



**UPDATE OF DATA SOURCES ON COLLISIONS INVOLVING MOTOR VEHICLES
AND LARGE ANIMALS IN CANADA**

TO

TRANSPORT CANADA ROAD SAFETY DIRECTORATE

BY

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Executive Summary

The issue of collisions between large animals and motor vehicles continues to pose particular road safety challenges. This report confirms that collisions between motor vehicles and large animals pose a threat to road safety and to our wildlife population. The report also supports the claim made in the 2003 report entitled: *Collisions involving large animals and motor vehicles in Canada* that there is an underestimation of the number of animal-vehicle collisions. In fact the Transport Canada data would appear to capture only 50% of the animal-vehicle collisions.

The literature review shows there is continuous attention being given to the issue of animal-vehicle collisions in North America. New research projects initiated by some high profile agencies, such as NCHRP and the US Federal Highway Administration, demonstrate the level of interest the issue is gathering in the United States. The literature also showed that the issue of underestimation seems to be recognized and acknowledged. This is also supported by an increased awareness regarding the need for data quality.

Along the same lines, new research points to the need for improved methods for recording animal-vehicle collisions. The Wildlife Accident Reporting System (WARS) developed by the British Columbia Transport Department is often mentioned as a model for data collection. The literature notes that data collection is often done by two and sometimes three different organizations within states and provinces. The use of a more common approach and/or technology is now being investigated in the United States.

The literature also showed that there has been continued development and testing of mitigation measures with some success with detection technologies (e.g. Switzerland site with an 83% reduction in animal-vehicle collisions). The literature review also confirmed that, although much progress has been made in the identification of more universal mitigation measures, local conditions often demand custom-designed solutions.

The statistical review showed that, for some provinces, the data to provide complete coverage of the issue exists. This is the case for Manitoba, Saskatchewan, Alberta and British Columbia. The data from these provinces can help to truly understand the magnitude of the issue.

This report also confirms that over 95% of animal-vehicle collisions result in a collision with only property damage, and the property damage is often less than a few thousand dollars. This degree of severity, or lack thereof, may be the reason why it is sometimes difficult to motivate a sustained effort to address this issue.

Several mitigation measures are being implemented across Canada. We also noticed that British Columbia, which used to be at the forefront of the development of technological measures, seem to have opted for a greater focus on education and awareness.

1. INTRODUCTION

Collisions between motor vehicles and large animals, such as deer, bear and moose, have been attracting increasing attention with the deployment of new awareness initiatives and new mitigation technologies. Previous research undertaken by L-P Tardif & Associates for Transport Canada shows the number of reported animal-vehicle collisions to be underestimated. The 2003 report entitled: *Collisions involving large animals and motor vehicles in Canada*, noted under-reporting may be as high as 50% in the case of collisions with injury and probably even higher in the case of animal-vehicle collisions with property damage only.

The objective of this report is to update the data and information contained in the first report.

2. PROBLEM STATEMENT

The previous report noted some discrepancies between provincial and federal databases. These discrepancies may be caused by a lack of reporting or a lack of uniform definitions. The previous report could not, however, obtain figures from all jurisdictions. This report will attempt to correct that deficiency and update the statistics and figures contained in the previous report.

3. PROJECT SCOPE

This project is basically an update of the 2003 study. First, a literature review was completed focusing on reports and papers produced since 2003. As well, all provincial and territorial governments were contacted to obtain their most recent statistics. These databases were reviewed and compared to the Transport Canada database.

4. LITERATURE SURVEY

As noted above, this literature survey reviews material produced since 2003 and looks specifically at new research conducted on data analysis procedures and mitigation measures.

A considerable amount of literature is produced annually on this topic. Much of this literature is presented at annual and bi-annual conferences and events sometimes dedicated solely to this issue including:

- International Conference on Ecology and Transportation (ICOET) – Bi-Annual events
<http://www.icoet.net/>
- Deer Vehicle Crash Information Clearinghouse – Annual workshop
- Transportation Research Board Annual Meetings – Workshops and poster sessions

Some University Research Centers specialize in the issue, creating the impetus for more research. These include:

- Center for Transportation and the Environment <http://itre.ncsu.edu/cte/index.asp>
- University of Wisconsin <http://www.deercrash.com/index.htm>
- Western Transportation Institute – Montana State University
<http://www.coe.montana.edu/wti/>

In 2005, Montana State University developed a Road Ecology Curriculum and implemented a university-based road ecology course.

The literature indicates a fair amount of research continuing to explore new mitigation measures. The need to demonstrate the potential for new technologies to address the problem creates the catalyst for some of the research conducted since 2003. The research is also extending far beyond the motor-vehicle-large-animal collisions with expansion to include animal/roadway interaction in general. The expression Road Ecology seems to be accepted as the appropriate terminology encompassing this field of activities.

The underestimation of the number of collisions between motor vehicles and large animals, especially deer, seems to be increasingly well accepted even though no firm statistics exist to validate the statement and not much research is dedicated to addressing this concern.

From the considerable volume of literature on the subject the following are highlighted as they are substantive and/or bring a new research perspective. The entries are made in chronological order.

New research related to data collection, analysis and modeling techniques includes:

- National Cooperative Highway Research Program – NCHRP (Active Project) launched a new project on the animal-vehicle crash issue. This new project is a synthesis examining how animal-vehicle crash data are collected and used in the United States and Canada. The synthesis will survey state and provincial agencies about their collection and use of data. This will include but not be limited to the following items:
 - What kinds of AVC data (crash, collision, near miss, carcass removal, etc.) are collected?
 - Are domestic animals included?
 - How are the data collected?
 - Who collects the data?
 - Where are these data stored and managed?
 - How are the data accessed, reported and used?
 - Are these data shared or combined among agencies? Who are they?
 - Are system improvements being discussed and/or planned? What are they?
 - What are the bureaucratic, political or procedural obstacles to and opportunities for implementing, advancing or improving data collection?
- Hasson (2005) of the Federal Highway Administration developed a national perspective on the issue of highway safety and wildlife. In his presentation he presented the national

statistics and stated that animal-vehicle crashes are probably under-reported by 50%. He confirmed that these crashes are a growing problem and that the data needs to improve. The presentation also outlined the role of the U.S. federal government on this issue and the possible animal-vehicle crash-related activities included in the new legislative agenda. Above all, the presentation stressed the need for better data and communication of best practices.

- Knapp (2005) presented a paper at the 2005 Transportation Research Board Annual Meeting: *Defining the Deer-Vehicle Crash Problem in the United States: National Estimates and Regional Data Collection*. The paper presents data from Illinois, Iowa, Michigan, Minnesota, and Wisconsin since 2001, and concludes that deer-motor vehicle collisions are an increasing transportation safety concern throughout most of the United States. The actual magnitude of this problem, however, can only be roughly estimated. Knapp recommends the magnitude, trends and/or location of collisions should be properly documented in each state, regionally and/or nationally and gaps in the datasets identified. The diversity and multidisciplinary nature of the related data that are available require close communication and coordination among multiple agencies, researchers and interested parties.

