

**COMMUNICATING THE RISK OF WILDLIFE HAZARDS TO NEW DRIVERS IN THE
UNITED STATES AND CANADA WITH STATE AND PROVINCIAL DRIVER MANUALS
AND HANDBOOKS**

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ABSTRACT

Wildlife are a significant natural hazard for drivers in the United States and Canada. Over the last century, as the road and highway systems of these two nations have expanded and encroached on wildlife habitats, and the number of drivers and motor vehicles has increased steadily, the incidence of wildlife-vehicle collisions has grown dramatically. Collisions involving large ungulates, such as deer, elk and moose, usually found in rural areas in both United States and Canada, are becoming increasingly common in urban and suburban areas as urbanization expands into wildlife areas. Large species of wildlife represent formidable hazards to drivers. Currently, more than a million wildlife-related motor vehicle collisions occur in the United States alone each year, resulting in over \$1US billion in damage to vehicles, 29,000 human injuries, and 200 human fatalities. The ability of drivers to deal effectively with wildlife hazards is largely dependent on driving skills, knowledge, experience and awareness of the hazards. Consequently, new drivers are extremely vulnerable to the threat posed by the presence of wildlife on and near roads and highways. For decades, the driver manuals and handbooks published by US state and Canadian provincial authorities have historically been the primary formal source of educational materials for new drivers. A review of official driver manuals and handbooks published over the last 100 years examines the variation in information provided with respect to the fundamental characteristics of wildlife hazards and basic driving techniques necessary to reduce the likelihood and severity of wildlife collisions. The evolution of wildlife-related information in these publications is traced through the decades, and the presentation of critical safety issues, such as wildlife hazard awareness and wildlife collision avoidance or collision severity reduction manoeuvres is evaluated. Review results show some states and provinces have provided extensive material and guidance to new drivers on handling wildlife hazards encountered while driving, while other states and provinces have not. The lack of consistency in communicating information about wildlife hazards has left potentially millions of drivers throughout the United States and Canada with little formal knowledge about these hazards, or safe and effective approaches to handling them. Recommendations are made for improving state and provincial driver manuals and handbooks to protect both drivers and wildlife.

INTRODUCTION

Wildlife represent a significant natural hazard to drivers traveling on roads and highways in the United States and Canada. Large ungulates, such as deer, elk and moose, can be formidable obstacles to motor vehicles. Collisions involving large wild animals can lead to serious property damage, disabling human injuries and human deaths. In the United States alone, it is estimated animal-vehicle collisions cause over 200 human fatalities, over 29,000 human injuries, and over \$1US billion in property damage each year (United States General Accounting Office, 2001).

The ability of drivers to deal effectively with wildlife hazards is dependent on driving skills, knowledge, experience and awareness of wildlife. As a consequence, new drivers are especially vulnerable to the threat of wildlife on roads and highways. To determine what information new drivers are provided by US state and Canadian provincial driver licensing agencies regarding wildlife hazards, over 300 driver manuals published between 1912 and 2012 were reviewed.

CHARACTERISTICS OF LARGE UNGULATES IN UNITED STATES AND CANADA

The magnitude of the animal hazard problem to drivers in the United States and Canada provinces is significant because of either the size and/or number of animals involved. Some animals, in particular elk and moose, represent a formidable danger to drivers, especially at night. Elk and moose are dark colored and very difficult to distinguish in darkness. They can also be very large. Some bull moose reach upwards of 500 kilograms and stand nearly 2 meter tall at the shoulder (British Columbia Ministry of Environment, Lands and Parks, 2000a). As primarily solitary animals, moose can run quickly and stealth-

like along a highway right-of-way at night, descending onto a highway with little warning to drivers. Striking a moose with a motor vehicle can be a fatal experience for the driver, their passengers and the moose.

Large male deer can weigh upwards of 180 kilograms and stand close to one metre at the shoulder (British Columbia Ministry of Environment, Lands and Parks, 2000b). Deer, while not as large as elk or moose, and representing less of a physical threat to drivers and their vehicles, are a significant hazard because of their great numbers and widespread distribution across United States and Canada.

NEW DRIVER EDUCATION

Driver education programs are designed to develop safe, capable and proficient drivers who know and understand the rules of the road (SGI, 2007). Fundamental information resources for new drivers are driver manuals or driver handbooks. They are intended to assist new drivers acquire a driver's license and develop safe and competent driving skills. Knowledge about hazards to motoring is key to the success of new drivers. In the United States and Canada, new drivers have the potential to encounter wildlife on roads and highways. Consequently, new drivers require the knowledge necessary to deal with these hazards safely and effectively. For new drivers, especially young ones located in major urban centers, driver manuals may represent their only source of information about wildlife hazards and how to deal with them.

CASE STUDY: DRIVER MANUALS IN WESTERN CANADA

The four Canadian Western provinces, British Columbia, Alberta, Saskatchewan and Manitoba, share many social, political, cultural and environmental characteristics (Figure 1). The provinces have relatively few, but large population centers that are connected to their scarcely populated, agricultural areas or resource hinterlands by extensive provincial highway systems (Statistics Canada, 2008a; Statistics Canada, 2008b; Statistics Canada, 2008c; Statistics Canada, 2008d). Great expanses of undisturbed natural areas and large rural land holdings support vast numbers of large wildlife species, in particular deer (Figure 2). Throughout Western Canada, large ungulates represent a hazard to drivers.

In Alberta, 14,148 vehicle-animal collisions occurred in 2005 (Alberta Infrastructure and Transportation, 2008). In Saskatchewan each year, there are nearly 10,000 collision claims involving wildlife (SGI, 2008). Likewise, in Manitoba, drivers also report approximately 10,000 wildlife-vehicle collisions each year (Wildlife and Ecosystem Protection Branch, 2008). Of these collisions, deer are involved in 65 to 80 percent. On average, the Insurance Corporation of British Columbia (ICBC) processes approximately 6,600 wildlife-related collision claims a year (Sielecki, 2004).

