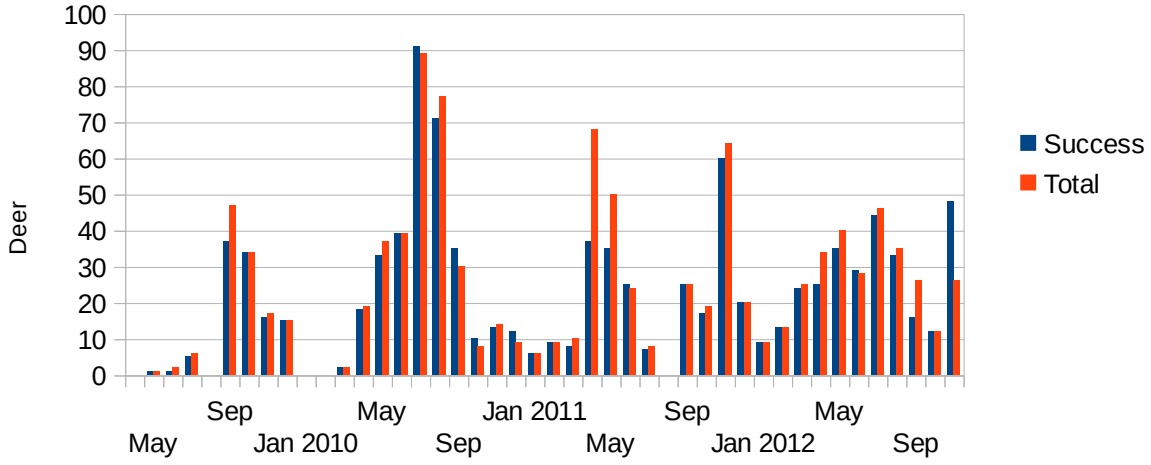


Kootenai Creek

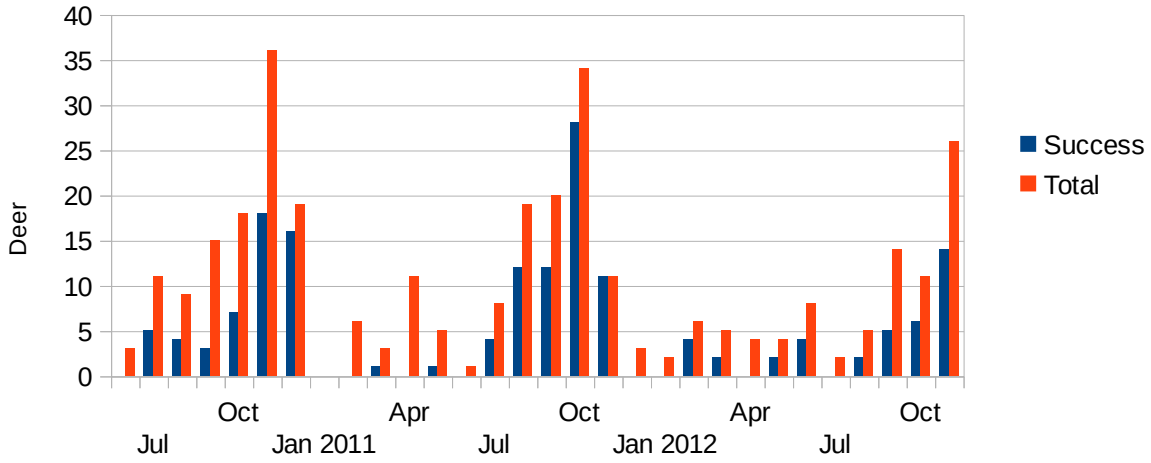


McCalla Creek North

