Evaluating Wildlife-Vehicle Collisions and Habitat Connectivity in the Madison Valley, Montana

Quarterly Progress Report #4
January – March 2013

Prepared by
Lance Craighead, PhD
Executive Director
Craighead Institute
201 S. Wallace Avenue, Suite B2D
Bozeman, MT

and

Angela Kociolek, MSc
Research Scientist

&

Tiffany Allen, MSc
Field Biologist
Western Transportation Institute
College of Engineering
Montana State University – Bozeman

Prepared for
Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, MT 59620-1001

April 30, 2013
Task Status

1. Literature Review

This task was completed by September 30 and a final report document was submitted concurrently with Quarterly Progress Report #2.

2. Gather Existing Data/Reconnaissance

This task was completed by September 30 and a final report document was submitted concurrently with Quarterly Progress Report #2.

Gather Existing Data

Additional relevant data will continue to be collected by many collaborators throughout the two years of this project and existing data will continue to be updated.

Geo-database

Some data for the project geo-database which were requested were not yet received by the time of the task report and follow up inquiries were made. Data from the IGBST have now been received and added to the database. Additional data from MDT maintenance will be requested as the project proceeds.

3. Road Kill Surveys

Road kill surveys began with the first reconnaissance visit on 4 April, 2012. Three surveys per week have been completed since that time. Tiffany Allen is the primary road kill surveyor. During the first quarter a total of 33 surveys were completed. During the second quarter a total of 39 surveys were completed. During the third quarter a total of 39 surveys were completed. During the fourth quarter a total of 38 surveys were completed (13 in January, 12 in February, and 13 in March). Total number of species and individuals recorded during the fourth quarter are presented in Table 1.
Table 1. Road kill observed in the study area from 01 January - 31 March, 2013.

<table>
<thead>
<tr>
<th>Species</th>
<th>Date</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mule deer</td>
<td>2/1/2013</td>
<td>45.368</td>
<td>-111.731</td>
<td>1</td>
</tr>
<tr>
<td>*Deer spp.</td>
<td>2/25/2013</td>
<td>45.378</td>
<td>-111.731</td>
<td>1</td>
</tr>
<tr>
<td>Elk</td>
<td>2/6/2013</td>
<td>44.987</td>
<td>-111.648</td>
<td>**3</td>
</tr>
<tr>
<td>Elk</td>
<td>2/6/2013</td>
<td>44.987</td>
<td>-111.648</td>
<td></td>
</tr>
<tr>
<td>**Elk</td>
<td>2/6/2013</td>
<td>44.987</td>
<td>-111.648</td>
<td></td>
</tr>
<tr>
<td>Pronghorn</td>
<td>1/16/2013</td>
<td>45.145</td>
<td>-111.678</td>
<td>2</td>
</tr>
<tr>
<td>Pronghorn</td>
<td>2/25/2013</td>
<td>45.366</td>
<td>-111.731</td>
<td></td>
</tr>
<tr>
<td>Ungulate</td>
<td>3/22/2013</td>
<td>44.980</td>
<td>-111.647</td>
<td>1</td>
</tr>
<tr>
<td>Coyote</td>
<td>2/4/2013</td>
<td>45.533</td>
<td>-111.700</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3/10/2013</td>
<td>45.516</td>
<td>-111.687</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/18/2013</td>
<td>44.893</td>
<td>-111.582</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/27/2013</td>
<td>44.867</td>
<td>-111.559</td>
<td></td>
</tr>
<tr>
<td>Skunk</td>
<td>3/18/2013</td>
<td>44.863</td>
<td>-111.547</td>
<td>1</td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>1/21/2013</td>
<td>44.824</td>
<td>-111.483</td>
<td>9</td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>1/21/2013</td>
<td>44.785</td>
<td>-111.473</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>1/25/2013</td>
<td>45.557</td>
<td>-111.693</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
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<tr>
<td>Rabbit/hare</td>
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<td>-111.700</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
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<td>45.469</td>
<td>-111.722</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>3/12/2013</td>
<td>45.509</td>
<td>-111.692</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>3/20/2013</td>
<td>44.939</td>
<td>-111.610</td>
<td></td>
</tr>
<tr>
<td>Rabbit/hare</td>
<td>3/25/2013</td>
<td>45.140</td>
<td>-111.674</td>
<td></td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>1/25/2013</td>
<td>44.843</td>
<td>-111.521</td>
<td>7</td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>1/25/2013</td>
<td>45.001</td>
<td>-111.648</td>
<td></td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>3/1/2013</td>
<td>44.903</td>
<td>-111.594</td>
<td></td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>3/8/2013</td>
<td>44.825</td>
<td>-111.484</td>
<td></td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>3/15/2013</td>
<td>45.069</td>
<td>-111.646</td>
<td></td>
</tr>
<tr>
<td>Animal Type</td>
<td>Date</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
<td>----------</td>
<td>-----------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Mammal spp.</td>
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<td>45.115</td>
<td>-111.658</td>
<td></td>
</tr>
<tr>
<td>Mammal spp.</td>
<td>3/27/2013</td>
<td>44.798</td>
<td>-111.476</td>
<td></td>
</tr>
<tr>
<td>Small mammal</td>
<td>1/2/2013</td>
<td>45.523</td>
<td>-111.695</td>
<td>1</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>3/27/2013</td>
<td>44.885</td>
<td>-111.573</td>
<td>1</td>
</tr>
<tr>
<td>Trumpeter swan</td>
<td>2/18/2013</td>
<td>45.534</td>
<td>-111.700</td>
<td>1</td>
</tr>
<tr>
<td>Bird</td>
<td>3/18/2013</td>
<td>44.804</td>
<td>-111.207</td>
<td>1</td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>1/7/2013</td>
<td>45.087</td>
<td>-111.648</td>
<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>1/14/2013</td>
<td>45.145</td>
<td>-111.678</td>
<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>2/4/2013</td>
<td>44.908</td>
<td>-111.597</td>
<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>2/6/2013</td>
<td>45.255</td>
<td>-111.679</td>
<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>3/4/2013</td>
<td>44.855</td>
<td>-111.395</td>
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</tr>
<tr>
<td>Unknown/blood smear</td>
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<td>45.554</td>
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<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>3/12/2013</td>
<td>45.360</td>
<td>-111.732</td>
<td></td>
</tr>
<tr>
<td>Unknown/blood smear</td>
<td>3/15/2013</td>
<td>45.341</td>
<td>-111.712</td>
<td></td>
</tr>
</tbody>
</table>