In Alberta, based on a five-year average from 2001 to 2005, six people died each year as a result of a collision with an animal, and 323 vehicle-animal collisions caused human injuries (Alberta Infrastructure and Transportation, 2008). Approximately 2 people are killed and 210 others are injured in wildlife-related collisions in British Columbia each year (Sielecki, 2005). The costs of these collisions are considerable.

Between 1997 and 2002, the Insurance Corporation of British Columbia paid over \$144 million in animal-related motor vehicle collision claims (Sielecki, 2004). According to the British Columbia Ministry Transportation Financing Authority, in 1999, the societal costs associated with a motor vehicle collision involving a human fatality were \$4.17 million; an injury were \$97,000; and property damage were \$6,000 (Perkins, 1999).

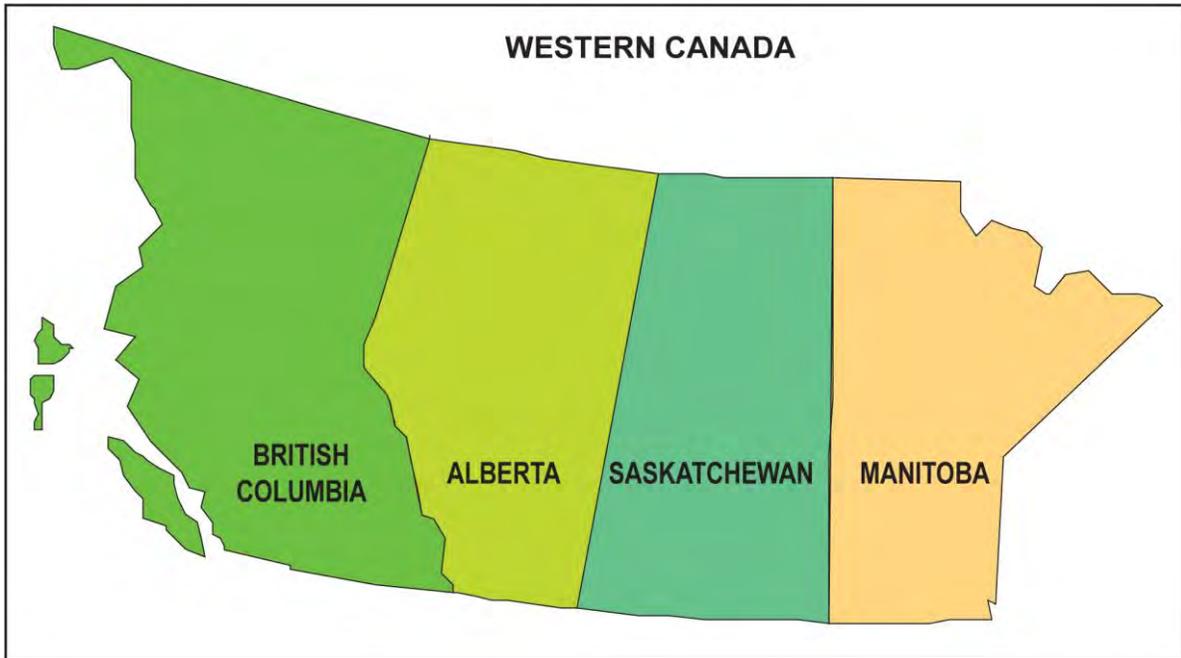
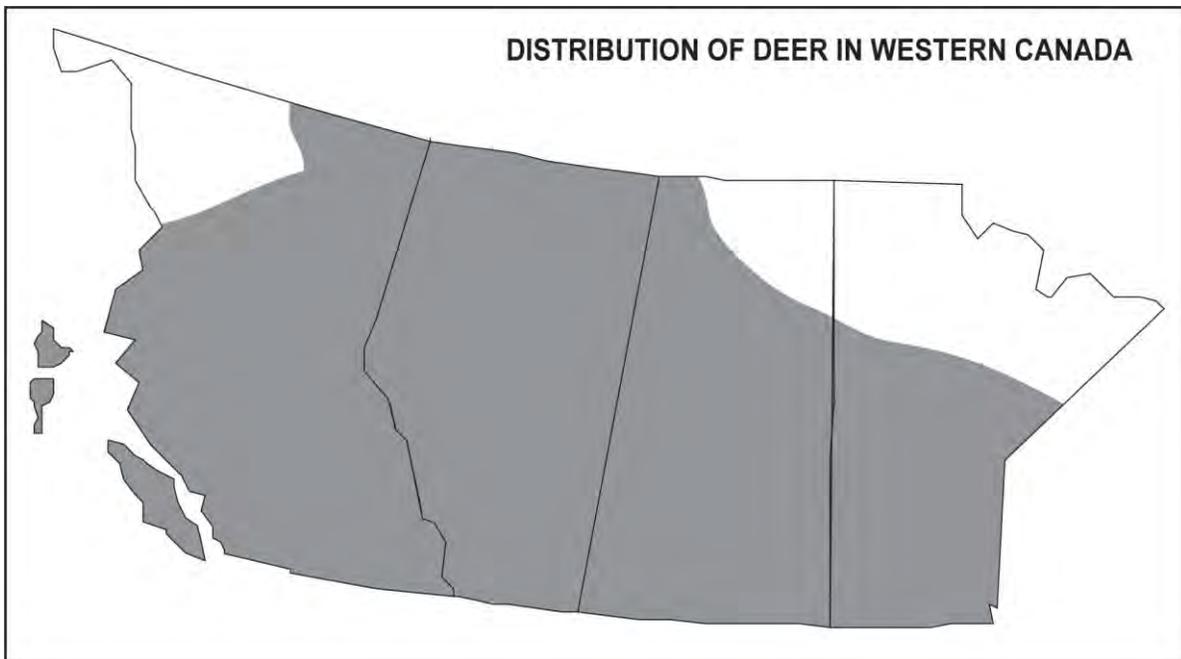


Figure 1 – Provinces of Western Canada



**Figure 2 - Distribution of Deer in Western Canada
Adapted from Whitehead (1972) and Wallmo (1981)**

Review of Driver Manuals and Handbooks

The driver manuals and handbooks for British Columbia, Alberta, Saskatchewan and Manitoba were reviewed to determine how wildlife hazards are presented to new drivers. The documents examined were: British Columbia's "RoadSense for Drivers: BC's Safe Driving Guide" produced by the Insurance Corporation of British Columbia in 2007; Alberta's "Basic Licence Driver's Handbook" produced by Alberta Infrastructure and Transportation in 2006; Saskatchewan's "Saskatchewan Driver's Handbook: A Guide to Safe Driving" produced by SGI in 2007; and Manitoba's "Driver's Handbook: Working with drivers to make our roads safer" produced by Manitoba Public Insurance in 2006.