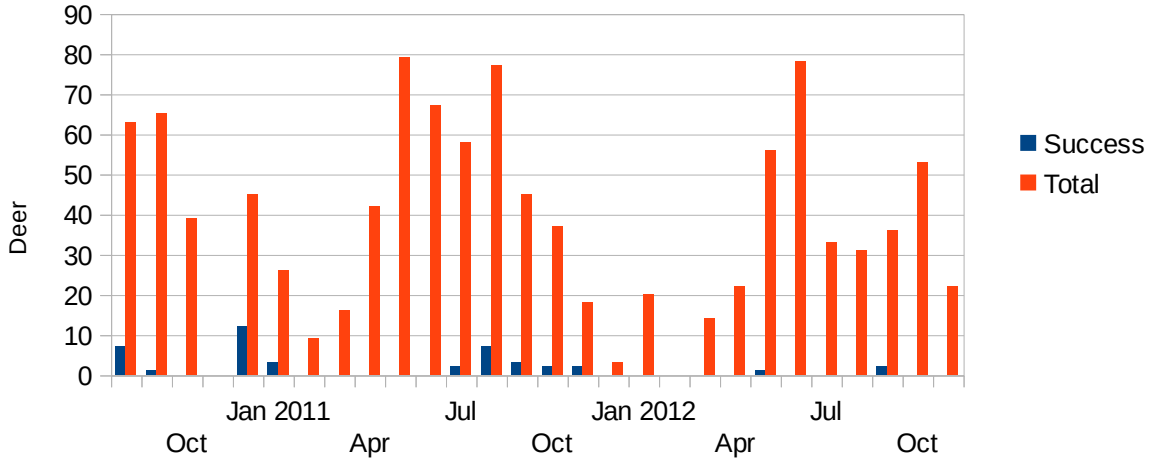
East Camera



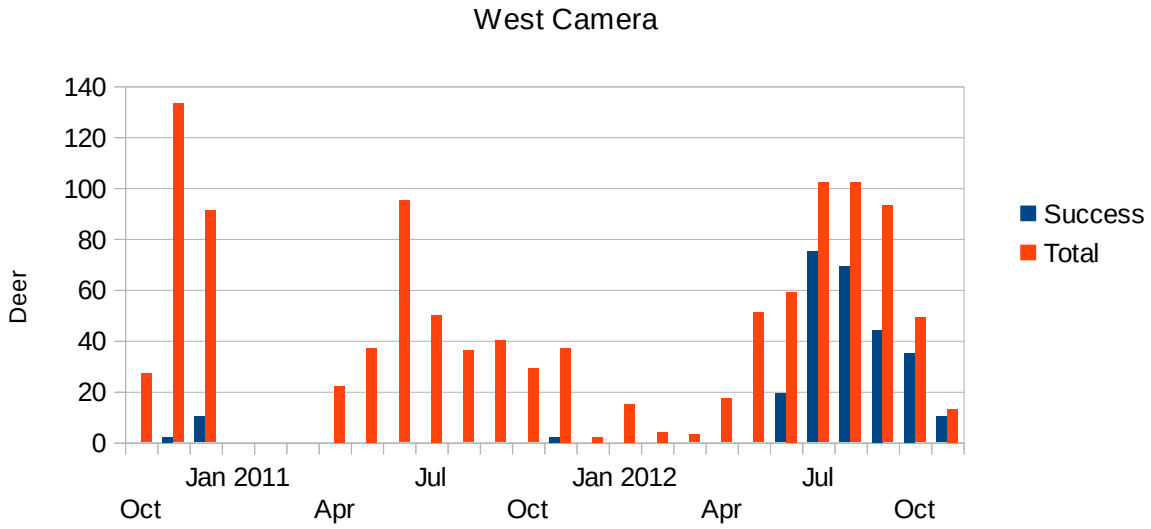
McCalla Creek South