The paper examines data for the five, above-mentioned states and notes that the total number of actual deer-vehicle crashes may be at least twice as large as reported. In Minnesota, it is believed to be three to four times as large as reported. The number of unreported deer-vehicle crashes probably varies from state to state due to different reporting procedures with few states tracking the actual number of carcass collections.

- Wells (2005) of the Insurance Institute for Highway Safety presented a paper at the annual workshop of the Deer Vehicle Crash Information Clearinghouse on the characteristics of vehicle-animal crashes in which vehicle occupants are killed. The paper shows that, in the United States, from 1993 to 2003, the annual number of fatalities resulting from these collisions increased from 95 to 195, a 100% increase. The author calls for the development of a strategic agenda to address this issue.
- Hardy (2005) published an analysis of wildlife-vehicle collision data related to applications for guiding decision-making for wildlife crossing mitigation and motorist safety. Research on wildlife-vehicle collisions has shown that they do not occur randomly but are spatially clustered. The report showed that the presence of wildlife tends to be linked to specific habitats and adjacent land-use types. Thus, landscape spatial patterns would be expected to play an important role in determining road-kill locations and rates. The project used wildlife-vehicle collision data to demonstrate how this information can be used to aid transportation management decision-making and identification of appropriate mitigation measures.
- Huijser (2005) focuses on developing a national standard for recording data relative to animal-vehicle collisions using a hand-held device combined with a GPS system. The project's objective is to develop a national standard for the reporting of animal vehicle collisions thereby encouraging transport departments and others to collect these data and

to provide better integration and analyses of the data. It is believed that more accurate and consistent data will also help transportation and wildlife managers to prioritize and focus efforts to reduce collisions.

- The California Department of Transportation (2005) has recently contracted Western Transportation Institute to develop and implement an at-scene data collection and incident support system to transmit data, including photos, from incidents.
- Sielicki (2004) presented 20 years of data using BC Wildlife Accident and Reporting Systems (WARS). The WARS system is designed to analyze wildlife accident data collected by maintenance contractors on numbered highways in British Columbia.

The WARS system is becoming an increasingly valuable information resource for BC Ministry of Transportation, other government agencies, consultants, researchers, wildlife associations, special interest groups and members of the general public. The Ministry of Water, Land and Air Protection uses WARS data to assess provincial wildlife population trends. The Insurance Corporation of British Columbia (ICBC) uses WARS data for identifying highway locations where joint BC Ministry of Transportation and ICBC initiatives, such as exclusion fencing, warning reflectors, and infrared camera detection systems, can be targeted to reduce wildlife-related motor vehicle collisions. The success of the WARS system in British Columbia has made it a model for other agencies seeking to monitor wildlife-related motor vehicle accidents.

- Knapp (2003) completed a survey on behalf of the Deer-Vehicle Crash Information Clearinghouse. The survey objective was to investigate Department of Transportation and Department of Natural Resources activities related to the collection and management of deer-vehicle crash and related data.

Law enforcement personnel complete the majority of the crash reports in each state, but all five of the states also allow some form of citizen self-reporting of a crash. The survey results confirm that only two states do not include this self-reported information in their official crash database. The status of this information in the other three states is unknown. The validity of crash information reported by the general public (away from the incident scene), however, should be questioned. Four of the states in the region allow a crash to be identified as a DVC (Deer-Vehicle Crash) on their crash report. The fifth allows animal-vehicle crashes to be specified.

- Newhouse (2003) presents the efforts deployed in British Columbia using infrared technology as a mitigation measure. In the publication, the author claims that in British Columbia, about 16,000 animal-vehicle collisions occur annually, including unreported cases.

The *Wildlife Protection System* (WPS) uses infrared cameras to detect wildlife on or near highways. When wildlife is detected, flashing lights are triggered, warning drivers to reduce speed and anticipate wildlife on the roadway. The first trial was initiated in the summer of 2002 in Kootenay National Park, British Columbia, Canada. In the trial, a camera was mounted on a 6-m pole at each end of a 2-km stretch of highway. Adjacent to

each pole was a trailer containing a computer (with tracking software), two radar guns, and a conventional digital video camera. Continuous (24-hour) infrared and conventional video footage was recorded. In addition, an “event log” was generated in an Excel spreadsheet that recorded traffic speeds before and within the test zone, and animal detections within the zone.

- Elzohairy (2003) in his paper presented at the Transportation Research Board Annual Meeting on the *Characteristics of Motor Vehicle-Wild Animal Collisions in Ontario* states that despite reductions in the total number of traffic fatalities and in the total number of reportable collisions in Ontario, there has been an increasing trend in motor vehicle-wild animal collisions. The number of collisions increased by 50 percent over a 6-year period (1996-2001) and claimed 42 lives over that period. The paper presents an analysis on collision trends and patterns associated with motor vehicle-wild animal collisions. It also reviews approaches and techniques currently available to reduce the risk of fatality and injury, as well as offering recommendations for future research.

The following notes efforts that have also gone into the modeling of the events.

- Knapp (2005) looked at the characteristics of the data and advanced the need of a Countywide Deer-Vehicle Crash Frequency Model using a negative binomial regression approach. The frequency model developed showed an increase in crash with deer population and vehicle travel, and a decrease with increased estimates of wolf population and woodland acreage. Deer population and vehicle travel approximate crash exposure measures, but wolf population and woodland acreage were also significant and added strength to the model. The authors claimed that the modeling approach used is more valid for crash data than those used in the past, and the model developed predicts a generally accepted measure of safety.
- Meyer (2004) looked at roadside characteristics and the roadway. Meyer’s methodology compared the relative risk of road segments so that they can be prioritized. Forty-five predictor variables were considered, and the predicted variable was accidents per year per mile. Wooded-land area by the side of the roadway, number of lanes, median types, traffic volume, posted speed, clear width, number of bridges and/or visible culverts, roadside adjacent side slope, roadside topography in the transverse direction, presence of deer warning sign and traditional fencing were all found to be positively correlated.
- Kline (2003) in a paper presented at the 2003 ICOET conference describes a model for estimating wildlife mortality on roads. In this instance, the research was undertaken to better understand the effects that roads are having on wildlife in Saguaro National Park. Surveys were conducted from 1994-1999. A model to estimate the average annual number of animals killed on roads in and adjacent to the park was developed.
- Gunson (2003) published a report showing the patterns and characteristics of large animal-vehicle collisions in the central Canadian Rocky Mountains. The paper focused on understanding the patterns and processes that result from animal-vehicle collisions.