The elements pertaining to wildlife hazards examined in each driver manual and handbook were:

- 1) Wildlife warning signs,
- 2) Physical characteristics of wildlife,
- 3) Geographic distribution of wildlife hazards,
- 4) Seasonal variations in wildlife hazards,
- 5) Consequences of wildlife collisions,
- 6) Strategies for anticipating wildlife hazards, and
- 7) Strategies for reducing the consequences of wildlife collisions.

Wildlife Warning Signs

Wildlife warning signs in the Western Canadian provinces are similar in design, size, shape and colour, as they conform to the Transportation Association of Canada's Manual of Uniform Traffic Control Devices for Canada (Transportation Association of Canada, 2002) (Figure 3). Although, the Western Canadian provinces are all home to deer, elk and moose, as well as other species of ungulates, only the Alberta driver manual illustrated deer and moose in its signs. However, in the Alberta driver manual the deer sign was described generically as an "Animal crossing" sign. Each of the other provincial manuals show only a deer sign which they describe as a "Watch for deer ahead" (British Columbia), "Deer crossing area ahead" (Manitoba), and "Section of roadway regularly crossed by deer" (Saskatchewan).

The British Columbia manual also provided an illustration of a deer on the side of a road in front of a motor vehicle approaching a curve in the road. The Alberta manual provided a small moose silhouette underneath text describing steps to be taken to avoid a wildlife collision or minimize the consequences of striking a wild animal. The Manitoba and Saskatchewan manuals did not provide any additional graphical materials relating to wildlife hazards or wildlife-related collisions.

Physical Characteristics of Wildlife

None of the driver manuals provided any factual information pertaining to the physical characteristics, such as height and weight, of the large ungulates found within their provincial jurisdictions.

Geographic Distribution of Wildlife Hazards

None of the driver manuals provided any maps showing the geographic distribution of wildlife hazards within their provincial jurisdictions.

Seasonal Variations in Wildlife Hazards

Wildlife movement varies throughout the year. Deer, elk and moose are most active in the fall during their mating season. None of the driver manuals provided any information regarding the seasonal variation in wildlife activities which may contribute to motor vehicle collisions.

Strategies for Anticipating Wildlife Hazards

Knowing how to identify the clues that indicate the presence of wildlife on or near a road or highway can help reduce the likelihood a new driver will strike a wild animal. In Saskatchewan, new drivers were advised to be alert to eyes shining out of a ditch, and the potential that if one animal is seen, others are likely nearby.

Consequences of Wildlife Collisions

The consequence of a wildlife-related motor vehicle collision can be significant. In British Columbia and Alberta, new drivers were advised that striking an animal can cause injuries to the driver and passengers, and the animal injuries, as well as to vehicles. In both Saskatchewan and Manitoba, new drivers were not advised of any physical injury or property damage risks. The driver manuals for all four provinces were silent on the potential for human deaths in wildlife-related collisions. In Alberta and British Columbia, the strategies were very similar. New drivers were advised to look ahead and scan the side of the road for animals. New drivers were also told to be extra careful at dawn and dusk, times when it is difficult to see animals. Dawn and dusk were identified as times when animals move around to feed.



FIGURE 3 Deer Warning Sign in British Columbia.

Like Saskatchewan, Alberta and British Columbia suggested looking for shining animal eyes caused by the reflection of headlights off an animal's eyes. Alberta and British Columbia also advised that wild

animals may move in herds, and like Saskatchewan's message, if one animal is seen that there may be more. In Manitoba, no strategies for anticipating wildlife hazards were given to new drivers in its driver manual.

Strategies for Avoiding Wildlife Collisions

If a new driver detects the presence of a wild animal on or near a road or highway, it is very important for the new driver to know how to respond to avoid a collision if possible. In Saskatchewan, new drivers were advised to slow down when approaching animals on or near the road and use emergency techniques referred to earlier in the driver manual to avoid a collision. No other specific instructions were given to avoid a wildlife collision.

In Alberta, if a wild animal suddenly appears in front of their vehicle, new drivers were advised to:

1. decide if they can stop safely;
2. if stopping safely cannot be done, figure out if they can steer around the animal, possibly choosing between hitting the animal or risking a collision with another vehicle;
3. slow down, resisting the urge to slam on their brakes, and possibly sending their vehicle out of control;
4. leave a lot of room if they choose to drive around an animal because a frightened animal may run in any direction; and
5. if driving around an animal to the left, being sure there is no traffic in the oncoming lane.

In addition to the advice Alberta new drivers were given, British Columbia new drivers were also advised to check their rear-view mirror to see if there is a vehicle following them as part of process of determining if their vehicle can be stopped safely. The Manitoba driver manual did not provide any directions for new drivers to avoid a wildlife collision.

Strategies for Reducing the Consequences of Wildlife Collisions

If a collision with a wild animal is inevitable, new drivers should know what actions to take to reduce potential property damage, human injuries and human death. In Saskatchewan, the new driver was advised to brake hard and hit the animal. If the animal was a horse or a moose, the new driver was also told to try to get down below the windshield as this is approximately where the belly of the animal will hit a car.

In Alberta and British Columbia, new drivers were advised to assess the risks and decide whether it is better to hit the wild animal or risk a collision with another vehicle. In Alberta, no direction was given to new drivers regarding actions to take upon impact with a wild animal. In British Columbia, new drivers were advised to brake firmly and steer to strike the animal at an angle. Immediately before striking the animals, new drivers were advised to let up on the brake pedal. This action would cause the front of the vehicle to rise and reduce the chance that the animal would come through the windshield.