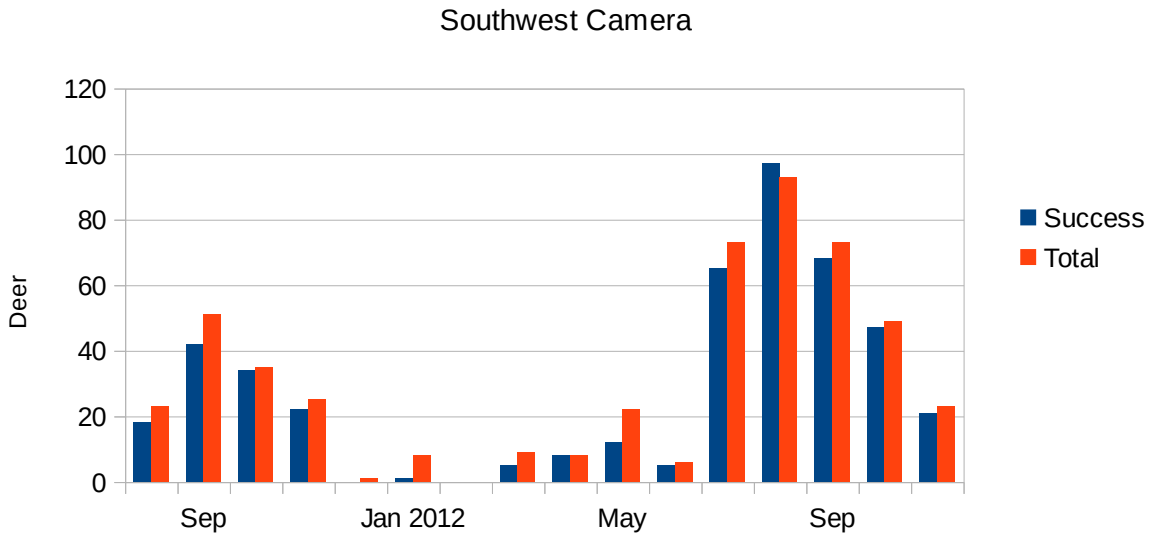
Kootenai Springs Ranch

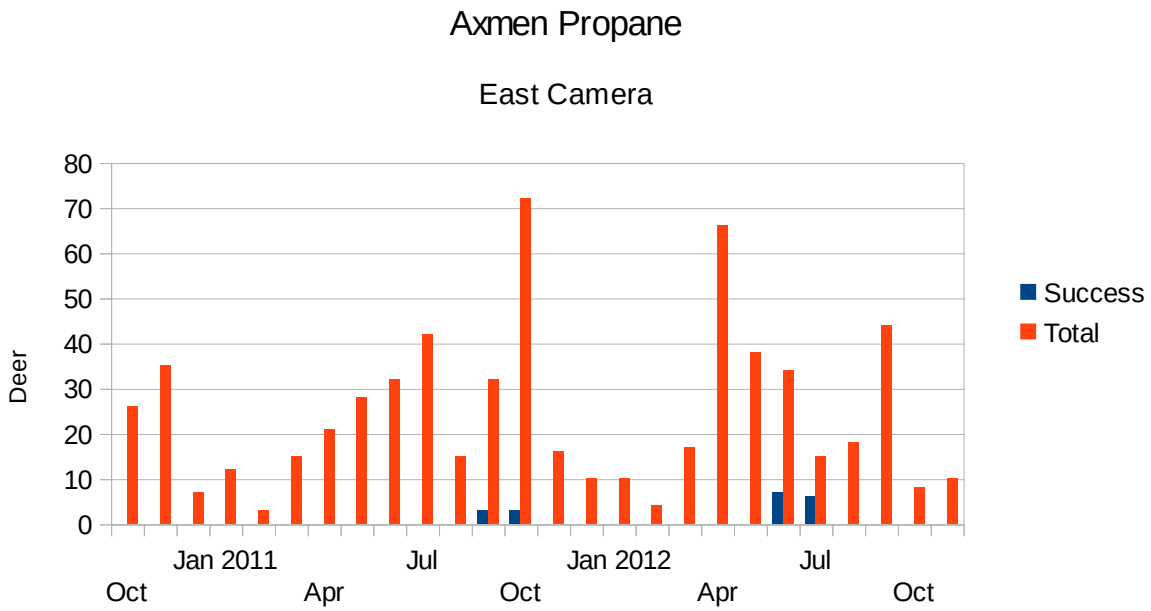


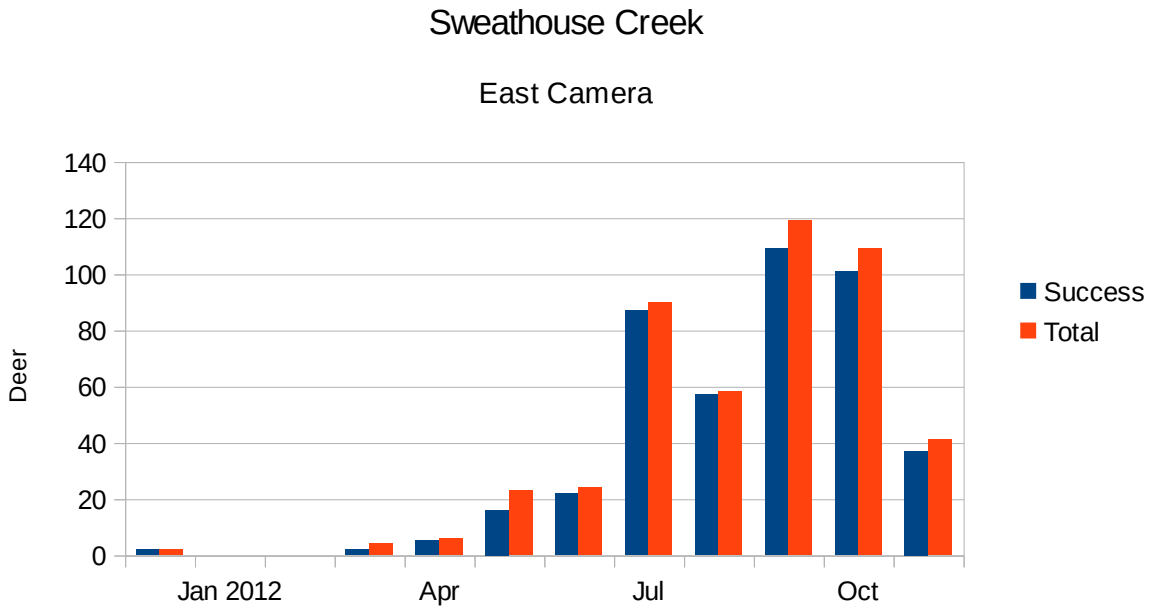