Other efforts have gone into developing databases and clearinghouse information on the same issue:

- Western Transportation Institute at Montana State University (2003) initiated a project referred to as ARTEMIS. The project's objective is to develop a database that would allow other universities, transportation professionals and interested individuals access to a complete reference source focused on animal-vehicle collisions and mitigation options. To date, not much has transpired from this initiative.
- Knapp (2003) published a summary of the activities of the Deer-Vehicle Crash (DVC) Information Clearinghouse. The Clearinghouse was initiated in July 2001 by the Wisconsin Department of Transportation as a regional information center. Five states in the Upper Midwest (i.e., Michigan, Minnesota, Illinois, Iowa and Wisconsin) joined in with this project. One of the first projects of the DVC Clearinghouse was to summarize the current state of the knowledge related to deer-vehicle crash countermeasure effectiveness.

The literature also contains information on mitigation measures and general improvements to the state of knowledge on the animal-vehicle collisions issue:

- Huijser (Active Project) is working on a quantitative comparison of different types of animal detection systems with regard to system reliability, and operation and maintenance aspects.
- National Cooperative Highway Research Program – NCHRP (Active Project)
This project is an evaluation of the use and effectiveness of wildlife crossings. The objective of the project is to develop guidelines for the selection (type), configuration, location, monitoring, evaluation and maintenance of wildlife crossings providing transportation professionals a better understanding of how wildlife and fisheries issues can be integrated into planning, engineering, design and maintenance of highways.
- Clevenger (2005) produced new guidelines for wildlife crossing structures. The new guidelines are intended to assist agencies in incorporating wildlife fencing and crossing systems into highway and road designs thereby reducing the harmful impacts of transportation facilities on wildlife and reducing collisions. The project is funded by the Federal Highway Administration.
- Huijser (Active) worked on a project to deploy and evaluate effectiveness of automated animal detection and warning systems. Western Transportation Institute will evaluate different types of animal detection systems from different vendors at the same site and under similar circumstances. Western Transportation Institute will also evaluate a relatively new mitigation measure called “Roadside Animal Detection Systems” (RADS).
- Hardy (Active) conducted research on whether or not fences and cattle guards are effective at reducing the number of animal-vehicle collisions, and at re-directing animal

movement patterns through existing highway ‘crossing’ structures (e.g., road and railroad bridges and culverts). The results of this project are expected early in 2006.

- Hardy (Active) evaluated the effectiveness of Intelligent Transportation Systems, combined with public information campaigns, to increase awareness of the high risk of animal-vehicle collisions on the Bozeman Pass and reduce the number incidents. The ITS technology will make use of Dynamic Message Signs (DMS) to motivate drivers to decrease speed and be aware of animal crossings. The results of this project are expected early in 2006.
- Knapp (2005) presented a paper on crash reduction factors for deer-vehicle crash countermeasures at the Transportation Research Board Annual Meeting and suggested safety research needs. The paper suggests an approach to deal with existing mitigation measures:
 - Countermeasures Used with Conflicting Safety Analysis Results and “Tried”: The paper recommends that a properly funded, designed and documented evaluation of these countermeasures (i.e., deer whistles and roadside reflectors/mirrors) be completed to definitively determine and quantify what, if any, collision reduction effectiveness they may have.
 - Countermeasures Used with Generally Positive Safety Analysis Results and “Proven”: The paper recommends that the impacts of exclusionary fencing/wildlife crossing installations continue to be evaluated.
 - Countermeasures Used but Rarely Studied for Safety Impacts and “Tried”: the past safety evaluations of these countermeasures has been limited in their approach and number. Additional evaluations are needed to determine their actual impact on collisions. Replicating and improving upon the studies previously completed to refute or support their results is necessary.
 - Countermeasures Used but Rarely Studied for Safety Impacts and “Experimental”: New deer crossing sign designs and sign/technology combinations only used in pilot study situations. The approach used in their safety evaluations should be reviewed to ensure they use the most appropriate analysis methodologies.
 - Countermeasures Used but Not Studied for Safety Impacts and “Tried”: countermeasures that have not had their impacts studied. These measures include public information/education and roadway development (i.e., maintenance, design and planning) policies.
 - Countermeasures Used but Not Studied for Safety Impacts and “Experimental”: Two countermeasures are also being used but are considered more of an “experimental” rather than a “tried” safety strategy. Their impacts on collisions have not been studied, but they are still believed to be at the “pilot study” stage of

implementation. These measures include in-vehicle technologies and deicing salt alternatives.

- Countermeasures Not Generally Used but Rarely Studied for Safety Impacts and “Experimental”: Four countermeasures have been suggested for implementation, but are not generally used. Their impacts have only rarely been studied.
- Huijser (2004) provides an overview of animal detection and animal warning systems in North America and Europe. In the United States animal-vehicle collisions are estimated to cause 211 human fatalities, 29,000 human injuries and over one billion dollars in property damage a year. Similar numbers are available from Europe (excluding Russia) where the annual number of collisions with ungulates was estimated at 507,000. These collisions were estimated to cause 300 human fatalities, 30,000 human injuries and over one billion dollars in material damage per year. The report identified 27 locations with an animal detection or animal warning system. Nine of these sites are located in North America and eighteen in Europe.

This overview shows that a wide variety of animal detection and animal warning systems have been installed across North America and Europe. Many of the systems encountered technical problems or experienced false positives, false negatives or maintenance issues. The report maintained that this was to be expected since most animal detection and animal warning systems are new applications of relatively new technology. In addition, the systems are typically exposed to rain, snow, heat and frost. A few systems seem to have resolved most of the problems and operate well. Examples are systems in Switzerland and in Finland. In Switzerland, passive infrared detection systems were able to reduce the number of animal-vehicle collisions by 82 percent.

The author concludes that it is important that animal detection systems produce very few false positives and false negatives. False positives may cause drivers to eventually ignore activated signs, and false negatives present drivers with a hazardous situation. Driver response through reduced vehicle speed or increased alertness determines how effective animal detection systems really are.

The report goes on to say that minor reductions in vehicle speed are important since a small decrease in vehicle speed is associated with a disproportionately large decrease in the risk of a fatal accident. In addition, activated warning signs are likely to make drivers more alert. Driver reaction time to an unusual and unexpected event can be reduced from 1.5 seconds to 0.7 seconds if drivers are warned.

The report concludes that animal detection and animal warning systems have the potential to be an effective mitigation tool. The report notes that each system type has its own (potential) strengths and weaknesses, and one has to review them carefully before installing a system in a particular location. In addition, further research and development is needed before animal detection and animal warning systems can be applied on a wide scale.

