

Ministry of Transportation

WARS 1983-2002

Wildlife Accident Reporting and Mitigation in British Columbia

Special Annual Report

Ministry of Transportation

Engineering Branch Environmental Management Section

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WARS 1983–2002 Wildlife Accident Reporting and Mitigation in British Columbia Special Annual Report

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Abstract:	 The Wildlife Accident Reporting System (WARS) is designed to collect and store information on wildlife killed on highways in British Columbia. The WARS database contains over 78,000 records collected since 1978. Wildlife accident information is used by the Ministry to: identify accident-prone locations and accident trends; direct cost-effective mitigation efforts; evaluate the effectiveness of mitigation techniques; provide data for highway planning purposes; model and forecast accidents; analyze traffic and climatic relationships for species-specific accident trends; develop species-specific accident risk profiles for highway corridors; and establish policies and strategies for accident issues and mitigation initiatives.
	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.
Comments:	In 2002, Ministry Maintenance Contractors reported finding 5,032 dead wild animals on British Columbia highways. Approximately 80% of the animals reported killed were deer. The number of wildlife accidents reported to the Ministry decreased by 2.7% from 2001.
Keywords:	WARS, wildlife, accident, reporting, system, road, kills, statistics, exclusion, fencing, British Columbia, risk, cost, deer, moose, elk, bear, sheep, mitigation, overpass, underpass, road ecology.



EXECUTIVE SUMMARY

The British Columbia Ministry of Transportation (BCMoT) administers the Wildlife Accident Reporting System (WARS). The WARS system is designed to analyze wildlife accident data collected by BCMoT Maintenance Contractors on numbered highways in British Columbia.

Since 1978, over 78,000 wildlife accidents have been reported on provincial highways. More than 90% of the accidents involved deer, moose and elk. Between 1995 and 2000, 13 people were reported killed in wildlife-related motor vehicle accidents in British Columbia. After weather, the Insurance Corporation of British Columbia (ICBC) rates wildlife as the next highest environmental contributing factor for police-attended accidents. Between 1997 and 2002, ICBC spent over \$118 million on wildlife-related motor vehicle accident claims.

In 2002, over 5,000 wildlife-related accidents were reported in British Columbia (table below). Between 2001 and 2002, the number of wildlife-related accidents reported decreased by 2.7%.

Wildlife Accidents by BCMoT Region (Year 2002)

	Region 1	Region 2	Region 3	Total
Wildlife Accidents	1,221	2,871	939	5,031

In 2002, it is estimated wildlife accidents cost the Province over \$20 million in motor vehicle accident claims; \$580,000 in highway accident clean-up costs; \$320,000 in lost provincial hunting license revenues; and \$30 million in lost value to residents and non-residents who view or hunt wildlife.

BCMoT is committed to protect the safety of the motoring public; stem the rising societal cost of human fatalities and injuries, motor vehicle damage, and highway maintenance; and reduce the loss of wildlife on provincial highways. Consequently, BCMoT uses the WARS system to:

- 1) identify accident-prone locations and accident trends;
- 2) direct cost-effective mitigation efforts;
- 3) evaluate the effectiveness of mitigation techniques;
- 4) provide data for highway planning purposes;
- 5) model and forecast accidents;
- 6) analyze traffic and climatic relationships for species-specific accident trends;
- 7) develop species-specific accident risk profiles for highway corridors; and
- 8) establish policies and strategies for accident issues and mitigation initiatives.

The WARS system is becoming an increasingly valuable information resource for BCMoT, and 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. ICBC uses WARS data for identifying highway locations where joint BCMoT/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.