Indian Prairie Loop

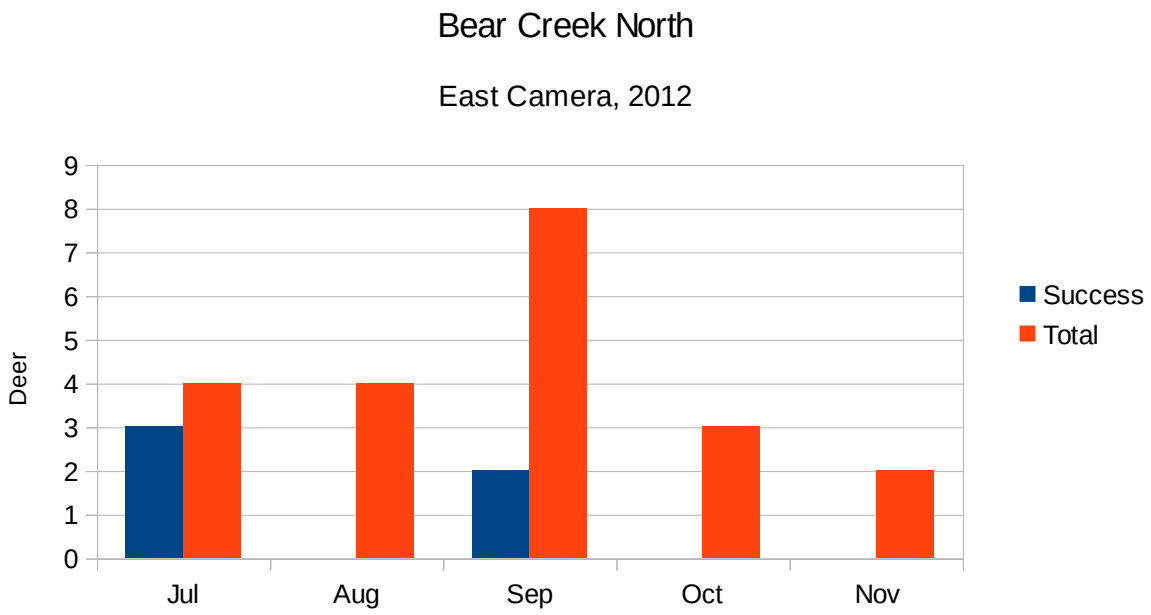


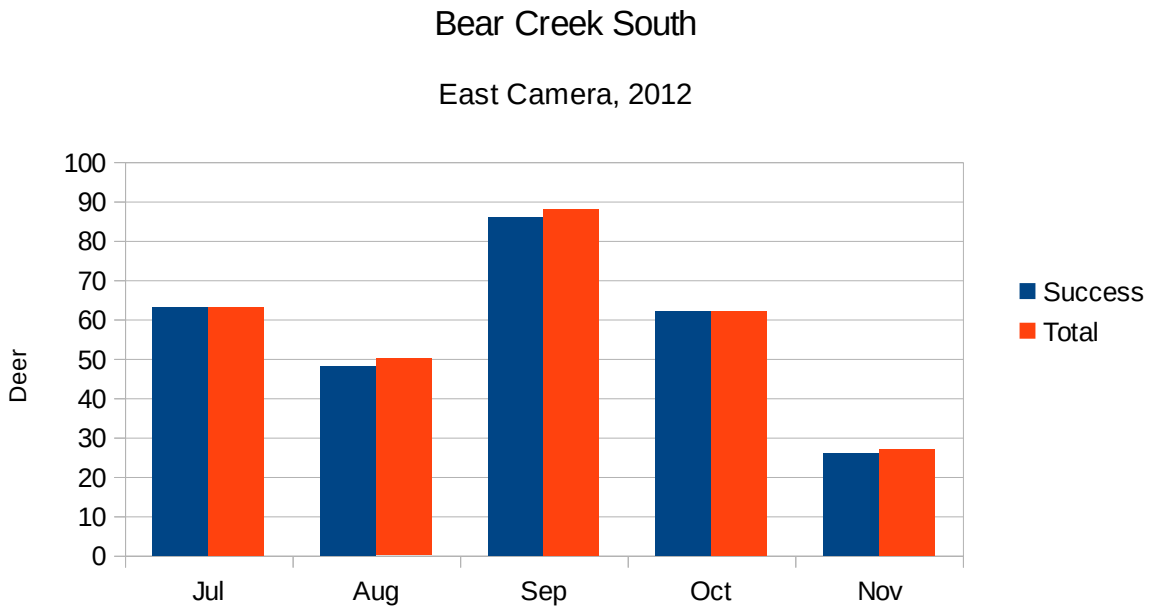
Big Creek




Axmen Propane
East Camera
Deer
80
70
60
50
40
30
20
10
0
Jan 2011
Jul
Jan 2012
Jul
Oct
Apr
Oct
Apr
Oct
Success
Total