The Manitoba driver manual did not provide any directions for new drivers to reduce the consequences of a wildlife collision.

CASE STUDY: DRIVER MANUALS AND DEER-VEHICLE COLLISIONS IN THE UNITED STATES

Over the last 30 years, the continued increase in wildlife-vehicle collisions, in particular deer-vehicle collisions, in the United States, appears to be the result of a culmination of a number of factors. The increase in deer populations, in particular, white-tailed deer, appears to be the result of a number of

factors relating to land use changes, loss of predators and state initiatives to increase deer populations. There are an estimated 30 million white-tailed deer in the continental United States (Bagley, 2013).

Deer Population Growth

Prior to European settlement, deer ranged across most of the United States (Figure 4). However, before state and federal legislation and regulations were effectively administered, fatigue was the only limit to a deer harvesting in the United States (McDonald and Miller, 2004). By the end of the 1800's, deer had been extirpated from much of their range. Population estimates of white-tailed deer at the end of the 19th century range from 300,000 in 1890 to 500,000 in 1900 (Downing, 1987). In the South-eastern region of the United States, remnant populations were limited to river swamps and rugged mountainous regions, areas largely inaccessible to humans. Deer were eliminated in the Piedmont regions and the more accessible areas of the Appalachians. In the Northeastern region of the United States, only small remnant populations survived in the mountains. In the United States Midwest, the few remaining deer persisted along the bottoms of remote, uninhabited river valleys. In the western states, a few remnant populations existed along river bottoms and drainages.

Deer restoration efforts began in the late 1800s (McDonald and Miller, 2004). The return of white-tailed deer to its original range in the United States is considered to rank among the world's greatest wildlife management successes. Early efforts to restore deer populations were funded by private individuals and state natural resource agencies. In 1937, The Pittman-Robertson Act created a source of funding for wildlife restoration initiatives (Downing, 1987). The act's funds enabled larger, more comprehensive efforts between the 1930s and the 1950s. By the 1960s and 1970s, most white-tail restoration initiatives were completed (Table 1). Enforced regulations protected deer from exploitation. This combined with the creation of wildlife refuges and management areas, and aggressive restocking programs, contributed to the restoration of white-tailed deer in the United States.

Deer Hazard for Drivers in the United States

From the literature, it appears, deer-vehicle collisions appear to have been relatively rare events from the 1920's until the late 1960's. Since then, deer-vehicle collisions have become an increasingly common event (Carbaugh et al., 1975; Allen and McCullough, 1976; Conover et al., 1995). The number of human fatalities resulting from deer-vehicle collisions has been rising over the late twenty years Highway Loss Data Institute (2008) (Figure 5). The number of states in which deer became an increasingly significant hazard for drivers grew between 2008 and 2011. According to the State Farm Mutual Automobile Insurance Company, the number of states in which the deer hazard potential was estimated to impact more than 1 in 100 drivers doubled between 2008 and 2011 (Figures 6 and 7).

Driver Manuals and Handbooks

State driver manuals and handbooks published in the 1960's were compared to those published in the 2000's. Inclusion of the traffic safety device most commonly used by state transportation agencies to warn drivers of deer hazards, the deer warning sign was examined (Figure 8). The deer warning sign is the Manual of Uniform Traffic Control Devices. From the samples studied, it appears only one state, Arizona, included a deer warning sign in its state driver manual in the 1960's, while by the 2000's, twenty-eight states included a deer warning sign in their driver manuals, while twenty-two states did not (Figures 9 and 10). It was assumed the increased number of states including a deer warning sign in their driver manuals reflected their recognition of the growing deer hazard for drivers.

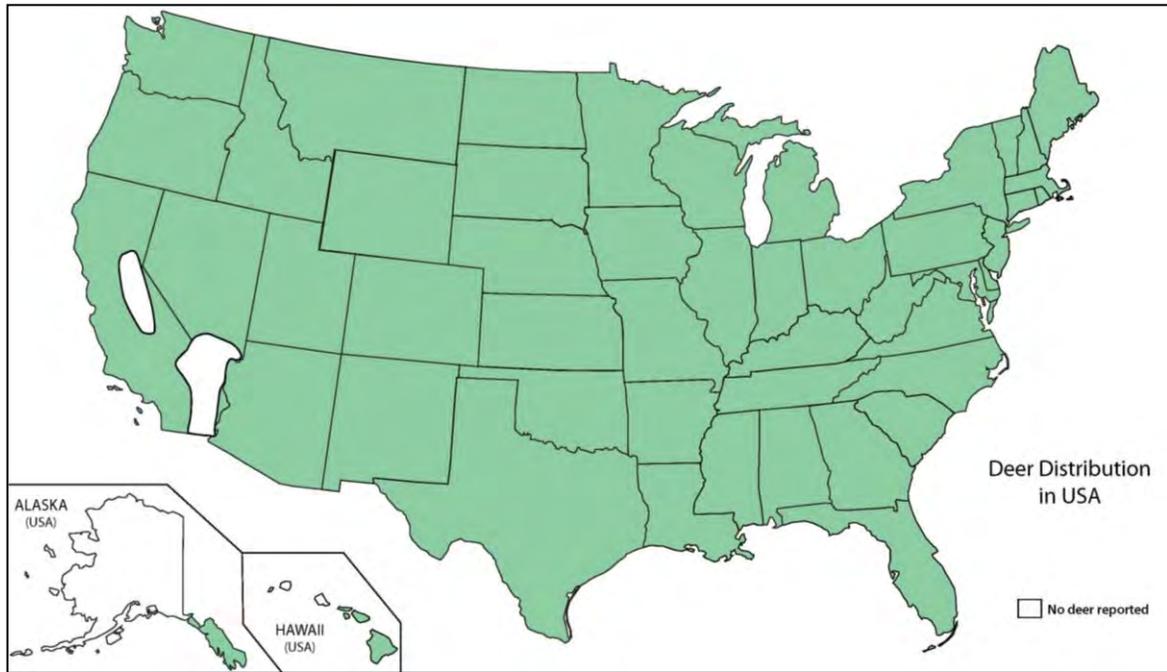


FIGURE 4 Distribution of Deer in the United States. Adapted from Whitehead (1972) and Wallmo (1981)