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In the year 2002, the consistent daily collection of wildlife accident information and submission of the monthly reports, critical for the operation of the WARS system and production of this report, was done by the staff of the following British Columbia Ministry of Transportation Private Maintenance Contractors:

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The timely assembly and proofing of the WARS monthly reports, vital for keeping the WARS system current and complete, was done by Ministry's District Staff:

Paul Bebington, District Operations Assistant, Lower Mainland District Sharon Beck, District Clerk, Cariboo District Cecil Bianco, District Operations Assistant, Okanagan Shuswap District Hugh Eberle, District Operations Technician, West Kootenay District Larry Griffith, Operations Technician, Vancouver Island District Bob Hickman, Operations Technician, Vancouver Island District Karen Jeff, District Clerk, Cariboo District Martin Madelung, Operations Technician, Vancouver Island District Percy Parent, Area Manager Assistant, Thompson Nicola District Sue Pauwels, A/Operations Technician, Vancouver Island District Deveta Roberts, Assistant Area Manager, Selkirk Area – Revelstoke, Rocky Mountain District Grant Watson, District Operations Technician, Skeena District

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WARS 1983-2002

Wildlife Accident Reporting and Mitigation in British Columbia

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1.0 INTRODUCTION

1.1 Overview

The Environmental Management Section, Engineering Branch, British Columbia Ministry of Transportation (BCMoT), administers the Wildlife Accident Reporting System (WARS). WARS was designed to systematically record the location, number and type of wildlife accidents reported by BCMoT Maintenance Contractors on numbered highways in British Columbia (Map 1.1). Records in the WARS database date back to 1978 when wildlife accident data collection was originally initiated. Currently, WARS has over 78,000 wildlife accident records for a diverse range of wild animal species, including deer, moose, elk, mountain sheep, and bears.

As part of its continuing efforts to protect the motoring public; stem the rising societal cost of human fatalities and injuries, motor vehicle damage, and highway maintenance; and reduce the loss of wildlife on provincial highways, BCMoT uses the WARS system to:



- 1. identify accident
 - prone locations and accident trends;
- 2. direct cost-effective mitigation efforts;
- 3. evaluate the effectiveness of mitigation techniques;
- 4. provide data for highway planning purposes;
- 5. model and forecast accidents;
- 6. analyze traffic and climatic relationships for species-specific accident trends;
- 7. develop species-specific accident risk profiles for highway corridors; and

Wildlife highway fatality

8. establish policies and strategies for accident issues and mitigation initiatives.

As its database has grown, the WARS system has become an increasingly valuable information resource for BCMoT. Environmental management staff at BCMoT Headquarters and the Ministry's Regional Environmental Coordinators have direct access to the WARS system enabling them to provide wildlife-related motor vehicle accident information at the provincial, regional and district levels (Maps 1.2 and 1.3).

With WARS, BCMoT has been able to maximize the use and effectiveness of its existing warning system infrastructure in a manner supported by statistically significant data, and not speculation or unfounded assumptions. Monitoring accident rates and locations over time helps the Ministry identify developing problems in a timely manner. WARS also directs Ministry attention to high wildlife accident locations to reduce the operating costs of its private maintenance contractors.

(Photo: Mike Kent

Map 1.1 Numbered Highways in British Columbia



Map 1.2 Highway Regions in British Columbia





WARS 1983-2002 — Wildlife Accident Reporting and Mitigation in British Columbia — Special Annual Report

Map 1.3 Highway Regions and Districts in British Columbia



South Coast Region

1. Lower Mainland District

2. Vancouver Island District

Southern Interior Region

- 3. Rocky Mountain District
- 4. West Kootenay District
- 5. Okanagan-Shuswap District
- 6. Thompson-Nicola District
- 7. Cariboo District

Northern Region

- 8. Peace District
- 9. Fort George District
- 10. Bulkley-Stikine District
- 11. Skeena District

WARS, with its long established, extensive multi-species, geographically-oriented database, has proven to be invaluable to other government agencies, consultants, researchers, wildlife associations, special interest groups and members of the general public. The Ministry of Water, Land and Air Protection (MWLAP) uses WARS data to assess provincial wildlife population trends in its management units. The WARS database contains long-term wildlife-related records that cannot be assembled or extrapolated from any other information sources in British Columbia.

Whenever new technology suitable for reducing wildlife accidents becomes available, WARS data is used to support decisions for locating the technology for test purposes. The Insurance Corporation of British Columbia (ICBC), the provincial insurance carrier for motor vehicles in British Columbia, uses WARS data for identifying highway locations where joint BCMoT/ICBC initiatives can be directed. These initiatives include exclusion fencing and infrared camera detection systems targeted specifically to reduce wildlife-related motor vehicle collisions.