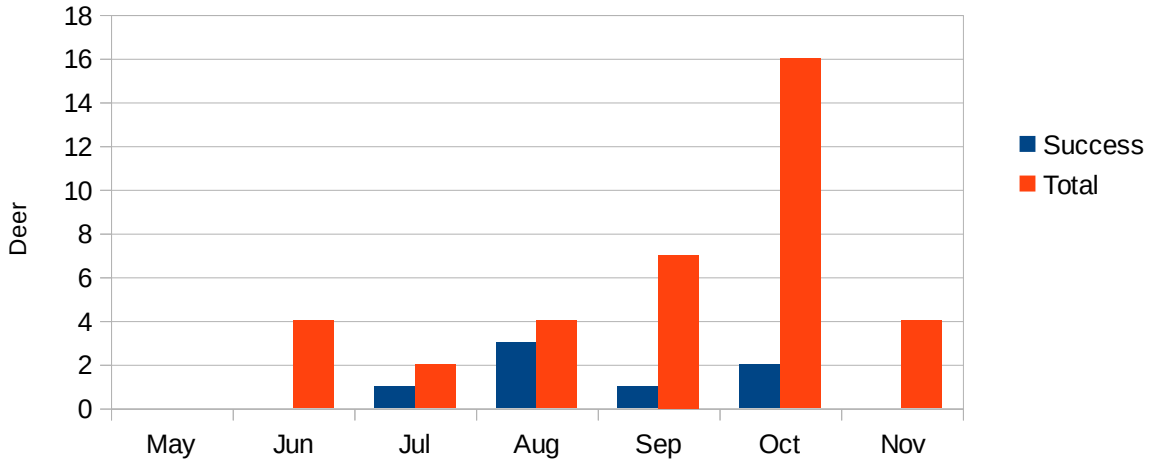

Sweathouse Creek
East Camera
Deer
140
120
100
80
60
40
20
0
Jan 2012
Apr
Jul
Oct
Success
Total


Bear Creek North
East Camera, 2012
Deer
9
8
7
6
5
4
3
2
1
0
Jul
Aug
Sep
Oct
Nov
Success
Total


Bear Creek South
East Camera, 2012
Deer
100
90
80
70
60
50
40
30
20
10
0
Jul
Aug
Sep
Oct
Nov
Success
Total