- Rogers (2003) examines using a GIS system to better understand the spatial and temporal patterns of deer-vehicle accidents within a town and to create a deer-vehicle accident management plan for a town. The results of the research showed that GIS analysis was able to show that measures being deployed had a significant effect.
- Dodd (2003) provides an evaluation of measures to minimize wildlife-vehicle collisions and maintain wildlife movement across highways in Arizona. The research objectives were to determine the effectiveness of the full complement of measures to minimize the incidence of wildlife-vehicle collisions and evaluate the degree to which wildlife permeability across the highway is maintained. The results of the research were to provide ongoing construction implementation guidance to Arizona Department of Transportation project managers throughout all construction phases of highways.
- Van-Riper (2003) presented a paper on Animal-Vehicle collisions in Maine at ICOET 2003. The paper showed that while the number of all other types of crashes is dropping, those with large wildlife species are increasing. It also stated that this total is probably a low estimate of the actual number of crashes since data used were from official accident records only. The paper also points out the fact that mitigation methods have had limited success, and there was an overall lack of statistically rigorous monitoring to evaluate the efficiency of the method(s). The report concluded that no simple solutions were apparent.
- Gordon's (2003) paper on motorist response to deer-sensing warning systems in Wyoming showed exactly the difficulties related to new technologies. It found that while the sign may work well for local traffic, people passing through the crossing will encounter the sign only once and during their brief encounter probably will not fully understand how it functions. Additionally, a program educating the local citizens about how the system works is recommended in conjunction with the system's installation.

The literature shows continuous attention being given to the issue of animal-vehicle collisions in North America. New research projects initiated by some high profile agencies such as NCHRP and the US Federal Highway Administration demonstrate the level of interest the issue is gathering in the United States. The literature also showed that the issue of underestimation seems to be recognized and acknowledged. This is also supported by an increased awareness regarding the need for data quality. The document published by FHWA recognizes this.

Along the same lines, new research points to the need for improved methods for recording animal-vehicle collisions. The Wildlife Accident Reporting System (WARS) data collection method developed by British Columbia Transport Department is often mentioned as a model for data collection. The literature notes that data collection is often done by two and sometimes three different organizations within the states and provinces. The use of a more common approach and/or technology is now being looked at in the United States.

The literature also shows that there has been continued development and testing of mitigation measures with some success with detection technologies (e.g. Switzerland site with an 83% reduction). It also shows that although much progress has been made in the identification of more universal mitigation measures, local conditions often demand custom-designed solutions.

5. STATISTICAL REVIEW

Canada

The following tables show the national statistics as reported by Transport Canada.

Exhibit 5.1
Fatal Collisions Where a Vehicle Hits an Animal – Canada

Province	Fatal Collisions				
	1999	2000	2001	2002	2003
Alberta	2	1	2	2	0
British Columbia	2	0	1	2	3
Manitoba	0	0	1	2	0
New Brunswick	4	4	1	4	2
Newfoundland	0	3	1	2	2
Nova Scotia	1	0	0	3	0
N.W.T	0	1	0	0	0
Ontario	5	7	4	8	4
P.E.I.	0	1	0	0	0
Quebec	6	5	2	6	6
Saskatchewan	1	2	0	3	0
Yukon	0	0	0	0	0
TOTAL	21	23	12	32	17

Source: Transport Canada, Road Safety Directorate

Exhibit 5.2
Collisions Where a Vehicle Hits an Animal – Canada
Collisions with Non-Fatal Injury

Province	Collisions with Non-Fatal Injury				
	1999	2000	2001	2002	2003
Alberta	150	160	166	185	12
British Columbia	185	236	276	316	345
Manitoba	158	160	199	159	214
New Brunswick	125	117	104	85	106
Newfoundland	78	62	56	70	62
Nova Scotia	79	105	82	69	47
N.W.T	4	3	3	1	2
Ontario	562	585	569	610	596
P.E.I.	12	9	7	5	9
Quebec	275	330	383	363	435
Saskatchewan	129	117	123	140	164
Yukon	4	3	7	6	6
TOTAL	1,761	1,887	1,975	2,009	2,003

Source: Transport Canada, Road Safety Directorate

Exhibit 5.3
Collisions Where a Vehicle Hits an Animal – Canada

Collisions with Property Damage Only					
Province	1999	2000	2001	2002	2003
Alberta	4,430	4,672	4,098	5,487	353
British Columbia	709	931	1,465	1,741	1,998
Manitoba	2,755	2,658	3,213	3,218	3,971
New Brunswick	948	876	893	806	786
Newfoundland	295	336	315	364	312
Nova Scotia	798	770	688	573	432
N.W.T	13	10	12	20	16
Ontario	9,026	10,503	11,248	12,894	14,018
P.E.I.	12	23	16	13	14
Quebec	5,978	6,082	5,456	6,075	6,256
Saskatchewan	1,987	1,936	3,604	5,780	9,564
Yukon	26	29	41	37	34
TOTAL	26,977	28,826	31,049	37,008	37,754

Source: Transport Canada, Road Safety Directorate

With the exception of 2003, the national statistics show a significant increase in the number of animal-vehicle collisions. As per previous analysis on this subject, this increase does not translate into more fatalities. The number of fatal collisions in fact decreases significantly in 2003.

Alberta

The data shows nevertheless some signs of peculiarities as far as provincial figures are concerned. The data for the province of Alberta seems inconsistent especially when looking at collisions with property damage, where only 353 collisions were reported in 2003 compared to 5,487 in 2001. The same can be said of the two other categories: fatalities and injuries. The provincial data obtained from the Province of Alberta shows the following statistics:

Exhibit 5.4
Alberta
Animal - Vehicle Collisions*
1999-2003

Severity of Collision	1999	2000	2001	2002	2003
Fatal	5	2	5	5	6
Injury	273	262	346	324	299
Property Damage	8,799	9,604	11,061	11,120	11,318
Total Collisions	9,077	9,868	11,412	11,449	11,623

Source: Alberta Infrastructure and Transportation

* Includes wild and domestic animals but more than 95% of the animals involved are wild animals

The data for the Province of Alberta shows that the provincial database is more than double the number of collisions shown in the national statistics. One explanation for this discrepancy appears to be found in the “data dictionary” submitted by Transport Canada to the provinces. The data presented by Transport Canada appears to only capture the collisions with damage estimated at a \$1,000 minimum, whereas the Alberta data depicts all the collisions reported in Alberta irrespective of the amount of damage.

The Province of Alberta has a system in place whereby a vehicle involved in a collision receives an “insurance sticker” before going to a garage to be fixed. It would appear that most mechanics accept for repair only the vehicles with these stickers as they fear that without that sticker they may not get paid.

The above explanation can only partially explain the differences between Transport Canada data and the ones from that Province. The difference in the number of collisions with fatalities cannot really be explained.

We will now look at other Provincial databases and continue to compare the national statistics to existing provincial databases.