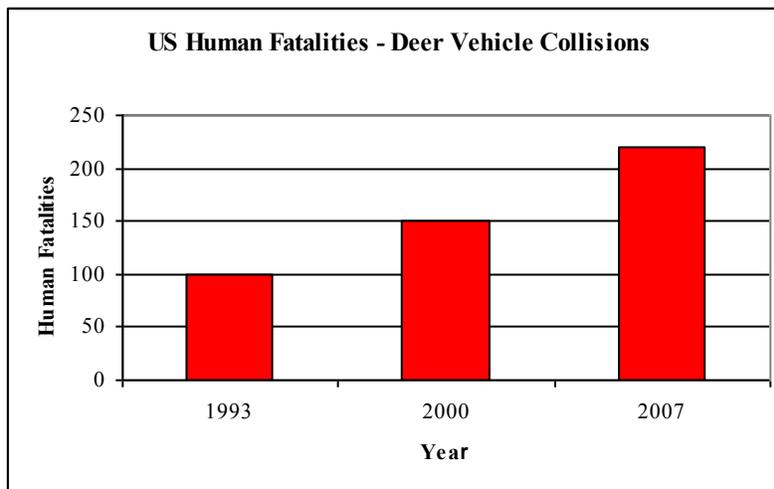


FIGURE 5 US Human Fatalities - Deer Vehicle Collisions (1993 to 2007). Data source: Highway Loss Data Institute (2008)

TABLE 1 White-tailed Deer Restocking in the United States
Adapted from McDonald and Miller (2004)

State	Low Deer Herd Population	Period	Deer Herd Restoration Period	Estimated 2004 Deer Herd Population
Deer Extirpated				
Illinois	Extirpated	1878 - 1893	1903 – 1953	750,000
Indiana	Extirpated	1893	1934 – 1961	Data not available
Ohio	Extirpated	1904	1919 – 1972	700,000
Vermont	Extirpated	1880s	1878	132,000
Deer Almost Extirpated				
Colorado	Almost extirpated	1920s to 1930s	1964 – 1965	9,000
Georgia	Almost extirpated	Early 1900s	1928 – 1992	1,000,000
Idaho	Almost extirpated	Not available	1985 – 1989	300,000
Iowa	Almost extirpated	1898	1884 – 1940s	340,000
Maryland	Almost extirpated	Not available	1914 – 1963	296,000
Mississippi	Almost extirpated	1900 – 1925	1931 – 1980	1,750,000
Missouri	Almost extirpated	1900s	1925 – 1957	1,000,000
Montana	Almost extirpated	1941	1945 – 1951	375,000
Nebraska	Almost extirpated	1930s	1959 – 1960	250,000
New Jersey	Almost extirpated	1900	1903 – 1968	160,000
New York	Almost extirpated	1880 – 1890	1889 – 1976	1,100,000
North Carolina	Almost extirpated	1900 – 1925	1890 – 1987	1,100,000
Pennsylvania	Almost extirpated	Not available	1906 – 1968	1,570,000
South Carolina	Almost extirpated	1915 – 1920	1950 – 1989	1,000,000
Tennessee	Almost extirpated	1900	1932 – 1985	1,000,000
Texas	Almost extirpated	1890s	1938 – 1991	3,800,000
West Virginia	Almost extirpated	1900s	1921 – 1992	925,000
Wyoming	Almost extirpated	1890s	1949 – 1953	70,000
Estimated Deer Populations				
Alabama	1,000	1915	1926 - 1998	1,750,000
Arkansas	< 500	1930	1915 – 1991	1,000,000
Louisiana	15,000 to 20,000	1920	1949 – 1980s	1,000,000
Oklahoma	500 (estimate)	1917	1942 – 1972	475,000
Low Deer Population Data Not Available				
Florida	Data not available	1935	1941 – 1978	800,000
Kentucky	Data not available	1927	1919 – 1999	600,000
Rhode Island	Data not available	Not available	1967 – 1971	12,000
Virginia	Data not available	1925	1926 – 1992	1,000,000

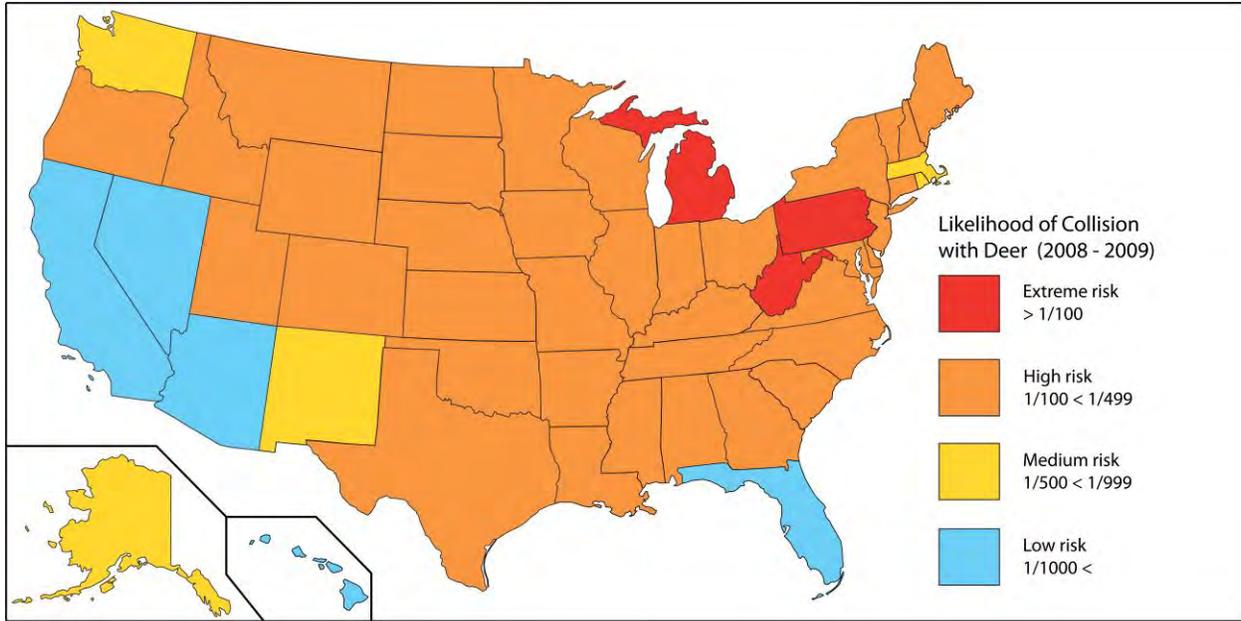


FIGURE 6 Likelihood of Collision with Deer in the United States (2008/2009).
Data Source: State Farm Mutual Automobile Insurance Company (2008)

