Wildlife-Vehicle Collisions: 2000-2014

Bull Elk down the hill near Jasper, Alberta, Canada
Image credit: © Spondylolithesis via iStock

The expansive natural rural environments and the widespread integration of nature within urban areas in Canada have meant that interactions between drivers and wildlife on the road are one of many concerns for road users. As evidence of this, 28.4% of respondents to a national survey considered the presence of wildlife crossing or standing on roads to be a serious problem (Meister et al. 2016).

This fact sheet, sponsored by Desjardins Insurance, examines wildlife-vehicle road collisions (WVCs) in Canada from 2000 to 2014. The Traffic Injury Research Foundation (TIRF) maintains the National Fatality Database which contains data on fatal collisions that involve several animal species. Data presented in this fact sheet include the number of persons killed in collisions with all wildlife as well as collisions with large mammals. These species include deer, elk, moose, bison, antelope, bears, wolves, coyotes and foxes. Large animals are most often identified in police-reported collisions as a result of personal injuries or damage to vehicles (cf., in an analysis of data for wildlife vehicle collisions, researchers at the University of Northern British Columbia focused their analysis on large animals, i.e., deer, moose, bear, elk and caribou). Also, because of the potentially more severe consequences when crashing with large animals, countermeasures are most commonly deployed to mitigate collisions involving these animals (O'Keefe and Rea 2012).

Data presented in this fact sheet also provides information about the times when fatal collisions more often occur. It is presented according to seasons, time of day, and month of the year. This data is important as it provides insight into factors such as migration, daylight, and road conditions that may heighten the risk of WVCs.

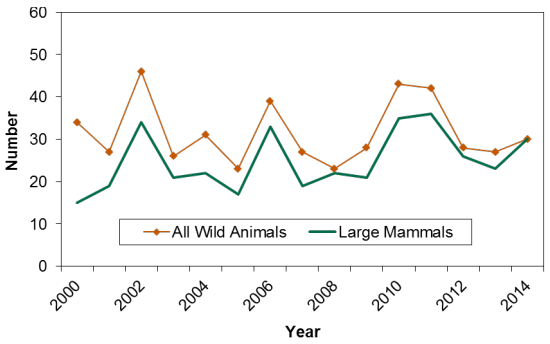
Persons killed in WVCs over time and by time of year

Given that there are a relatively small annual number of persons who are fatally injured in WVCs in Canada (i.e., only 30-40 cases per year) trend data were limited to the number of fatalities per year. To examine the month of the crash and the season of the crash, data from 2000-2014 were combined to conduct an analysis of the number of persons killed in WVCs during this 15-year period. A total of 474 persons were killed in WVCs during this time period, representing 1.18% of all motor vehicle collision fatalities.

Year of collision. The number of persons killed in WVCs in Canada from 2000 to 2014 is shown in Figure 1. The

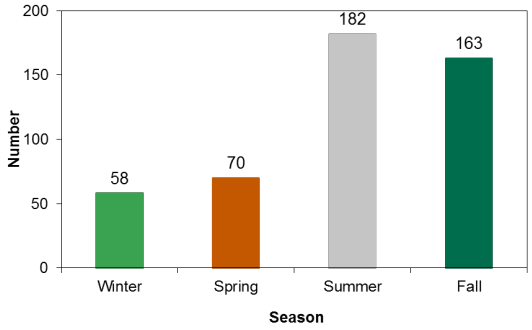
orange line indicates the number of persons killed in motor vehicle collisions involving any species of wildlife whereas the green line shows the number of persons killed in collisions involving large mammals. It reveals that the majority of persons killed in WVCs died in crashes that involved large mammals such as deer, elk, moose, bison, antelopes, or bears. There appears to be a consistent trend where fatalities increase by 15 to 20 per year and then decline to a more steady average for three years before increasing again. Despite this fluctuation that has occurred over the fifteen years, there has been minimal change, with 34 fatalities in 2000 and 30 in 2014.