1.2 Methodology

Wildlife accidents are recorded by the Ministry's Road and Bridge Maintenance Contractors located throughout British Columbia (Map 1.4). Data regarding wildlife-vehicle accidents, such as species and location, by Landmark Kilometre Inventory (LKI), are recorded on WARS forms H-107 (2001/06) (Figure 1.1). These forms are compiled by each Highway District office and then sent on a monthly basis to the Engineering Branch, HQ. The forms are screened, coded and then entered into the WARS database.



Map 1.4 BC Ministry of Transportation Maintenance Contract Service Areas





MONTHLY WILDLIFE ACCIDENT REPORT Phone: (250) 356-2255 Fax: (250) 387-7735 Comments ð DISTRICT NO. YEAR call the ORR (Observe, Record, Report) Line at 1-800-663-9453. Page Within 30 days of completion, please send this form to: (please specify (Other: Sheep, Caribou, Coyote, Porcupine, etc) Please Use "Y" to indicate if Yearling or Younger Other Please Specify Sex (Male / Female / Unknown) Dec MFU Leonard E. Sielecki, WARS Manager Animal Type Bear Environmental Management Branch PO Box 9850 STN PROV GOVT Victoria, BC Canada V8W 9T5 Sep Oct Nov BC Ministry of Transportation MFU 4B - 940 Blanshard Street Ě Moose MFU Mar Apr May Jun Jul Aug DISTRICT Deer M F U * * Rflctr Deer XIN 9 poachers, please contact your local Cor Deer 100m vithin Y/N ŝ Telephone Telephone 4 Nearest 2 3 Jan Feb LKI = Landmark Kilometre Index (must be completed) -RFI = Road Features Inventory (optional) Location of Killed Animal Please provide the following information to assist in report follow-ups. Ж REGION (Please Circle) MONTH (Please Circle) Ľ lent Note: If you suspect that an animal has been the target of **Transportation** Sean Maintenance Contractor Contact (Please Print) Ministry of Ministry District Contact (Please Print) Offset RFI Enter the day of the month (e.g. 1, 2, 3, ... etc.) in the "Day" column Hwy No. H0107 (2001/06) Time of Kill D 1 = Dawr y 3 = Dusk 4 = Dark **a** 2 = Day 2, 3,

WARS forms are not completed for highways maintained by the Federal Government or the Yukon Government under agreements with the British Columbia Government. These are:

Highway 1 – Glacier National Park

Highway 1 – Mt. Revelstoke National Park

Highway 1 – Yoho National Park

Highway 4 - Pacific Rim National Park,

Highway 93 – Kootenay National Park

Highway 97 - Alaska Highway (to Yukon Border)

Highway 97 - Alaska Highway (Watson Lake to Iron Creek)

Highway 1 – Alaska Highway (Morley to Swift River)

Haines Highway

Skagway Highway

Figure 1.1 – H107, Monthly Wildlife Accident Report Form

1.3 Reporting

WARS is a flexible system which attempts to meet a broad range of requirements, from producing site specific reports over a few kilometres to creating detailed reports of various aspects of wildlife-vehicle accidents for the entire province. WARS data are used to produce annual reports for each calendar year and a wide range of ad hoc reports. Annual reports provide detailed information and analyses of wildlife-vehicle accidents for a given year. Multi-decade reports provide significant long term information of wildlife-vehicle accidents and examine trends such as frequency, location and magnitude of accidents. Ad hoc reports are created for people in need of specific information for particular species on selected highways. Approximately 30% of these inquiries are from BCMoT personnel. The remaining inquiries are made by other government agencies, consultants, researchers, news media, wildlife associations, and members of the general public.

1.4 Assumptions and Constraints

The Ministry estimates the number of wild animals recorded by the WARS system represents only about 25% to 35% of the actual number of wild animals killed. The low number of reports can be attributed to a number of factors. In high traffic areas, the remains of small species of wildlife, like badgers and raccoons, often become unrecognizable after being run over by a number of vehicles. Some animals, primarily deer, are removed from the roadside by passing motorists before they



Coyote remains

(Photo: BC Ministry of Transportation)

Data is also lost due to the following:

• animals die outside the highway right-of-way,

are recorded by BCMoT Maintenance Contractors.