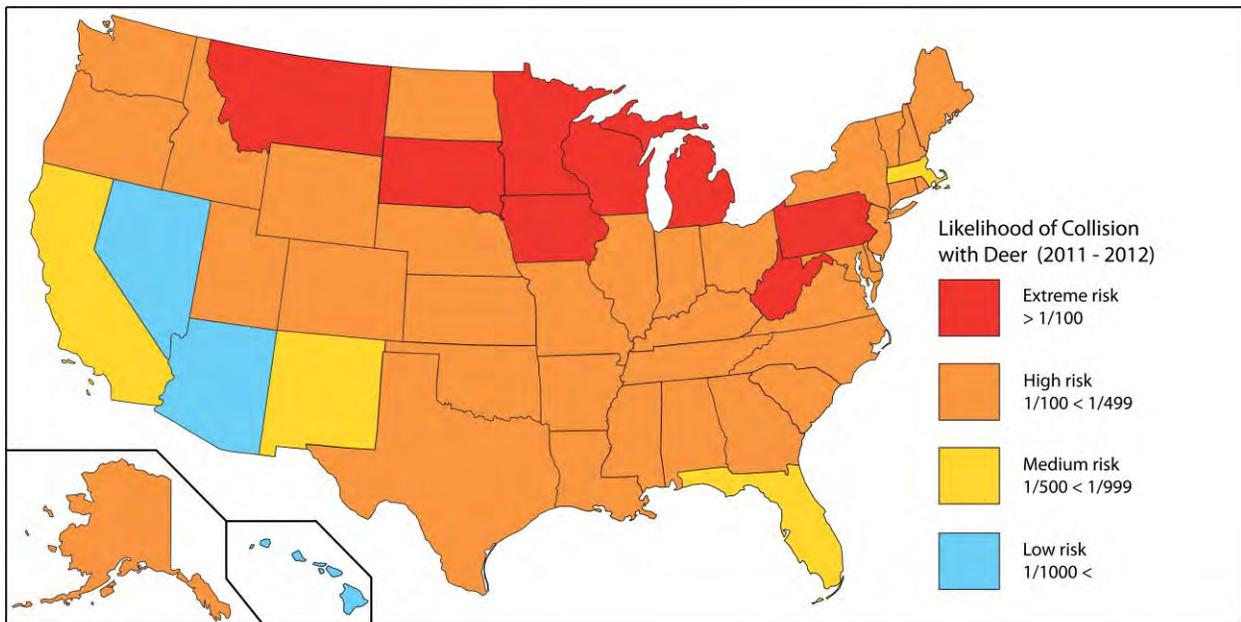


FIGURE 7 Likelihood of Collision with Deer in the United States (2011/2012).
Data Source: State Farm Mutual Automobile Insurance Company (2012)



FIGURE 8 Deer Warning Sign in Washington State.

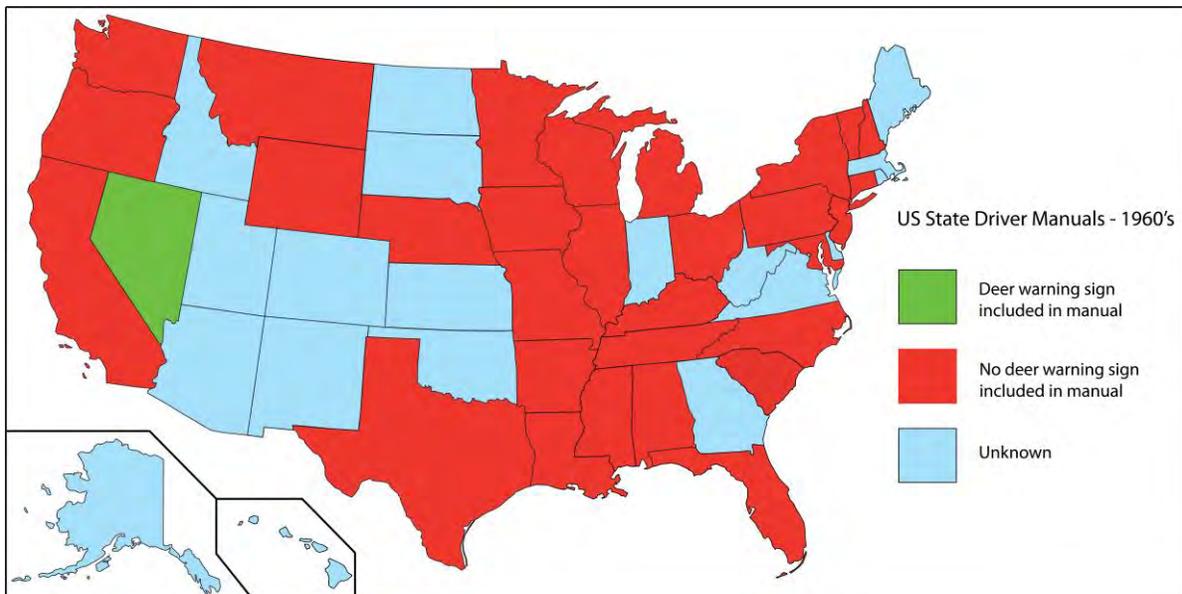


FIGURE 9 Analysis of US State Driver Manuals and Handbooks published in 1960's.