*Cause of death uncertain, but likely a road kill.

**This elk was reported as injured by a Highway Patrol officer. Its status (dead or alive) is unknown.

***This swan was very likely killed by a collision with a fence, not due to roadkill, but the cause of death is uncertain.

4. Wildlife Monitoring

Live animals in the vicinity of the highway were observed during all reconnaissance and road kill surveys and relevant locations were recorded using the ROCS unit. Live animals are generally recorded in groups except for some single individuals in close proximity to the highway. Locations of animal groups will be used in the GIS analysis to determine general movement patterns of elk and pronghorn primarily.

Opportunistic snow tracking conditions were not suitable to record animal tracks crossing the highways during the third quarter. Tracking conditions improved during the fourth quarter and some locations of successful crossing were recorded as described below.

Cameras were checked periodically to replace batteries and exchange data cards. Total species and individuals recorded are listed in Table 2. Each record indicates a separate event, not necessarily a unique individual. In some sites it is likely that the same individuals returned daily and often repeatedly in the same day.
Table 2. Species and individuals crossing through culverts or under bridges in the study area from 01 January - 31 March, 2013.

<table>
<thead>
<tr>
<th>Structure (RP = reference post)</th>
<th>Minimum number of days camera operated</th>
<th>Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock culvert at RP 5.0 Hwy 87</td>
<td>*38-66</td>
<td>Fox</td>
<td>2</td>
</tr>
<tr>
<td>Stock culvert at RP 5.2 Hwy 87</td>
<td>*10-23</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Stock culvert at RP 6.0 Hwy 87</td>
<td>86</td>
<td>Coyote</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rabbit/hare</td>
<td>2</td>
</tr>
<tr>
<td>Beaver Creek Bridge (both cameras combined)</td>
<td>90</td>
<td>Moose</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>48-90</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Grayling Creek Bridge</td>
<td>90</td>
<td>Boreal owl</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flicker</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fox</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human</td>
<td>1</td>
</tr>
<tr>
<td>Indian Creek Bridge</td>
<td>90</td>
<td>Human</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mule deer</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raccoon</td>
<td>3</td>
</tr>
<tr>
<td>Madison River Bridge at Ennis</td>
<td>38</td>
<td>Human</td>
<td>1</td>
</tr>
<tr>
<td>Underpass south of Madison River Bridge at Ennis</td>
<td>90</td>
<td>Deer spp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic cat</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long-tailed weasel</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skunk</td>
<td>1</td>
</tr>
<tr>
<td>Madison River Bridge on Hwy 87</td>
<td>59</td>
<td>Bobcat</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic dog</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human</td>
<td>274</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium mammal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mule deer</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raccoon</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skunk</td>
<td>2</td>
</tr>
<tr>
<td>North Meadow Creek Bridge</td>
<td>88</td>
<td>Human</td>
<td>3</td>
</tr>
<tr>
<td>O’Dell Creek Bridge</td>
<td>90</td>
<td>Medium mammal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raccoon</td>
<td>6</td>
</tr>
</tbody>
</table>