Figure 1: Persons killed in wildlife-vehicle collisions by year of crash – Canada, 2000-2014



Season of collision. The number of persons killed in WVCs was analyzed by season from 2000 to 2014. The seasons were classified as winter (December to February), spring (March to May), summer (June to August), and fall (September to November). Figure 2 shows that the majority of fatalities occurred in the summer (182) and fall (163) months. This is further demonstrated when examining the number of persons killed in WVCs by month as shown in Figure 3. The higher frequency of reported collisions in the fall corresponds to the greater likelihood of encountering wildlife at this time of year due to increased animal movement for winter migration, mating season, and hunting season. The findings for fall were similar to a 2016 study which determined that the number of WVCs increases as the hours of darkness increases, notably during the fall (Ellis et al. 2016).

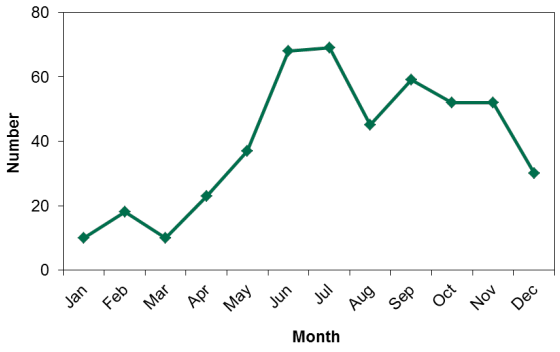
Figure 2: Persons killed in wildlife-vehicle collisions by season of crash – Canada, 2000-2014



The high frequency of fatalities during the summer likely reflects the larger number of people travelling for vacation, particularly through more rural or summer vacation areas where many animals are active during summer months (Meister et al. 2016). One reason for this animal activity is forest fires. Fires destroy the animals' habitat and brings drought and dry, hot weather that decreases the availability of feed (Wildlife Collision Prevention Program 2017). Consequently, animals are forced to move in order to obtain the food and this increases the number of animals on the move.

Month of collision. The number of persons killed per month in WVCs in Canada from 2000 to 2014 is shown in Figure 3 below. The months during which most people died in WVCs involving any species were June and July (68 and 69 fatalities, respectively). From September to November, there were also a substantial number of persons killed in WVCs. By comparison,

Figure 3: Persons killed in wildlife-vehicle collisions by month of crash – Canada, 2000-2014



fewer persons are killed in WVCs from December until April.

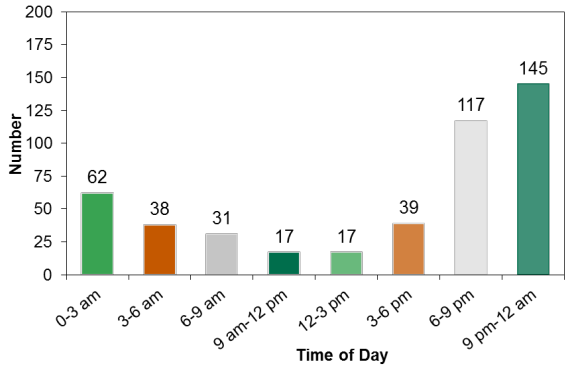
Characteristics of fatal WVCs

This section examines characteristics of fatal WVCs which occurred in Canada from 2000 to 2014. These characteristics include:

- Time of day when crashes occurred;
- Jurisdiction of the collision;
- Location of the collision (highway, public road, private property, other location);
- Circumstances of collision (struck wild animal, swerved to avoid wild animal, struck wild animal and/or second vehicle); and,
- Type of vehicle occupied.

Time of collision. Figure 4 shows the number of fatal WVCs according to the time of day. Time slots are divided into three-hour increments, and show that the largest number of persons died in collisions between 9:00 p.m. and midnight (145 or 31.1%). Similar to the reasoning above, this may be a result of low visibility which makes it increasingly difficult to see wildlife as darkness increases. This also applies to the large number of crashes between 6:00 p.m. and 9:00 p.m. (117 or 25.1%), when it is dusk and increasingly dark. Research has shown that dusk and dawn are two peak periods of high activity for deer and moose. Deer typically avoid entering an open space in daylight compared to nighttime, thus there are more deer that are active and crossing the road (Haikonen 2001).

