The Municipality of Crowsnest Pass is situated in a rare east-west corridor bisecting the Canadian Rocky Mountains in SW Alberta. Highway 3, which runs the length of the Pass, is a major transportation route supporting over 6000 vehicles per day. Wildlife mortality, due to collisions with vehicles, has been identified as a major human safety and wildlife conservation issue on this 44 km stretch of highway with approximately 109 large mammal deaths each year. It is important that decision makers acquire information on where wildlife are most likely to cross the road to ensure effective mitigation measures are implemented. This report highlights the results of an analysis of eight years of wildlife mortality data (1997-2004) collected by Volker Stevins from the Alberta/British Columbia border extending east to Lundbreck, Alberta.

**INTRODUCTION**

Special points of interest:
- The analysis includes mortality data from 1997-2004 from the Alberta/British Columbia border to Lundbreck.
- Deer account for 88% of the mortality records.
- An average of 109 large mammals are killed each year.
- Ten high collision zones were identified in the study area.

**METHODS**

Mortality data are collected daily along Highway 3 by Volker Stevins, a contractor hired by Alberta Transportation to maintain Highway 3. Volker Stevins’s staff drive the road in the morning and evening to remove wildlife killed on the highway. Information is recorded on the type of species, date (d/m/y), time (AM or PM), sex and location (distance from local landmarks) on hard copy forms. The majority of records are for ungulates. Alberta Fish and Wildlife are contacted when a carnivore is killed and information on the event is entered into the ENFOR database at the Fish and Wildlife office. ENFOR data were not included in this analysis. Volkers Stevins mortality data was obtained from Alberta Fish and Wildlife Blairmore office. The mortality data was entered into a GIS database. Location information was entered as a distance in meters east or west from specified local landmarks. Local landmarks were given a spatial location by driving highway 3 and using a global positioning system (GPS) to mark their location. A route processing wizard in ArcGIS was used to accurately place each mortality point the appropriate distance from the specified landmark. The resulting database was used to create graphs highlighting the total mortality per year, type of species and seasonal variations in mortality. The spatial data were used to determine high mortality zones along Highway 3.
**Data Limitations**

There are a number of data limitations that should be considered when evaluating the results of this analysis. The true accuracy of each mortality point is unknown. The data collected by Volker Stevins is described in meters from a local landmark. As with any study that relies on human estimates of distance, we are not sure of the accuracy level. Other studies have documented mortality points within 250 m segments or 1/10 of a mile. In our spatial analysis we also used 250 m segments to represent high collision areas. Other data limitations include missing data for the months of April and July 2001 and December and February 2002. These data are missing from the analysis and represent an inconsistency and limitation of the database.

**Results**

**Mortality Per Year**

The mortality data indicate that over the eight year period (1997-2004) an average of 109 animals were killed per year. This is likely an underestimate because the calculation does not include animals (mainly carnivores) that are collected by Alberta Fish and Wildlife, animals that are picked up by people for various purposes or injured animals that may wander off into the bush to die. Additionally, there are data missing for 2001 and 2002, resulting in a lower overall average per year.

**Average Mortality Per Month**

Mortality varies seasonally in the region. The mortality data indicates that months of higher collisions include February to April and October to November.
Mortality per Species (1997-2004)

There was a total of 877 mortality occurrences recorded along Highway 3 from 1997 to 2004. Deer account for 88% of the total mortality records. 56% of the collisions involved mule deer and 32% involved white tailed deer. Elk accounted for just under 5% of the total mortality records. Although carnivores appear infrequently, this data analysis did not include data from the Alberta Fish and Wildlife database in which most carnivore data is stored.

Species Mortality per Month (1997-2004)

This graph represents species mortality per month over the eight year period (1997-2004). Of interest here is the pattern between mule deer and white tailed deer. Mule deer account for the highest mortality numbers between Jan-Jun and Sep-Dec (represented by the blue line). White tailed deer however account for the highest mortality numbers from Jul-Aug (represented by the green line).
HIGH COLLISION ZONES ALONG HIGHWAY 3

To assess high collision zones along Highway 3 the highway was divided into 187, 250 m segments. The total number of mortality records occurring in each segment was summed. The mean number of mortality records per segment was 8.57, with a standard deviation of 7.5. The data ranged from 0 to 37 total mortalities per segment. To determine high collision zones, we compared the spatial pattern exhibited by the mortality data with that expected from a random distribution based on a Poisson distribution. Assuming a Poisson distribution and a significance level of 0.05, each segment is expected to have 0-14 mortality records. This means that there is a 95% chance of a segment having between 0 and 14 mortality records assuming a Poisson distribution. High collision zones were defined as a minimum of 2 adjacent segments with 15 or greater mortality records. This analysis includes total mortality (all species). Based on these criteria there are 10 high collision zones in the study area from the Alberta/British Columbia border to Lundbreck, based on the mortality data from 1997-2004. The graph below depicts the segments along the y-axis and the number of wildlife mortality records on the x-axis. The green line represents the cut off for expected results assuming a Poisson distribution.
Highway 3 Wildlife Mortality

High collision zones along Highway 3

The map above depicts all high collision zones along Highway 3. High collision zones are defined as 2 or more adjacent segments with 15 or greater mortality records. The zones are labeled from 1 through 10. Zones 1-6 occur within the Municipality of Crowsnest Pass.

The map to the right focuses on high collision zone 3 near the West Coleman assess. This type of information is useful when considering human safety issues in the Pass, because it reflects where collisions have been most prominent in the last eight years.

Focus area of high collision zone 3

A new project, “Road Watch in the Pass” provides the community with an opportunity to report their wildlife observations along Highway 3 using an on-line tool. This project will provide another valuable information source on wildlife movement and crossing locations. The website is www.rookies.ca/roadwatch.
The map to the left depicts total mortality per 250m segment. The red bars illustrate proportional mortality, visually highlighting the high collision zones.

The graph and maps represented on the previous page depict total mortality (88% deer). Species can be assessed separately to depict species-specific high collision zones. Elk account for 5% of the mortality records and are a species of management interest. The graph below depicts high collision zones for elk based on the same methodology used for the total mortality high collision zones. The mean mortality per 250m segment was 0.223 with a standard deviation of 0.717. Mortality records per segment ranged from 0-4. Therefore any segment with 1 or greater mortality records occurring in 2 or more adjacent segments is considered a high collision zone. Based on these assumptions there are five high collision zones for elk.
The map at the top of the page depicts spatially the high collision zones along Highway 3 for elk. All the five zones occur within the Municipality of Crowsnest Pass. The map to the right focuses in on high collision zones 3 and 4.
**DISCUSSION**

It is important that decision makers and the community of the Crowsnest Pass have access to information regarding the location of collision zones along Highway 3. This information is important when addressing human safety through the development of mitigation measures to reduce vehicle and wildlife collisions. The collision zones along Highway 3 identified by the mortality data are based on 877 mortality records from 1997-2004. Eighty-eight percent of the records are comprised of deer. Zones of high collision may be linked to habitat variables or road characteristics, such as curvature and line of sight. Characteristics associated with these zones were not assessed in this report.

The information presented in this report is important for decision makers to identify both general and species-specific movement areas. As an example, we highlighted high collision zones for elk. There were 42 mortality records for elk over the eight year period. There were not enough mortality records for Bighorn sheep to run a similar analysis.

The mortality data presented in this report represents one information source of information that focuses on wildlife and Highway 3. However, it does not contain sufficient information for carnivores. Other data sets that provide insight on crossing locations in this region will greatly enhance the knowledge base needed by decision makers.

The information in this unsolicited report was prepared for the community of the Crowsnest Pass.

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