Newfoundland & Labrador

Exhibit 5.5
Newfoundland Animal-Vehicle Collisions 1999 - 2003

Year	1999	2000	2001	2002	2003
Total Collisions	356	378	353	397	363
Collisions with Injury	99	76	64	80	87
Collisions with Fatality	0	2	1	2	2

Source: Newfoundland & Labrador Ministry Department of Environment and Conservation

Exhibit 5.6
Newfoundland
Animal-Vehicle Collisions 1999 – 2003
RCMP and Conservation Officers Reports

Year	1999	2000	2001	2002	2003
Collisions as reported by RCMP	356	378	353	397	363
Collisions based on RCMP + Conservation Officer reports combined	685	622	718	805	706
Difference	329	244	365	408	343

Source: Newfoundland & Labrador Ministry Department of Environment and Conservation

The data from Newfoundland shows that the reportable collisions matched closely the national database. Only when all collisions are factored in, is there is a discrepancy between the national database and the provincial database. In fact, the number of reported collisions almost doubled. Again we are confronted with the same phenomenon as in Alberta whereby motorists are

required to report all collisions to the RCMP that result in injury or incur more than \$1,000 in vehicle damage. Many people simply do not bother reporting collisions with damages less than that amount.

Other facts regarding Newfoundland:

- Newfoundland animal-vehicle collisions are mostly moose-vehicle collisions.
- Generally speaking, moose-vehicle collisions are a serious threat to motorists and moose as they cause injury and death.
- Only 16.0% of collisions reported to RCMP resulted in injury of any kind, the majority of these being minor. Of all accidents reported to RCMP and Conservation Officers, only 8.0% of the collisions led to reported injuries.
- On average, only 2 people are killed every year in these collisions.
- According to government sources, 89% of moose die at the scene.

Nova Scotia

The Province of Nova Scotia is well known for its huge deer population. The collision data from provincial sources show the following statistics:

Exhibit 5.7
Nova Scotia
Deer-Vehicle Collisions 2001-2003

Year	Fatal	Injury	Property Damage Only	Total
2001	1	74	638	713
2002	1	55	514	570
2003	0	33	364	397

Source: Nova Scotia Department of Transportation and Public Works

Nova Scotia's data seem to be in line with the national statistics and the differences between the table above and the national tables may be related to other species such as moose and black bears.

Prince Edward Island

PEI indicated that they do not have a major problem with any large wild animals and they do not collect statistics other than those for Transport Canada.

Quebec

The Ministry of Transport in Quebec has been addressing the issue of animal-vehicle collisions for the past 10 years. They have developed measures aimed at reducing the number and severity of the collisions and their efforts have been concentrated in some particular regions within the Province of Quebec. These efforts have meant that the ministry collects data for those regions. The following statistics are extracted from reports produced by the ministry for those specific regions. Therefore, it does not cover the entire province but only part of it.

The statistics below cover the following regions with their estimated length of highway network:

- Bas-St-Laurent-Gaspésie-Îles-de-la-Madeleine – 3,651 kms
- Capitale-Nationale (Quebec city area) – 1,629 kms
- Chaudière-Appalaches – 2,777 kms
- Côte-Nord – 2,086 kms
- Mauricie-Centre-du-Québec – 2,866 kms
- Saguenay-Lac-St-Jean-Chibougamau – 2,332 kms

At the time of completing this report, the statistics were only available for the period 1996 to 2000. A report covering the period 2001 to 2005 will be published later in 2006. It will nevertheless allow us to compare data for two years, i.e. 1999 and 2000.

Exhibit 5.8
Quebec Regions
Animal-Vehicle Collisions

Year	Deer	Moose	Bear	Caribou	Total
1996	1,195	236	8	0	1,439
1997	1,256	210	23	1	1,490
1998	1,640	310	30	1	1,981
1999	1,900	300	41	0	2,241
2000	2,454	297	58	1	2,810
Total	8,445	1,353	160	3	9,961

Source: Ministère des Transports du Québec

Exhibit 5.9
Quebec Regions
Animal-Vehicle Collisions by Severity

	1996	1997	1998	1999	2000
Fatalities	4	3	1	4	3
Injuries	80	59	113	111	129
Property Damage	1,355	1,428	1,867	2,216	2,678
Total	1,439	1,490	1,981	2,241	2,810

Source: Ministère des Transports du Québec

The statistics from the Province of Quebec show no particular discrepancies when compared to the data published by Transport Canada.

Ontario

The same situation prevails for Ontario. There are no significant discrepancies between the data published by Transport Canada and the data available from the Ministry of Transportation of Ontario. This does not mean however that the number of animal-vehicle collisions is not under-represented.

Exhibit 5.10
Ontario
Animal-Vehicle Collisions by Severity

Year	Fatal	Injury	Property Damage Only	Total
1997	5	403	7,309	7,717
1998	3	394	7,803	8,200
1999	4	466	8,390	8,860
2000	6	506	9,826	10,338
2001	4	482	10,565	11,051

Source: Y.M. Elzohairy, C. Janusz, & L. Tosca, Characteristics of Motor Vehicle-Wild Animal Collisions: An Ontario Case Study, Transportation Research Board, 2004

Ontario data indicate that less than 0.1 percent of animal-vehicle collisions are fatal, 4.8 percent of all reported animal-vehicle collisions are non-fatal injury collisions, and over 95% of all reported animal-vehicle collisions are property damage only (PDO) collisions.

The same report also provides useful information regarding animal-vehicle collisions in Ontario and the type of roads on which they occurred.

Exhibit 5.11
Ontario
Collision Severity by Road Characteristics, 2001

Road Characteristics	Fatal	Injury	Property Damage Only	Total	%
Undivided One-Way	0	4	171	175	1.6
Undivided Two-Way	4	423	9,375	9,802	88.7
Divided with Restraining Barrier	0	24	337	361	3.3
Divided	0	31	626	657	5.9
Ramp	0	0	22	22	0.2
Collector lane	0	0	5	5	0.0
Express lane	0	0	12	12	0.1
Transfer Lane	0	0	1	1	0.0
Other	0	0	16	16	0.1
Total	4	482	10,565	11,051	100

Source: Y.M. Elzohairy, C. Janusz, & L. Tosca, Characteristics of Motor Vehicle-Wild Animal Collisions: An Ontario Case Study, Transportation Research Board, 2004

The same study provides other interesting statistical facts:

- The number of animal strikes on Ontario roads has increased from 7,389 in 1996 to 11,051 in 2001. This represents a 50 percent increase over a 6-year period.
- Approximately one out of every 21 collisions that occur on Ontario highways involves a wild animal venturing onto the highway.
- Motor vehicle-wild animal collisions have claimed 42 lives in the past eight years.

- High numbers of animal-vehicle collisions were found during the months of October to December, with November being the month with the greatest number of motor-vehicle wild-animal collisions.
- Most wild animal collisions occur during early morning (5am-7am) or after sunset (5pm-11pm).
- With 719 vehicle-animal collisions reported in 2001, the Regional Municipality of Ottawa-Carleton has had a consistently higher number of wild animals collisions than any of the other 53 counties in Ontario.