- animal remains are removed by natural predators or scavengers,
- animal remains are obscured by snow, ice, vegetation, or roadside debris,
- errors and omissions in reporting accident locations and/or species type,
- random and systematic errors and omissions in reporting and data processing, and
- process changes in reporting and data handling

WARS contains data on wildlife-vehicle accidents dating back to 1978. The data used in this report represents the data received from District offices and Maintenance Contractors by October 23, 2003.

1.5 Species Identification

While many of the Ministry's Maintenance Contractors are extremely knowledgeable about wildlife, they are not expected to be experts in species identification for WARS reporting purposes. Consequently, reporting is based largely on generic species classifications.

For WARS, white-tailed, black-tailed and mule deer are all reported as "deer", with comments



on the respective Dakota Whitetail and Northwest Whitetail, Columbia Black-tailed Deer, Mule Deer, and Sitka Black-tailed Deer subspecies recorded separately, if provided by the Maintenance Contractor. Similarly, Roosevelt Elk and Rocky Mountain Elk, the North

American Elk subspecies that occur in British Columbia, are both reported as "elk".

The "moose" classification includes the subspecies Northwestern Moose, Alaskan Moose and Shiras Moose. The "sheep" classification includes the Bighorn Sheep subspecies, California Bighorn Sheep and Rocky Mountain Bighorn Sheep, and the Thinhorn Sheep subspecies, Dall's Sheep and Stone's Sheep. Although, "buffalo" is the commonly used incorrect term for bison, the "buffalo" classification used in WARS includes the North American Bison subspecies, Woods Bison and Plains Bison.

The "bear" classification includes black bears and grizzly bears. In British Columbia, black bears can range in colour from black to white, with cinnamon, brown and blonde not being uncommon. The blue bear or "glacier" bear is rare.



Bison on centreline

(Photo: Colin Leake)



Kermode Bear

(Photo: Tom Ryan, Tourism BC)

1.6 Data Quality

The quality of the data contained in the WARS system is very dependent on the reporting diligence of the Ministry's Maintenance Contractors. Since wildlife accidents often occur at very untimely hours, under less than ideal weather conditions, comprehensive reporting at the accident scene is difficult at times.

In 2002, of the 5,031 reports received, 28% lacked valid segment numbers, and 28% lacked valid kilometre references. These reports did not contain enough information for Environmental Management Section staff to determine the valid segment numbers and km references. This represented a dramatic decline in reporting diligence from the year 2001, when, of the 5,123 reports received, only 7% lacked valid segment numbers and 10% lacked valid km references. A data quality feedback mechanism appears to be required to keep reporting quality consistent. When Wildlife Accident Report Forms are filled out correctly and consistently with the necessary LKI and km information, the value of the WARS data to the Ministry, Maintenance Contractors, and others increases.

Initially, the Maintenance Contractors' positive response to the new WARS forms H-107 (1999/01) appeared to be address the issue of data completeness and accuracy. Up until 2002, the data provided on the new H-107 forms was appeared more complete and accurate than data provided in earlier years, thus it more valuable for analysis and outcomes.

WARS data helps the Ministry direct its limited financial resources for wildlife accident mitigation to locations where it is most needed. ICBC also uses WARS data to evaluate Ministry cost-sharing proposals for highway safety projects. Since each wildlife-related accident clean-up can cost hundreds of dollars in Maintenance Contractor staff and equipment time, the WARS system can direct Ministry attention to high wildlife accident locations to reduce the operating costs for Maintenance Contractors.

1.7 WARS Enhancements

In 1994, two notable enhancements were made to the system. The first of these was expanding on the Potential Hazard reporting function of the system. In addition to Potential Hazard Reports for specified highways, the system can now also produce Potential Hazard Reports by Province, Region and District. This function can identify where accidents are most likely to occur within the area of concern whether it is a particular highway or Region. The second enhancement involved the capability of the system to report on the location of wildlife mitigation measures throughout British Columbia. WARS now contains up-to-date information on the location of wildlife fencing, reflectors and wildlife warning signs throughout the Province. In 2000, additional functions were added to the WARS system to streamline database queries and make multi-year analysis of species-specific accidents easier. To improve the accuracy and timelines of reporting and report production, the development of a web-based reporting system is underway.