*A range of days (i.e., 38-66) indicates that the camera stopped operating for whatever reason sometime after the last check (71 days) but no later photos had been triggered to determine a closer end date.

The maximum number of days of operation was 90 for the cameras deployed during the third quarter. Fewer days of operation indicate that data cards were filled to capacity before the camera was checked, or batteries had died, or cameras were covered. This occurred at the Stock culverts at RP 5.0 and 5.2 and 6.0 on Hwy 87 where two of the cameras were covered with snow drifts. One of the cameras at the Beaver Creek Bridge had lost battery power when inspected; 48 days indicates the latest date a photo was recorded. Similarly the cameras at the Madison River Bridge at Ennis, Madison River Ridge on Highway 87, and North Meadow Creek Bridge had data cards filled to capacity with the most recent date indicating when that occurred.
Locations of live animals have been continually recorded during road kill surveys and their distance from the highway estimated. These data will be mapped and analyzed for the final report, but in the interim the data will be summarized in table form so that project personnel and collaborators can get a picture of general animal movements in the vicinity of the highway, concentrations of animals near the highway in relation to collision sites, numbers of animals seen, etc. Fourth quarter live animal sightings are summarized in Table 3. Animals were generally recorded only within 500 meters of the highway, but occasional observations of large herds (especially elk), or unusual species, were recorded at longer distances.

Table 3. Species, estimated distance from the highway, and estimated number of live individuals observed in the study area from 01 January - 31 March, 2013. If there was a group of animals spread out (i.e. some closer to the highway than others), distances given are for the individual(s) closest to the highway. Therefore, the number within any given distance range below is likely a slight overestimate, with the exception of the greater than 500 m row, which is likely a slight under estimate.

<table>
<thead>
<tr>
<th>Species</th>
<th>Estimated distance from highway (m)</th>
<th>Count estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bighorn sheep</td>
<td>0</td>
<td>669</td>
</tr>
<tr>
<td></td>
<td>1-24</td>
<td>370</td>
</tr>
<tr>
<td></td>
<td>25-49</td>
<td>486</td>
</tr>
<tr>
<td></td>
<td>50-99</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td>100-499</td>
<td>263</td>
</tr>
<tr>
<td></td>
<td>≥500</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>1947</td>
</tr>
<tr>
<td>Coyote</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1-24</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>25-49</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50-99</td>
<td>0</td>
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<tr>
<td></td>
<td>100-499</td>
<td>5</td>
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<td>≥500</td>
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<td></td>
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<tr>
<td>Elk</td>
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<tr>
<td></td>
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<td></td>
<td>25-49</td>
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</tr>
<tr>
<td></td>
<td>50-99</td>
<td>38</td>
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<tr>
<td></td>
<td>100-499</td>
<td>6,949</td>
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<tr>
<td></td>
<td>≥500</td>
<td>28,750</td>
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<td></td>
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<td></td>
<td>50-99</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100-499</td>
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<tr>
<td></td>
<td>≥500</td>
<td>0</td>
</tr>
<tr>
<td>Animal</td>
<td>1-24</td>
<td>25-49</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Mule deer</td>
<td>25</td>
<td>76</td>
</tr>
<tr>
<td>Pronghorn</td>
<td>20</td>
<td>479</td>
</tr>
<tr>
<td>White-tailed deer</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>Wolf</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

At distances greater than 500 m from the highway, the observer generally is not able to observe and record animals, because at that distance animals are difficult to spot, especially while driving. The larger the group size and/or the larger the animal size, it becomes more likely that the observer will see wildlife at a greater distance. Because of this, it is difficult to directly compare, for example the number of coyotes to the number of elk observed or the number of pronghorn observed at a close range to the number observed at a greater distance.