On the subject of the Regional Municipality of Ottawa-Carleton, the region shows the following statistics over a eleven-year period:

Exhibit 5.12
Regional Municipality of Ottawa-Carleton
Animal – Vehicle Collisions 10-Year Period 1994-2004

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total	Avg
Total deer collisions	261	241	355	469	475	509	629	680	817	944	917	6,297	572.5
Fatal	0	0	0	0	0	0	0	0	1	0	0	1	0.1
Injury	4	8	8	16	17	17	17	11	29	23	32	182	16.5
Property Damage	257	233	347	453	458	492	612	669	788	921	885	6,115	555.9

Source: City of Ottawa, Transportation, Utilities and Public Works Department, 2006

Exhibit 5.13
Exposure Data - Regional Municipality of Ottawa-Carleton

	Deer Collisions	Population	Collisions / Population Ratio*	Registered Vehicles	Collisions / Reg Veh Ratio**
1994	261	707,500	0.37	384,764	0.7
1995	241	719,000	0.34	380,186	0.6
1996	355	730,000	0.49	378,109	0.9
1997	469	741,000	0.63	384,681	1.2
1998	475	750,000	0.63	396,048	1.2
1999	509	765,000	0.67	413,892	1.2
2000	629	780,500	0.81	430,547	1.5
2001	680	790,000	0.86	441,625	1.5
2002	817	811,500	1.01	441,169	1.9
2003	944	828,693	1.14	445,120	2.1

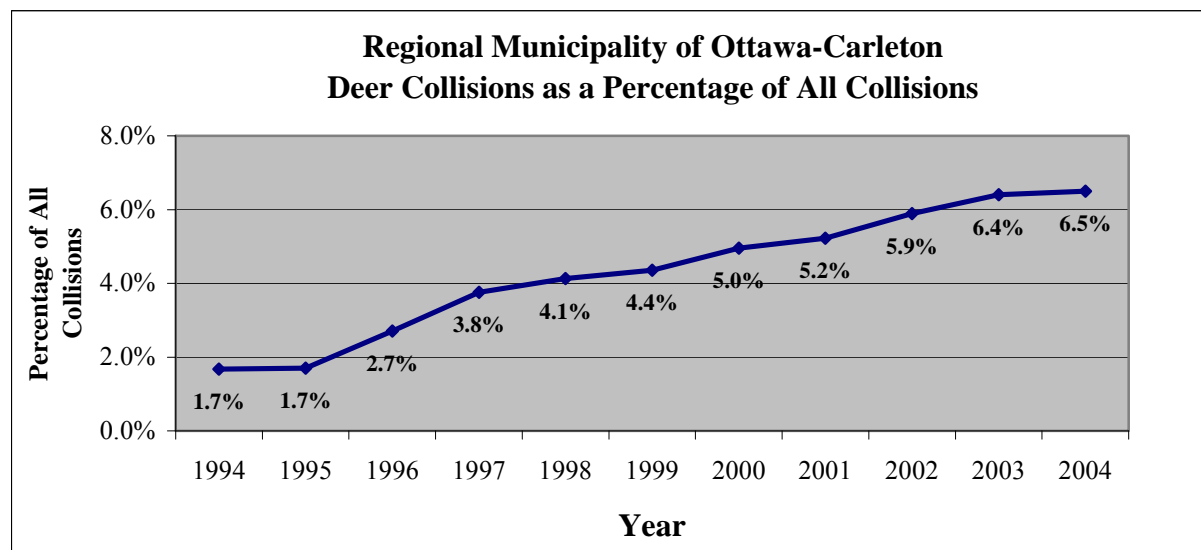
Source: City of Ottawa, Transportation, Utilities and Public Works Department, 2006

Exhibit 5.14
Regional Municipality of Ottawa-Carleton
Proportion of Animal-Vehicle Collisions

Municipality		2003 Deer Collisions		2003 All Collisions		Deer Collisions as a Percentage of All Collisions
West Carleton	WC	203	21.5%	469	3.2%	43.3%
Goulbourn	GO	82	8.7%	337	2.3%	24.3%
Rideau	RI	91	9.6%	274	1.8%	33.2%
Kanata	KA	99	10.5%	818	5.5%	12.1%
Nepean	NE	156	16.5%	2,178	14.7%	7.2%
Ottawa	OT	7	0.7%	7,717	52.0%	0.1%
Vanier	VA	0	0.0%	279	1.9%	0.0%
Osgoode	OS	98	10.4%	308	2.1%	31.8%
Gloucester	GL	158	16.7%	1,837	12.4%	8.6%
Cumberland	CU	50	5.3%	634	4.3%	7.9%
Total		944		14,851		6.4%

Source: City of Ottawa, Transportation, Utilities and Public Works Department, 2006

Exhibit 5.15



Source: City of Ottawa, Transportation, Utilities and Public Works Department, 2006

The above exhibits and figures show the statistical characteristics of the problem in an area where animal-vehicle collisions are an issue. As can be seen, for some areas around the City of Ottawa, deer-vehicle collisions are a serious issue and represent a large proportion of the road collisions for that area.

Manitoba

The province of Manitoba has a public no-fault insurance system. Although the data collected by Manitoba Public Insurance covers all collisions, some may be excluded because not all car owners have full coverage for damage to their cars. When they purchase their insurance coverage, car owners have the option to choose their deductible for damage to their vehicles.

The Manitoba data show a difference between provincial data and Transport Canada data.

Exhibit 5.16
Manitoba
Animal-Vehicle Collision Claims 2001 –2003

Year	Total Claims	Claims with Fatality	Claims with Injury	Claims with Property Damage Only (PDO)	Average Costs from Collisions with PDO
2001	9,389	2	238	9,141	\$1,617
2002	9,262	0	251	9,011	\$1,701
2003	10,804	0	277	10,527	\$1,818

Source: Manitoba Public Insurance

Saskatchewan

As we have seen for the province of Manitoba, when a province has a full public insurance regime in place, some data discrepancies can be expected between the provincial data and Transport Canada's database. Saskatchewan is no different in this respect. The data obtained from Saskatchewan Government Insurance shows that there are some data discrepancy issues between data obtained from the province of Saskatchewan and the national database.

Exhibit 5.17
Comparison of Wildlife-Vehicle Collisions in Saskatchewan According to:
Traffic Accident Information System (TAIS) and SGI claims 1996-2004

Year	Total Collisions (TAIS)	Collisions with Injuries	Collisions with Fatalities	Collisions with Property Damage Only	SGI Claims Related to Animal Collisions
1999	2,228	190	1	2,037	9,998
2000	2,205	196	2	2,007	10,645
2001	3,860	189	0	3,671	11,775
2002	6,112	209	2	5,901	11,514
2003	9,960	229	1	9,730	13,966

Source: Saskatchewan Government Insurance

The discrepancy shown above in Exhibits 5.16 and 5.17 illustrates the different data collection methodologies existing in Canada. While the Transport Canada data collection (TAIS) efforts are

on the number of collisions where wild animal action was a contributing factor in the crash and the damage often exceeds \$1,000, organizations like MPI and SGI focuses on all claims.