1.8 Region and District Boundary Changes

As a result of significant organizational restructuring in BCMoT, major changes in the Region and District Boundaries occurred in 2002. The number of Regions was reduced from 6 to 3, and the number of Districts was reduced from 27 to 11.

In each amalgamated Region and District, the Ministry Maintenance Contractors continue to collect WARS data separately for the Maintenance Contract Service Areas that remain in the former districts. The data is merged either at Ministry District offices or at Headquarters for reporting purposes.





2.0 WILDLIFE-RELATED MOTOR VEHICLE ACCIDENT FACTORS

2.1 Identifying Factors

The highway environment in British Columbia is a very complex and varied one, ranging from multi-lane freeways located in urban centres to two-lane highways transecting the undeveloped hinterland. British Columbia has a diverse number of wild animal species and there are 133 native and 9 introduced species of mammals in the Province, ranging from seemingly ubiquitous deer to elusive wolves, each with their own highway interaction characteristics. Wildlife-related motor vehicle accidents have been recorded on highways throughout the Province. There are many related and unrelated, man-made and natural factors which may influence drivers and wildlife interactions, and affect highway conditions. Some of the factors identified, many difficult to measure and evaluate, are listed in Table 2.1.

Table 2.1 Wildlife-related Motor Vehicle Accident Factors (adapted from Sielecki, 2001)

1.	Wildlife Characteristics	species, population, age, sex, stage of reproduction, nutritional needs, movement behavior, population cycles
2.	Wildlife Activities	feeding, breeding, sleeping, migrating, evading predators, chasing prey
3.	Natural Water Sources	intermittent and permanent streams, rivers, sloughs, lakes, ponds, springs, waterfalls
4.	Man-made Water Sources	settling ponds, surface drainage systems, wells, dugouts
5.	Natural Food Sources	natural vegetation, salt licks, fish-bearing waters, prey
6.	Man-made Food Sources	orchards, gardens, fields, pets, livestock, garbage
7.	Wildlife Shelter	caves, cliffs, forests, culverts, bridges
8.	Habitat Conditions	seasonal vegetation changes, snow depth, drought, flooding, wildfire, overgrazing
9.	Traffic	volume, speed, composition, time-of-day, time-of-year
10.	Vehicles	size, design, operating condition, brakes, lights, horns
11.	Drivers	wildlife hazard awareness, highway familiarity, general alertness, driving skill, response time, response actions
12.	Highway Design	road width, number of lanes, curvilinearity of alignment, right-of-way width, shoulder width, ditch depth, pavement surface, lighting
13.	Roadside Management and Maintenance	native and non-native right-of-way vegetation, weed control, mowing, brushing, ditching, snow removal, de-icing, sign and reflector repairs
14.	Roadside Development	natural, urban, suburban, rural
15.	Accident Mitigation Devices	wildlife signs, fencing, under/overpasses, reflectors
16.	Topography	elevation, cliffs, slopes, plains, undulating terrain
17.	Weather	rain, snow, sleet, fog, haze, smoke, wind, cloud cover
18.	Time of Day	dawn, day, dusk, night, length of day/night
19.	Lunar Cycle	phases of the Moon, intensity of Moonlight
20.	Human Activities Outside Right-of-Way	construction, forestry, farming, mining, hunting, off-road recreation, controlled forest and grass fires

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The most important factors influencing the incidence of wildlife-related motor vehicle accidents appear to be animal populations and their locations relative to highways. The population of any species will generally rise and fall in relation to their food supplies, the number of its predators, and the number of other species its predators can also prey upon. The location is also dependent on food supplies, predators and other competing species, as well as climate (i.e. snow depth) and other critical lifecycle needs (i.e. shelter for pregnant females and newly born offspring).