All Bighorn sheep were observed near Quake Lake, typically between RP 1.0 and 6.0, where there is steep, timbered terrain. If sheep were greater than 500 m from the highway they typically would not be visible. Large concentrations were observed near RP 1.0 on Highway 287. This is an area where the landowner previously fed them during the winter. Although they are not being fed currently it is likely that they remember this area as a location where food has been available and return periodically to check. Sheep observed at this site have been feeding on native grass among the sagebrush and on non-native species on the road ROW.
Elk were observed almost entirely in the middle of the valley in relatively wide-open areas. While there were many further north, the largest concentrations of observed elk were to the south of Cameron and north of Wolf Creek. One moose was observed about 0.25 mi. south-east of Ennis, near the Madison River. The other was observed crossing the highway at Beaver Creek. Most pronghorn were observed spread out in the middle of the valley and just north of Ennis. Wolves were observed in wide-open areas south of Cameron and north of Wolf Creek, in the same general areas as most of the elk. Most wolf observations were made while also observing elk.

Snow tracks and crossing locations were recorded on 9 and 18 January. In general, between RP 9.0 and RP 34.0 of highway 287, deer and other species travelled along south-facing benches and hills where wind and sun reduced the snow depth. Where these features intersected the highway, tracks could be observed on both sides indicating successful crossings. North of RP 34 there was insufficient snow near the highway to reveal tracks. Other tracks were observed along Highway 87 and in deeper snow between RP 1.0 and RP 22.0 along highway 287. Bighorn sheep tracks were observed crossing between RP 0.5 and RP 6.0.

5. GIS Development

Set to begin post data collection in April 2014. However, see discussion of geo-database development of existing data in Gather Existing Data/Reconnaissance. Also, progress was made during the fourth quarter in the development of an ArcGIS script to transform the lat/long positions recorded by the ROCS unit into the nearest 1/10th Reference Post marker. This will be completed during the fifth quarter so that the ROCS data can be more easily understood in terms of locations on-the-ground.

6. Data Analysis

Set to begin post data collection in April 2014.

7. Mitigation Recommendations

Set to begin post data collection in April 2014.

8. Management and Reporting

Ongoing.
Schedule

Table 3. Project schedule

<table>
<thead>
<tr>
<th>Task #</th>
<th>Planned</th>
<th>Actual</th>
<th>% complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apr-Sep 2012</td>
<td>On schedule</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Apr-Sep 2012</td>
<td>On schedule</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: updated</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>data will be</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>added through</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>April 2014</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Apr 2012-Mar 2014</td>
<td>On schedule</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Apr 2012-Mar 2014</td>
<td>On schedule</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Apr 2014-Jun 2014</td>
<td>On schedule</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Apr 2014-Jun 2014</td>
<td>On schedule</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Apr 2014-Jun 2014</td>
<td>On schedule</td>
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</tr>
<tr>
<td>8</td>
<td>Apr 2012-Dec 2014</td>
<td>On schedule</td>
<td>50</td>
</tr>
</tbody>
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Problems

Heavy snowfall or other precipitation can cause excessive triggering of cameras. This can fill the data card quickly and also use up battery power. Batteries are also depleted more quickly in sub-zero temperatures. Despite more frequent camera checks made in the fourth quarter, a total of 263 camera-days out of 990 possible camera-days were missed: 132 of those were due to snow drifts at culverts where snow was also too deep for animals to travel.

Major accomplishments

Winter has proven to be a good season for documenting the locations of live animals as elk, deer, bighorn sheep and pronghorn appear to gather in larger groups and move around the valley. Bighorn sheep in particular have moved closer to the highway and are frequently found in large groups close to, and crossing, the highway. Data collected on group locations will be useful in modeling how animals move north and south parallel to the highway and also for estimating where and when some large groups may cross.

Recommendations

As noted in the previous quarterly report the bighorn sheep have often been observed between the junction of Highway 287 with 87, and the north shore of Quake Lake. Animals are frequently on the shoulder and crossing the highway. To date, no road-killed bighorn have been observed by our study team, but the potential for WVCs remains high. Motorists often stop along the shoulder and add to the traffic hazard. A flashing wildlife warning sign would help alert motorists of sheep near the road and signs could be posted advising motorists to park completely off the roadway.
Fiscal Expenditures

A total of $14,574.18 was spent in the quarter ending on 31 March, 2013, for a total of $95,176.83 to date. Craighead Institute received a total of $5,266.40 for a cumulative total of $34,381.87 invoiced through the end of this quarter.