British Columbia

As for British Columbia, the data provided by the Insurance Corporation of British Columbia (ICBC) showed the following trends.

Exhibit 5.18
British Columbia
Animal-Vehicle Collisions

Year	Collision Counts	Injured Victims
2002	9,300	330
2003	9,100	280

Source: Insurance Corporation of British Columbia

As was the case for Manitoba and Saskatchewan, and for the same reason stated for these two provinces, the number of collisions shown for British Columbia is much more than was shown in Transport Canada national statistics.

The available data shows that there are some discrepancies in the data between Transport Canada and provincial databases. These differences continue to point towards an under-reporting of the number of animal-vehicle collisions in Canada. At the same time, the differences can probably be bridged by a change in the data dictionary being asked of the provinces. We have at least four provinces that appear to capture the total count of animal - vehicle collisions. For those provinces, the data reflect the true number of collisions. The comparisons of databases also showed that on the issue of collisions with fatalities and collisions with injuries, the gap between provincial databases and the Transport Canada database is very small.

6. MITIGATION MEASURES

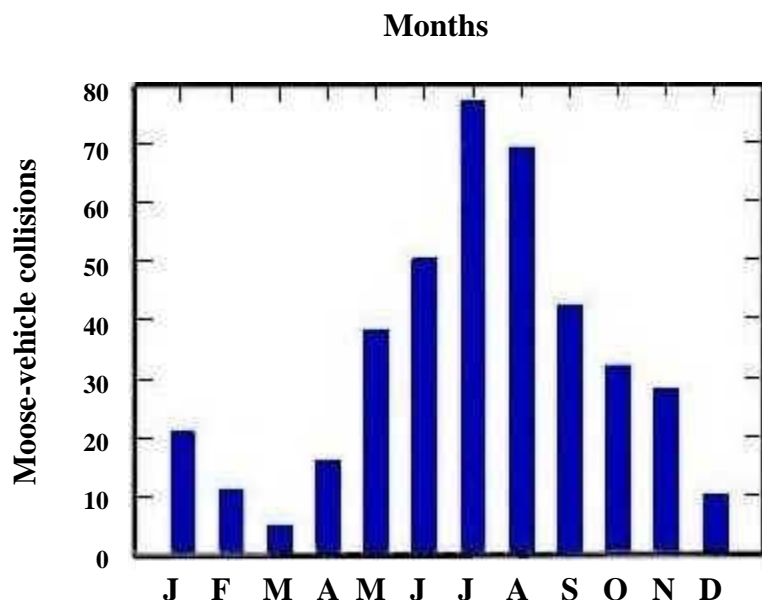
As described in the 2003 report entitled: *Collisions involving large animals and motor vehicles in Canada* by L-P Tardif, there are many mitigation measures applied across Canada. Following is a brief summary of the types of measures applied in the provinces for wildlife accident mitigation. Nancy Newhouse of Sylvan Consulting in British Columbia provided some of the information gathered in this section. Sylvan has been active in several mitigation projects both in Canada and in the United States.

Newfoundland:

The province is focusing mostly on signage and education/awareness campaigns especially during the peak seasons.

Their data analysis has shown that:

- The risk of an animal-vehicle collision occurring is 2.7 times greater during the peak versus the non-peak period.



- The risk of a severe injury is 1.5 times greater during darkness than daylight.
- The risk of a severe injury is 1.8 times greater at highway speeds.
- The risk of a severe injury or death when involved in a moose-motorcycle accident is 12 times greater than for all other passenger vehicles combined.
- 9% of injured occupants were not wearing seatbelts when the accident occurred (excluding accidents involving motorcycles). This group accounted for 29% of fatalities.
- The risk of a fatal injury is 8 times greater for those individuals involved in an accident and who are not wearing a seatbelt.
- According to an RCMP report in Newfoundland, the average estimated vehicle damage is \$3,000.

Prince Edward Island:

PEI is not facing much of an issue regarding animal-vehicle collisions.

Nova Scotia:

Nova Scotia's main problem is with deer-vehicle collisions. They have put into place the following measures for dealing with wildlife: underpasses, fish culverts and signage.

New Brunswick:

New Brunswick is active on mitigation measures. They have put into place fish culverts, electric fencing, overpasses, open bridges, signage and reflectors.

Quebec:

The mitigation measures put into place in Quebec include: overpasses, fish culverts, electric fencing, lighting, signage, detection systems, destruction of salt ponds, and zones with special speed limits. They tested electric fencing in the Laurentide Park, where every year 65 collisions usually happen. They installed two electric fences: one of 5 kilometers and another one 10 kilometers long. They also installed special gates in the fences for the animals to use in order to cross. After three years of testing, the results show that fences have been effective in 75% of the cases in preventing an animal from crossing the road at points other than the gates and no collisions took place in the fenced area.

Ontario:

The mitigation measures put into place in Ontario include: education and awareness, fencing, lighting, repellents, signage and some areas with special speed limits. More specifically, in some areas with high exposure rates such as northern Ontario, the Ministry of Transportation of Ontario has been working on specific programs.

- **Regional Working Group**
In the spring of 2000, the Ministry of Transportation of Ontario Northeastern Region formed a regional committee that targets highway motorists travelling through northwest Ontario (i.e. Sault Ste Marie to the Manitoba border). The coalition, called the Highway Safety Education Committee (HSEC), is made up of concerned citizens, the Ministry of Transportation (MTO), Ontario Provincial Police, the District Health Unit, several independent trucking and logging companies, Thunder Bay Regional Hospital, the Regional Coroner, Lakehead University, Insurance Brokers Association of Ontario and Bowater Forest Products.
- **Placemats**
The Ministry of Natural Resources and nine community injury prevention coalitions, in partnership with the Ontario Provincial Police, developed placemats to elevate driver awareness of the risk of striking a wild animal, and to provide helpful tips that may

reduce their chance of becoming involved in a wildlife collision. As the majority of wildlife collisions in Ontario occur during the hours of darkness, the focus of this initiative was an emphasis on the increased risk while traveling during early morning hours or at night. 100,000 placemats were printed (English/French flip) and distributed to restaurants throughout Northeastern Ontario. This initiative was launched in April 2005 to coincide with the increased risk motorists face during this time of year, and ran for a period of three weeks.