While natural population expansions and contractions occur with cyclical repetition, useful accurate information on wildlife is usually not available as the dynamics of population cycles of animals in the wild are complex (Cooper, 1998). Detailed information regarding wildlife locations and movement



Deer capture





Radio collar on a deer

(Photo: Mike Kent)

behavior is also often unavailable in remote or undeveloped locations.

The Ministry recognizes the need for accurate and timely information on wildlife. Consequently, before the construction of new highways or the major upgrading of existing ones occurs, the Ministry's environmental staff, aided by wildlife consultants, conduct extensive, long term, wildlife counts and tracking to locate, identify, and quantify species, as well as determine movement patterns. Depending on the species, tracking may include radiocollaring over extended periods of time.

For day-to-day operations, general information on specific species of wildlife can often be found in materials developed by various wildlife agencies. For BCMoT, the Biodiversity Branch, British Columbia Ministry of Water, Land and Air Protection (MWLAP) has been a vital source of expertise on various wildlife species.

A number of species typically found on British Columbia highways are profiled here. These profiles are intended to provide a general description on the appearance, life history, abundance and distribution of each animal for a better insight into their interaction with highways. The animals profiled are:

1. 2	Bear (Black Bear and Grizzly Bear) Caribou (Woodland	5.	Deer (Mule Deer, Black- tailed Deer and White- tailed Deer)
2.	Caribou)	6.	Elk (Roosevelt Elk and
3.	Cougar		Rocky Mountain Elk)
4.	Coyote	7.	Moose (Alaskan Moose, Northwestern Moose and

- 8. Porcupine
- Sheep (Bighorn Sheep)
 Wolf





2.2 Black Bear (Ursus americanus: ssp: altifrontalis, carlottae, cinnamomum, kermodei, vancouveri)

Appearance and Size

Black bears have a bulky body, small black eyes, a broad head, rounded ears, a short tail, and a fine, long hairy covering. Usually, their fur is uniformly black, except for a tan muzzle and a white "V" on the chest. Black bears can range in colour from black to white, with cinnamon, brown and blonde not being uncommon. A blue-coloured black bear or "glacier" bear is rare. Adult size and weight varies greatly according to sex, season, food supply, and geographic area. Adult males measure about 60 cm to 90 cm in shoulder height and 130 cm to 190 cm in length and weigh 80 kg to 300 kg. Females are smaller, weighing 40 kg to 140 kg.

Life History

Black bears have low reproductive rates compared to many other mammals. Females typically do not reach sexual maturity until four years of age and breed only every two to three years after that. Where food is scarce, females might not bear their first litter until they are six or seven years old. Most males don't mature sexually until age five or six. Although black bears can live for 25 to 30 years in captivity, their life-span in the wild is usually much shorter. Black bears in British Columbia usually mate from early June to mid-July. Cubs are born in January or February, during hibernation. While litter sizes vary from one to five, black bears usually have two cubs. Cubs nurse while the mother continues hibernating and weigh 3 kg to 5 kg when they leave the den in spring. Cubs stay with their mother their entire first year and sometimes longer. For bears hibernation is an important survival strategy, where their main foods, green vegetation, berries, salmon and insects are not available in winter. Black bears usually hibernate for three to five months on the south coast and for longer periods (probably five to seven months) in the interior and the north. Females, in particular pregnant ones, hibernate longer than males.

Abundance and Distribution

British Columbia supports one of the largest populations of black bears in North America. Black bear numbers vary from year to year but their population in British Columbia is estimated to be between 120,000 and 160,000 bears. This is about one quarter of all black bears in Canada. One of the most widely distributed mammals in British Columbia, the black bear is found in forestland across the province. Its natural range includes Vancouver Island and most coastal islands to the north, including the Queen Charlottes. Although bears are generally absent from alpine, grassland, and heavily settled landscapes, they often are found

close to the fringes of communities and sometimes wander into them. Bear numbers are higher in wet climatic zones, where vegetation is more plentiful, than in dry regions. Coastal bear densities are higher because of access to spawning salmon.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2001, *Black Bears in British Columbia*, Victoria, 6pp.