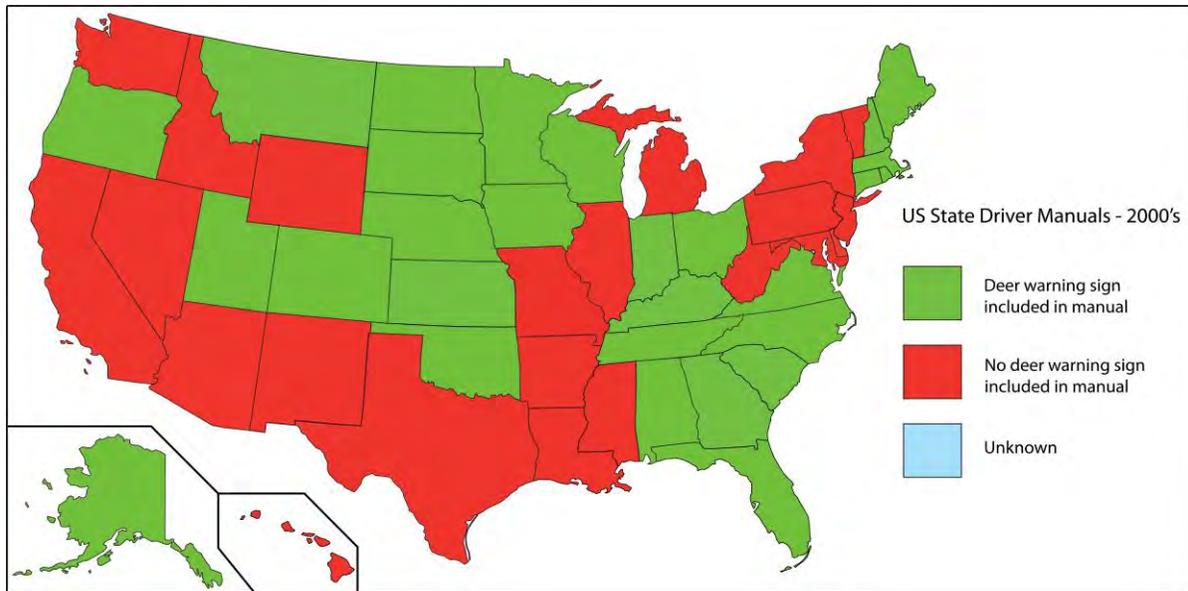


FIGURE 10 Analysis of US State Driver Manuals and Handbooks Published in 2000's.

Comparison of Driver Manuals and Handbooks of the Ten States with the Greatest Likelihood of Deer-Vehicle Collisions

Driver manuals and handbooks from the ten states with the highest deer vehicle collision potentials in 2008, as rated by the State Farm Mutual Automobile Insurance Company, were evaluated with respect to the information they provided relating to deer. The elements of the driver manuals published in the early 2000's and early 2010's examined were:

1. Deer mentioned in any format,
2. Deer warning sign example,
3. Description of deer warning signs,
4. Supplementary deer warning sign tabs,
5. Physical characteristics of deer,
6. Geographic distribution of deer,
7. Diurnal variation in deer movement,
8. Seasonal variation in deer movement,
9. Deer behavior,
10. Consequences of deer collisions,
11. Strategies for anticipating deer,
12. Strategies for reducing the consequences of deer collisions, and
13. Post-collision advice.

These elements were selected as the essential elements necessary for a driver to be adequately aware of deer, the hazard they represent, and techniques for avoiding deer collisions and reducing the severity of collisions. The results of the analysis are shown in Tables 2 and 3.

TABLE 2 Driver Manuals and Handbooks of the Ten States with the Greatest Likelihood of Deer-Vehicle Collisions in 2008/2009

State	Arkansas	Iowa	Michigan	Montana	North Dakota	Pennsylvania	South Dakota	Virginia	West Virginia	Wisconsin
National Deer Collision Rankings (2008/2009) State Farm (2008)	6	4	2	5	9	3	7	10	1	8
Projected number of deer collisions	18,974	32,427	104,561	9,103	5,215	105,843	8,056	48,303	30,203	43,392
Likelihood of deer collision/licensed driver	1/106	1/104	1/78	1/104	1/136	1/94	1/107	1/137	1/39	1/116
State Driver Manual										
a) Publication Year	2004	2005	2004	2004	2003	2005	2005	2005	2004	2004
b) Deer-related Information										
1. Deer mentioned in any format	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
2. Deer warning sign example	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
3. Description of deer warning signs	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
4. Supplementary warning sign tabs	No	No	No	Yes	No	No	No	No	No	No
5. Physical characteristics of deer	No	No	No	No	No	No	No	No	No	No
6. Geographic distribution of deer	No	Yes	No	No	No	No	Yes	No	No	Yes
7. Diurnal variation in deer movement	No	Yes	Yes	No	No	No	No	No	No	Yes
8. Seasonal variation in deer movement	No	Yes	No	No	No	No	No	No	No	Yes
9. Deer behavior	No	Yes	Yes	No	No	No	Yes	No	No	No
10. Consequences of deer collisions	No	Yes	No	No	No	No	No	No	No	Yes
11. Strategies for anticipating deer	No	Yes	Yes	No	No	No	No	No	No	Yes
12. Strategies for reducing the consequences of deer collisions	No	Yes	Yes	No	No	No	No	Yes	No	Yes
13. Post-collision advice	No	No	Yes	No	No	No	No	No	No	Yes

TABLE 3 Driver Manuals and Handbooks of the Ten States with the Greatest Likelihood of Deer-Vehicle Collisions in 2008/2009