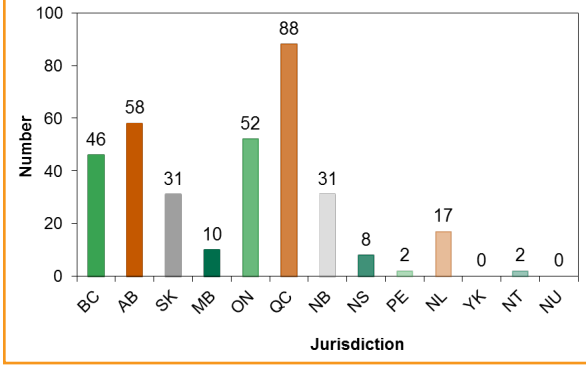
Figure 4: Persons killed in wildlife-vehicle collisions by time of day of crash – Canada, 2000-2014



In addition to animal movement patterns, another explanation for the large increase in fatal collisions between 6:00 p.m. and 12:00 a.m. may be driver fatigue. Studies have shown that fatigued drivers typically react more slowly, pay less attention to their surroundings, and have impaired decision-making skills (Voelker 2014). As a result of the side effects of fatigue, drivers may react slowly to animals on the road, or may not notice them entirely, which increases the risk of a collision with animals. In the 2011 TIRF Road Safety Monitor, 22.3% of respondents reported they had fallen asleep or nodded off while driving between 6:00 p.m. and 9:00 p.m., and 14.4% between 9:00 p.m. and 12:00 a.m.

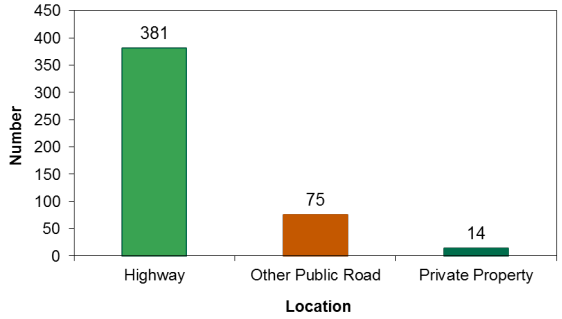
Jurisdiction of collision. Figure 5 depicts the number of persons killed in WVCs by province and territory from 2000-2014. It shows that the largest number of WVC fatalities occurred in Quebec (88). The larger number of crashes in Quebec is perhaps not surprising since this province has dense forest coverage compared to other jurisdictions in Canada. In Quebec, forests cover 45.6% of the province and are home to many large mammals, including white-tailed deer, moose and caribou (Gouvernement du Québec 2017).

Figure 5: Persons killed in wildlife-vehicle collisions by jurisdiction – Canada, 2000-2014



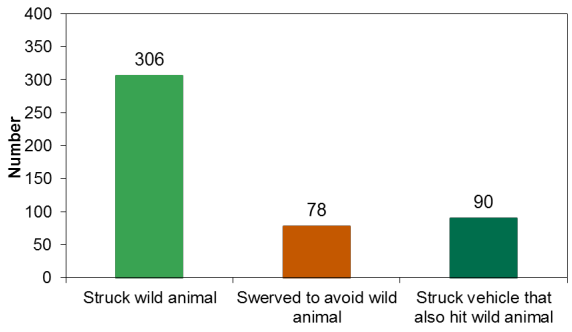
Location of collision. In Figure 6, the number of fatalities in WVCs is shown according to type of road including highway, other public road, or private property. The majority (381 or 81%) of fatal collisions occurred on highways from 2000-2014. Many large animals (i.e., moose, deer, and bears) are attracted to roads as the edges are usually "open edges" supporting the growth of shrubs that are an important source of food (Dussault et al. 2007). Furthermore, animals often use valleys along the sides of highways during migration, as they are flat terrain with access to food sources (Dussault et al. 2007). These factors increase the presence of wildlife near highways, therefore increasing the risk of WVCs.