- **Poster**
A poster was developed to complement the placemat initiative and provide consistent messaging to the public. 1,000 posters were distributed to restaurants, beer/liquor stores, government information centres, police services, tourist information centers, provincial parks, public libraries and municipal offices.
- **Highway Signage**
As a pilot project, two new wildlife warning signs were developed by the Ministry of Transportation and installed in 10 high risk areas across Northeastern Ontario. In keeping with the theme of night-time collisions, the signs were created to provide a similar appearance to the placemats and posters. These signs have been strategically placed along provincial highways. The signs will remain in place for a period of three years, at which time their effectiveness will be evaluated.
- **Media Launch**
Simultaneously to these public education products, a media launch was held in April prior to the products being distributed.
- **Wildlife Pamphlet**
Corporately, the Ministry of Transportation of Ontario has just developed and released its first wildlife pamphlet. There was significant interest by media outlets in southern and eastern Ontario to host on-air interviews to discuss this issue.

Manitoba:

The following mitigation measures have been deployed in Manitoba: fish culverts, snake pipes, fencing and signage.

Saskatchewan:

The following mitigation measures have been deployed in Saskatchewan: electronic warning systems, fish culverts, reflectors and zones with special speed limits.

Alberta:

The following mitigation measures have been deployed in Alberta: bridges, underpasses, overpasses, fish culverts, jersey barrier openings, jump-outs, signs, "caribou cowboy" (to scare caribou off road), alternative de-icers, zones with special speed limits and reflectors.

British Columbia:

The following mitigation measures have been deployed in British Columbia: overpasses, underpasses, fish culverts, badger culverts, fencing, signage, animal detection systems, right-of-way habitat modifications, repellents, reflectors and public awareness campaigns.

Yukon:

The following mitigation measures have been deployed in Yukon: fish culverts, signage, salt reduction and vegetation control.

Northwest Territories:

The following mitigation measures have been deployed in the Northwest Territories: fish culverts and public awareness campaigns.

Exhibit 6.1
Summary of Mitigation Measures by Province / Territory

Measures	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT
Education	√				√					√		√
Signage	√	√		√	√	√	√	√		√	√	
Fencing	√			√	√	√	√					
Underpasses/culverts	√	√	√	√		√		√			√	√
Overpass	√	√				√	√					
Reflectors/lighting	√	√	√		√	√	√					
Special speed limits		√	√		√	√						
Detection Systems	√		√			√						
Salt/ vegetation control / habitat	√	√			√	√					√	

7. CONCLUSION

The issue of animal-vehicle collisions continues to be a well-documented problem and several researchers are working hard to address the problem. The literature review confirmed that although much progress has been made in the identification of more universal mitigation measures, local conditions often demand custom-designed solutions.

The update of the 2003 report confirms that at the national level there is still underreporting of the number of animal-collisions. In some provinces, notably Newfoundland & Labrador, Manitoba, Saskatchewan, Alberta and British Columbia, there are mechanisms or organizations in place to capture data on the majority of these collisions. For those provinces, the data show a discrepancy between provincial databases and the national statistics. Although the underreporting issue seems to be most noticeable for collisions with property damage only (PDO), it also exists for the other categories as well.

The following tables provide a comparison and the discrepancies between provincial data and Transport Canada data. The two sets of data illustrate the underreporting issue:

Exhibit 7.1
Comparison of Transport Canada Data and Provincial Data
Collisions with Fatality

Provinces/Territories	2001		2002		2003	
	TC	Provincial	TC	Provincial	TC	Provincial
Alberta	2	5	2	5	0	6
British Columbia	1	1	2	2	3	3
Manitoba	1	2	2	0	0	0
New Brunswick	1	1	4	4	2	2
Newfoundland	1	1	2	2	2	2
Nova Scotia	0	1 ¹	3	1 ¹	0	0 ¹
N.W.T	0	0	0	0	0	0
Ontario	4	4	8	8	4	4
P.E.I.	0	0	0	0	0	0
Quebec	2	2	6	6	6	6
Saskatchewan	0	0	3	2	0	1
Yukon	0	N/A ²	0	N/A ²	0	N/A ²
Total Canada	12	17	32	30	17	24

¹Provincial data received from Nova Scotia only includes collisions involving deer

² N/A: not available – no response was received from the jurisdiction

Exhibit 7.2
Comparison of Transport Canada Data and Provincial Data
Collisions with Injury

Provinces/Territories	2001		2002		2003	
	TC	Provincial	TC	Provincial	TC	Provincial
Alberta	166	346	185	324	12	299
British Columbia	276	276	316	330	345	280
Manitoba	199	238	159	251	214	277
New Brunswick	104	104	85	85	106	106
Newfoundland	56	64	70	80	62	87
Nova Scotia	82	74 ¹	69	55 ¹	47	33 ¹
N.W.T	3	3	1	1	2	2
Ontario	482	569	610	610	596	596
P.E.I.	7	7	5	5	9	9
Quebec	383	383	363	363	435	435
Saskatchewan	123	189	140	209	164	229
Yukon	7	N/A ²	6	N/A ²	6	N/A ²
Total Canada	1,975	2,253	2,009	2,313	2,003	2,353

¹Provincial data received from Nova Scotia only includes collisions involving deer

² N/A: not available – no response was received from the jurisdiction

Exhibit 7.3
Comparison of Transport Canada Data and Provincial Data
Collisions with Property Damage Only

Provinces/Territoires	2001		2002		2003	
	TC	Provincial	TC	Provincial	TC	Provincial
Alberta	4,098	11,061	5,487	11,120	353	11,318
British Columbia	1,465	1,465	1,741	9,300	1,998	9,100
Manitoba	3,213	9,141	3,218	9,011	3,971	10,527
New Brunswick	893	893	806	806	786	786
Newfoundland	315	718	364	805	312	706
Nova Scotia	688	638 ¹	573	514 ¹	432	364 ¹
N.W.T	12	12	20	20	16	16
Ontario	11,248	10,565	12,894	12,894	14,018	14,018
P.E.I.	16	16	13	13	14	14
Quebec	5,456	5,456	5,780	5,780	6,256	6,256
Saskatchewan	3,604	11,775	5,780	11,514	9,564	13,966
Yukon	41	N/A ²	37	N/A ²	34	N/A ²
Total Canada	31,049	51,740	37,008	61,777	37,754	67,077

¹ Provincial data received from Nova Scotia only includes collisions involving deer

² N/A: not available – no response was received from the jurisdiction

There does not seem to be any easy solution to correct the underreporting problem. It is possible that there may be an issue here with the data dictionary being used by Transport Canada so that

some events may not be entered in the national data fields by the provinces/territories. Alberta would be a perfect case study to explore that angle.

It needs to be pointed out that even though some provinces capture all events involving large animals and motor vehicles, not all provinces and territories can do it. They simply do not have the mechanism for doing so. Although one of the compromises would be for Transport Canada to show the full data where it is available, this could raise other uniformity issues in the national database.

The review of the mitigation measures by province/territory shows that almost all provinces and territories are involved in mitigation measures of some sort. Special highway signs remain the most-favored mitigation measure.

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