State	Arkansas	Iowa	Michigan	Montana	North Dakota	Pennsylvania	South Dakota	Virginia	West Virginia	Wisconsin
National Deer Collision Rankings (2011/2012) State Farm (2011)	9	3	4	6	12*	5	2	10	1	7
Projected number of deer collisions	20,281	30,117	97,856	9,576	4,586	115,571	8,863	52,369	30,203	52,525
Likelihood of deer collision/licensed driver	1/103	1/72	1/72	1/78	1/105	1/76	1/68	1/103	1/40	1/79
State Driver Manual										
a) Publication Year	2007	2011	2011	2012	2011	2012	2010	2012	2011	2012
b) Deer-related Information										
1. Deer mentioned in any format	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
2. Deer warning sign example	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes
3. Description of deer warning signs	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes
4. Supplementary warning sign tabs	No	No	No	Yes	No	No	No	No	No	No
5. Physical characteristics of deer	No	No	No	No	No	No	No	No	No	No
6. Geographic distribution of deer	No	Yes	Yes	No	No	No	Yes	No	No	Yes
7. Diurnal variation in deer movement	No	Yes	Yes	No	Yes	No	No	Yes	No	Yes
8. Seasonal variation in deer movement	No	Yes	Yes	No	No	No	No	No	No	Yes
9. Deer behavior	No	Yes	Yes	No	No	No	Yes	Yes	No	No
10. Consequences of deer collisions	No	Yes	Yes	No	Yes	No	No	Yes	No	Yes
11. Strategies for anticipating deer	No	Yes	Yes	No	Yes	No	No	No	No	Yes
12. Strategies for reducing the consequences of deer collisions	No	Yes	Yes	No	Yes	No	No	Yes	No	Yes
13. Post-collision advice	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

* Note: In the State Farm 2011/2012 state rankings, Minnesota was ranked 8th

From this analysis, it is apparently, that even among the states with the greatest likelihood of deer-vehicle collisions, new drivers are not being provided information in a consistent manner. The following passage, developed by the Georgia Department of Motor Vehicle Safety for its 2005 drivers manual, is probably the most comprehensive and complete illustration of the deer hazard provided for new drivers by a driver's manual or handbook produced state or provincial agency in the United States or Canada:

“Each year numerous collisions occur in Georgia due to deer. Although hunting will keep deer herds in check, the potential for an accident always exists. Understanding common habits of deer and knowing what to do when a deer runs out in front of the car can help to avoid serious accidents.

Automobile accident statistics from the Department of Motor Vehicle Safety indicate that though deer-automobile collisions are on the rise, they still account for less than three percent of automobile accidents reported each year.

It is important to remember that deer are wild animals and are very unpredictable. The deer you see calmly standing on the side of the road may bolt into the road rather than away from it when startled by a car. In areas with known deer populations, drivers should constantly scan the road and road shoulders for deer movements and sightings. Always slow down when a deer crosses the road in front of you or another car. Deer usually travel in groups and there likely is another one following closely behind. If a deer is spotted on the road or roadside at night, the driver should slow down immediately, blink their headlights and switch to low beam so as not to blind the deer. Also, short horn blasts should help scare the deer from the road.

Should the deer or other animal run out in front of your car, slow down as much as possible to minimize the damage of a collision. Don't swerve to avoid a deer because you may collide with another car and cause - more damage. If you do have an accident, call the police as soon as possible. Most insurance companies will require an accident report from the police before paying claims for those vehicles covered by collision insurance.

Deer are usually seen along the roadside during the early morning hours and late evening. Drivers should be alert for deer during these peak hours. Deer are most active in the fall months of October, November and December during the peak breeding season. Also late February and early March are critical months for deer car collisions. During this period they concentrate along road shoulders to feed on new green food available following a long hard winter.

There's little you can do when a deer crashes into your car of its own accord. Fortunately, many collisions are avoidable, if you take precautions, slow down and know something about their habits.” (Georgia Department of Motor Vehicle Safety, 2005, page 70)

The Georgia Department of Motor Vehicle Safety provides (1) a background and context on the deer hazard, (2) describes factors influencing deer populations and deer activity patterns, (3) identifies when the deer hazard is greatest in the states, (4) suggests what drivers can do to reduce the potential for a deer-vehicle collision, and (5) advises what drivers should do following a deer-vehicle collision.

Over the years, few states have included graphics to illustrate the deer hazard. In 1969, the State Nevada included a graphic contrasting the visibility of deer during the day and at night. In 1991, the State of Virginia included a black and white photograph of a deer at night. The Virginia photograph appears to be the only photograph of a deer ever provided in a driver manual published in the United States or Canada.

DISCUSSION

Wildlife represent a significant hazard to drivers in the United States and Canada. Large ungulates, in particular deer, are involved in many motor vehicle collisions. While their physical size can make them formidable creatures to strike with a vehicle, their widespread distribution increases the potential for drivers to encounter them on rural roads and highways. Although the state and provincial departments of transportation use wildlife warning signs to advise drivers of potential wildlife hazards, many driver manuals and handbooks do not include an example of these signs. The majority of driver manuals and handbooks produced by driver licensing agencies and departments of transportation in the United States and Western Canada lacked factual information about the physical characteristics these wild animals, or their geographic distribution and seasonal activities. Simple maps of wildlife areas would illustrate the geographic distribution of wildlife. A seasonal calendar of peak wildlife activity periods could help reinforce the temporal nature of wildlife hazards, where these exist. The consequences of wildlife collisions are not portrayed in any detail as even the potential for serious injuries and death is rarely mentioned. Most driver manuals and handbooks do not provide strategies for anticipating wildlife hazards and avoiding them, or reducing the consequences of collisions with wildlife.

CONCLUSIONS

Driver manuals and handbooks, produced by state and provincial motor vehicle licensing administrations and departments of transportation in the United States and Canada, are the primary government reference resource for new drivers. Wildlife, in particular deer, are becoming an increasingly significant natural hazard for drivers in the United States and Canada. However, judging from driver manuals published by state and provincial motor vehicle licensing administrations and departments of transportation, new drivers may not be receiving enough information on the fundamentals of the problem, and the relationships of the contributing factors and processes. From the comparative review of the manuals and handbooks published by Canadian provinces and the US states, it apparent that new drivers are not being uniformly informed of the risk of wildlife hazards or of effective strategies for avoiding wildlife collisions or minimizing their consequences. Given the growing magnitude of wildlife-related motor vehicle collisions, and their cost in property damage, human injuries and human deaths, it may be prudent for those responsible for producing state and provincial driver manuals and handbooks to include more information about the risk of wildlife hazards on roads and highways, and present the information in a manner that communicates the hazards more completely, and supplemented with maps and diagrams.

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