Figure 6: Persons killed in wildlife-vehicle collisions by location of crash – Canada, 2000-2014



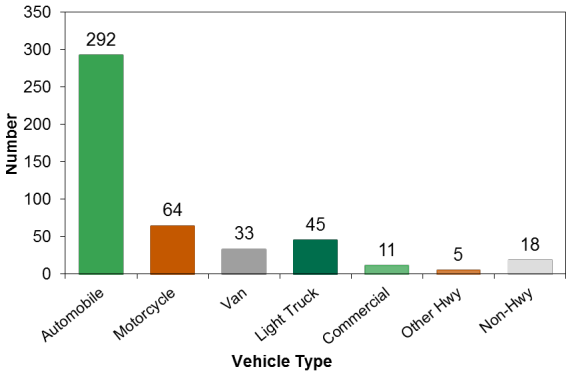
Circumstances of collision. WVCs are associated with several different circumstances. Collisions involved the victim's vehicle directly striking an animal as opposed to those collisions where the victim's vehicle swerved to avoid an animal. There were also collisions where the victim's vehicle struck a second vehicle that either struck or swerved to avoid an animal. Figure 7 shows the number of fatalities in each of these circumstances. The majority of fatalities (306 or 64.5%) occurred in WVCs that were single-vehicle crashes where the victim's vehicle struck an animal.

Figure 7: Persons killed in wildlife-vehicle collisions by circumstances of crash – Canada, 2000-2014



Type of vehicle occupied by victim. The number of persons killed in WVCs by type of vehicle occupied by the victim is shown in Figure 8. Commercial vehicles included heavy trucks and tractor-trailers and other highway vehicles included buses and emergency vehicles. Occupants of non-highway vehicles included those who were on a bicycle, farm tractor, snowmobile or all-terrain vehicle. More automobile occupants died in WVCs (292) than any other vehicle occupants. Although not shown in the figure, six pedestrians died in collisions where they were struck by a vehicle that had swerved to avoid a wild animal.

Figure 8: Persons killed in wildlife-vehicle collisions by type of vehicle occupied – Canada, 2000-2014

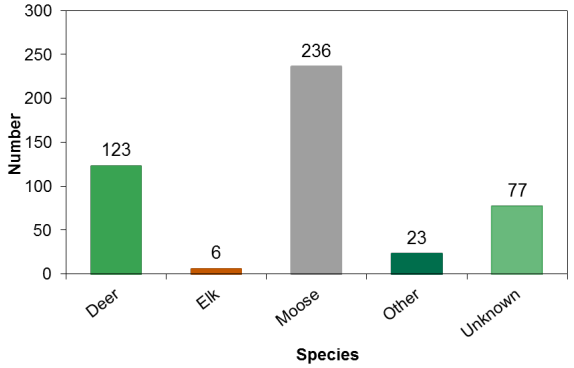


Species of animal involved in WVCs

This section examines the species of animals that are involved in fatal WVCs in Canada from 2000-2014.

Number of persons killed in collisions by animal species. Figure 9 shows the number of persons killed in WVCs by animal species involved in the crash. In some collisions, the species of animal was not specified in the collision data. Other species included large mammals such as bison, antelope, bears, foxes, ducks, coyotes, and wolves, smaller mammals (e.g., raccoons, squirrels, porcupines), and birds (e.g., geese, ducks, crows). There were 236 people killed in collisions involving moose, 123 people were killed in deer-vehicle collisions, and six people died in collisions involving elk.

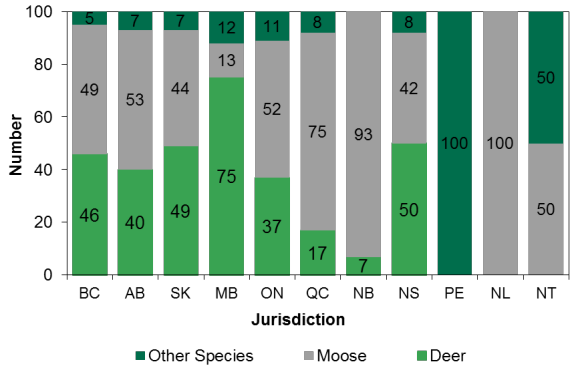
Figure 9: Persons killed in wildlife-vehicle collisions by species of animal involved in crash – Canada, 2000-2014



Moose and deer are often attracted to the salt pools that form on roads during the spring snow melt, increasing their presence on the road and risk for vehicle collisions (Leblond et al. 2007). For example, a study in Quebec determined that these salt pools increased moose-vehicle collisions by 80% (Leblond et al. 2007).

Species of animals in WVCs by jurisdiction. Figure 10 shows the percentage of animal species involved in WVCs by jurisdiction for collisions in which the animal species was known. In six jurisdictions (British Columbia, Alberta Ontario, Quebec, New Brunswick, and Newfoundland and Labrador), moose were involved in the most WVC fatalities with humans. In Saskatchewan, Manitoba, and Nova Scotia, most people died in WVCs that involved deer.