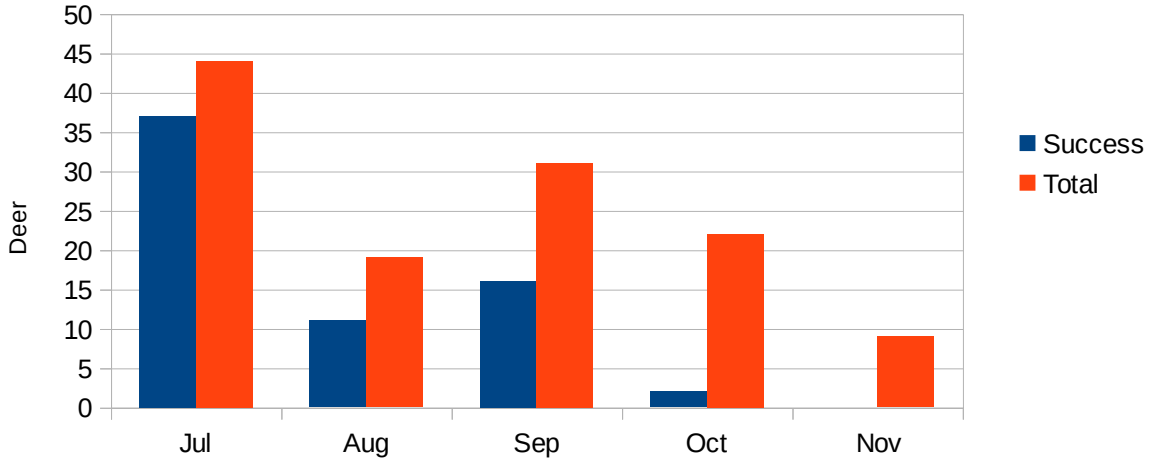
Mountain Gallery

East Camera, 2012



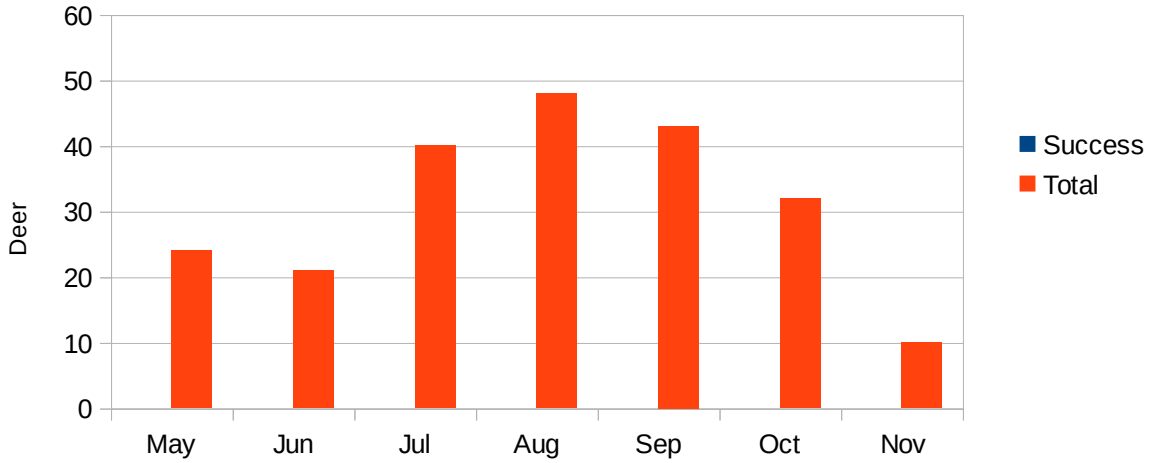
Lupine

West Camera, 2012



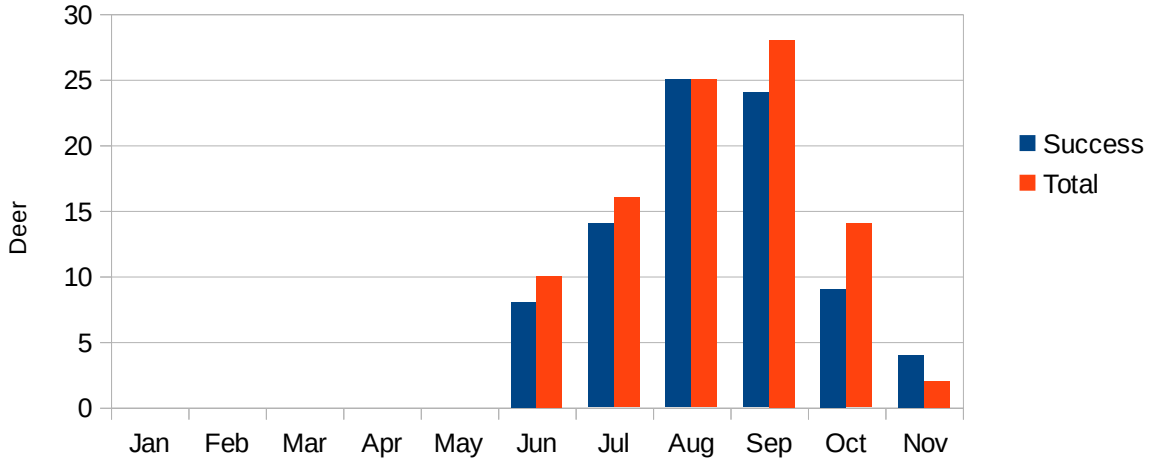
Fun Park

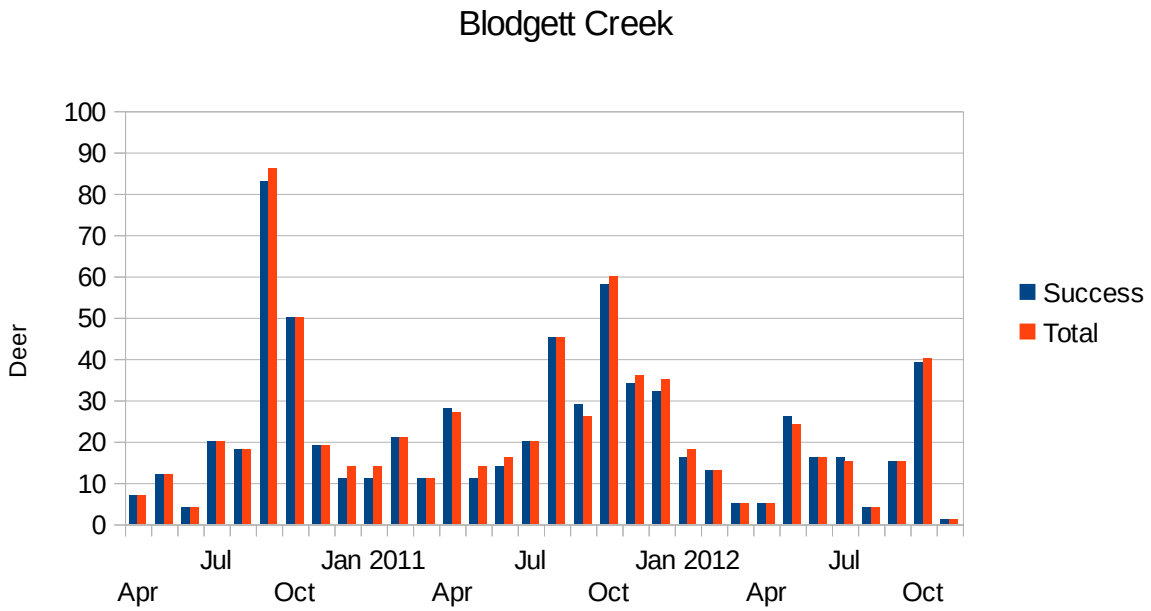
West Camera, 2012



Mill Creek

East Camera, 2012




Blodgett Creek
Deer
100
90
80
70
60
50
40
30
20
10
0
Apr
Jul
Oct
Jan 2011
Apr
Jul
Oct
Jan 2012
Apr
Jul
Oct
Success
Total

Appendix B. Successful use of wildlife crossing structures by carnivores.

	Black Bear	Puma	Bobcat	Coyote	Wolf	Red Fox	Raccoon	Skunk
Bass Creek North	1	0	1	2	0	25	106	20
Bass Creek South	4	0	4	0	0	7	181	12
Bass Creek Fishing Access	9	2	1	15	0	164	66	37
Dawn's Crossing	5	0	2	25	2	30	29	9
Kootenai Creek	19	0	0	0	0	6	92	63
McCalla Creek North	7	3	0	6	0	1	191	187
McCalla Creek South	0	0	0	2	0	0	81	12
Kootenai Springs Ranch	8	5	1	6	0	0	44	2
Indian Prairie Loop	10	0	0	1	0	4	54	15
Big Creek	8	1	0	2	0	1	34	0
Axmen Propane	0	0	0	6	0	234	224	12
Sweathouse Creek	0	0	0	0	0	0	43	1
Bear Creek North	0	0	0	0	0	2	23	0
Bear Creek South	2	0	0	0	0	8	1	2
Mountain Gallery	0	0	0	0	0	54	9	0
Lupine	0	0	0	0	0	48	5	0
Fun Park	0	0	0	1	0	0	74	0
Mill Creek	0	0	0	2	0	0	92	1
Blodgett Creek	1	0	1	0	0	0	42	20