Figure 10: Percentage of persons killed in wildlife-vehicle collisions by species of animal involved – Canada, 2000-2014

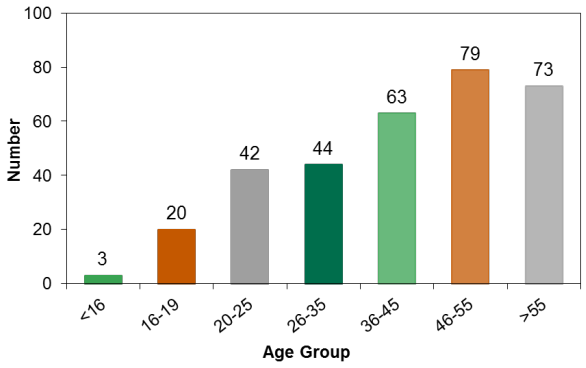


Driver Characteristics

This section examines the characteristics of drivers who were killed in WVCs. These include driver age group, driver sex, and the number of occupants in the driver's vehicle.

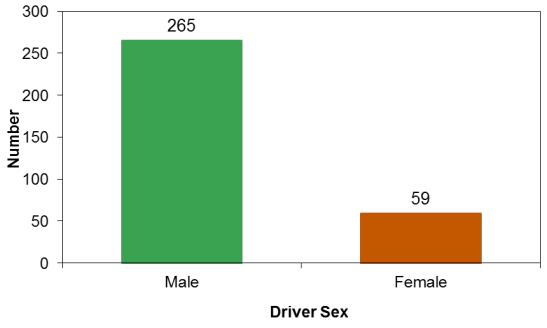
Driver age group. The number of fatally injured drivers killed in WVCs by age group is shown in Figure 11. Drivers aged 46-55 accounted for the largest number (79) of drivers who were killed in WVCs.

Figure 11: Drivers killed in wildlife-vehicle collisions by age group – Canada, 2000-2014



Driver sex. The number of fatally injured drivers killed in WVCs by driver sex is shown in Figure 12. The

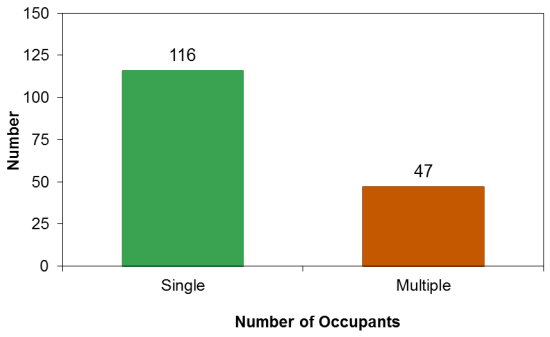
Figure 12: Drivers killed in wildlife-vehicle collisions by driver sex – Canada, 2000-2014



majority of drivers killed in these collisions were male (265).

Number of occupants. Figure 13 shows the number of drivers killed in WVCs with single and multiple occupants. The majority of drivers killed in these collisions were the sole occupants of their vehicles (116) while 47 drivers were accompanied by passengers.

Figure 13: Number of drivers killed in WVCs with single and multiple occupants – Canada, 2000-2014



Conclusion

The data contained in this fact sheet examined WVCs in Canada from 2000 to 2014. Within these fifteen years, there has been a consistent trend of a three year average followed by a one year spike which then decreases to a three year average. Despite this cyclical trend, there is little difference in the number of fatalities that occurred in 2000 (34) versus 2014 (30). The data indicated that June and July are the months in which the most WVC fatalities occurred. This is largely attributed to the fact that during the summer months there are more vehicles on the road as people are traveling for vacation, and road conditions are typically safer than in the winter months, which may increase the speed of vehicles. Additionally, the majority of these collisions occurred between 6:00 p.m. and 12:00 a.m., where risk of collision may increase due to animal movement patterns, less daylight and decreased visibility, and driver fatigue.

Collisions between wildlife and vehicles can be extremely hazardous and have deadly consequences for both people and animals. As such, the collection and interpretation of WVC data is critical in helping researchers and practitioners formulate new approaches to road safety, wildlife management, road design, public education, and environmental impact. To illustrate, data show that the majority of WVCs occur with moose (236) and deer (123). How drivers react to wildlife on the road is critical to the safety of both road users and wildlife. In most cases, with the exception of moose, the safest response to wildlife is for drivers to slow down in a controlled manner and steer straight, even if the animal is in the pathway of the vehicle. The safest response to moose is for drivers to aim their vehicle at the flanks (rear) of the moose. Most animals are not likely to remain still and since their behaviour is unpredictable, drivers cannot anticipate which direction the animal will move. This is especially true of deer whose natural defence is to dart and zig-zag to avoid predators. Therefore, swerving to avoid animals is often much more dangerous for drivers and animals, and is not recommended in most situations (Insurance Information Institute n.d.). More collisions are caused by drivers who swerve to avoid striking an animal and instead lost control of their vehicle and/or collided with other road users or hazards.

Swerving to avoid animals is often much more dangerous for drivers and animals, and is not recommended in most situations.

For more information on wildlife-vehicle collision research, visit **www.wildliferoadsharing.tirf.ca**.

Sources

Dussault, C., Ouellet, J-P., Laurian, C., Courtois, R., Poulin, M., Breton, L. (2007). Moose movement rates along highways and crossing probability models. The Journal of Wildlife Management, 71(7), 2338-2345.

Ellis, W. A., FitzGibbon, S. I., Barth, B. J., Niehaus, A. C., David, G. K., Taylor, B. D., Matsushige, H., Melzer, A., Bercovitch, F. B., Carrick, F., Jones, D. N., Dexter, C., Gillet, A., Predavec, M., Lunney, D., Wilson, R. S. (2016). Daylight saving time can decrease the frequency of wildlife-vehicle collisions. Biology Letters, 12: 1-5.

Haikonen, H. and Summala, H. (2001). Deer-vehicle crashes: Extensive peak at 1 hour after sunset. American Journal of Preventative Medicine, 21(3): 209-213.

Leblond, M., Dussault, C., Ouellet, J-p., Poulin, M., Courtois, R., Fortin, J. (2007). Management of roadside salt pools to reduce moose-vehicle collisions. The Journal of Wildlife Management, 71(7): 2304-2310.

Litvaitis, J. A., Tash, J. P. (2008). An approach toward understanding wildlife-vehicle collisions. Environmental Management, 42: 688-697.

Marcoux, K. D., Vanlaar, W. G.M., Robertson, R.D. (2012). Road Safety Monitor 2011: Fatigued Driving Trends. Ottawa, Ontario: Traffic Injury Research Foundation.

Meister, S.R., Mainegra Hing, M., Vanlaar, W.G.M., Robertson, R.D. (2016). Road Safety Monitor 2014: Driver Behaviour and Wildlife on the Road in Canada. Ottawa, Ontario: Traffic Injury Research Foundation.

O'Keefe, S., Rea, R.V. (2012). Evaluating ICBC Animal–Vehicle Crash Statistics (2006-2010) for purposes of collision mitigation in northern British Columbia. Prince George, British Columbia: University of Northern British Columbia.

Olson, D. D., Bissonette, J. A., Cramer, P. C., Bunnell, K. D., Coster, D. C., Jackson, P. J. (2015). How does variation in winter weather affect deer-vehicle collision rates? Wildlife Biology, 21(2): 80-87.

Sullivan, J. M. (2011). Trends and characteristics of animal-vehicle collisions in the United States. Journal of Safety Research, 42(1): 9-16.

Voelker, R. (2014). Reducing drowsy driving crashes. Journal of the American Medical Association, 312(9), 883.

Project Information

The Wildlife Roadsharing Resource Centre (WRRC) is a centralized source of information, research, education, resources, and many other features to answer any questions you may have regarding wildlife-vehicle collisions.

Visit **www.wildliferoadsharing.tirf.ca** to learn more.

ISBN: 978-1-988945-26-2

TIRF
A TIRF PROJECT

Desjardins Insurance
PROJECT PARTNER

Wildlife Roadsharing Resource Centre

613.238.5235 1.877.238.5235 wrrc@tirf.ca 171 Nepean St., Suite 200, Ottawa, ON K2P 0B4