2.3 Grizzly Bear (Ursus arctos horribilis)

Appearance and Size

Grizzlies are large, heavy-bodied bears that can weigh up to 680 kg, with the average weight ranging from 270 kg to 360 kg. Average adult grizzlies reach nose-to-tail lengths of 1.8 m but have been recorded as long as 2.7 m. The long, outer guard hairs of the grizzly are often tipped with white, silver, or cream giving the bear the grizzled appearance its name denotes. Coat colour can be various shades of blond, brown, black, or a combination of these, and can be affected by spring shedding, growth of new hair, nutrition, and climate. Coat colour is not a good characteristic for distinguishing between black bears and Grizzly Bears. Black bears and grizzly bears sometimes look similar, but grizzlies are usually larger and are seldom completely black. Grizzlies have a prominent shoulder hump, which is lacking in black bears, and a dish-shaped face instead of the straight facial profile of the black. Grizzlies have much longer claws, adapted for digging, while black bears have shorter, curved claws, well suited for tree climbing.

Life History

Grizzly bears have one of the lowest reproductive rates of North American terrestrial mammals. Females reach reproductive maturity between four and seven years of age, and once mature, normally produce young every two to three years. The breeding season begins in late May and lasts until mid-July. The gestation period is relatively short (7 to 9 months). One to four, usually two, cubs are born in the den in January or February. The cubs will remain with the female for two or three years, during which time she does not breed. Grizzlies rarely live past the age of 25.

Abundance and Distribution

Grizzly Bears inhabit most of the province except the Queen Charlotte Islands, the Lower Mainland, and portions of the south-central interior. While they are not common on Vancouver Island, a cub was found on the northern end of the island in 2003. Grizzly Bears occur in all major biogeoclimatic areas and utilize habitats ranging from coastal estuaries to alpine meadows. Habitat use is primarily influenced by the presence of food, denning and mating sites, and other bears. Home ranges vary in size depending on the individual bear and the locality, ranging from less than fifty to hundreds of square kilometres. Coastal bears tend to have smaller home ranges than do interior bears. Home ranges of males are generally larger than those of females. Given their secretive nature, affinity for wilderness areas and low



population densities, accurate counts of Grizzly Bear populations are almost impossible. Current estimates put the B.C. population at about 10,000 bears, approximately one-quarter of the North American population.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 1994, *Grizzly Bears in British Columbia*, Victoria, 6pp.





2.4 Woodland Caribou (Rangifer tarandus caribou)

Appearance and Size

Woodland Caribou are classified into three ecotypes: Mountain, Northern and Boreal. The ecotypes look about the same but differ with behavior, habitat use, distribution and migration. Woodland Caribou have soft medium brown coats, but their colour pales as guard hairs break and fade during winter. In males, the head and neck are often white or greyish-white, with a mane on the underside of the neck. The tail and rump area, as well as a band around each hoof, are also whitish. Their long dense winter coat provides effective insulation against low temperatures and high winds. Caribou have erect, spreading antlers. Males have a flattened (palmate) brow tine that points down over the forehead. Female Caribou also have antlers, which is unique among females in the deer family. Woodland Caribou can range in height at the shoulder from 100 cm to 120 cm. Males typically weigh 180 kg to 270 kg while females usually weigh about 90 to 135 kg.

Life History

The breeding season is much shorter for Caribou than for other deer. The majority of the breeding occurs in a one-week period in the middle of October. Gestation averages seven to eight months, and calves are born in late May to early June. To avoid predators, pregnant females seek secluded sites in alpine and subalpine habitats. Single births are the most common, and females usually give birth to their first calf when they are three years old. Caribou calves are dark brown and have no spots. They are probably the most precocious of the deer family; calves must be up and travelling with their cows almost immediately in order to avoid predators. Generally, females live 10 to 15 years while males live 8 to 12 years.

Abundance and Distribution

Woodland Caribou occur east of the Coast Mountains, from the Yukon border south to the Itcha-Ilgachuz in the Western Chilcotin, eastwards to the foothills of the northern Rocky Mountains; in the Cariboo, Selkirk, Purcell, and Monashee mountains in the southeast; and throughout the highlands and plateaus (e.g. Spatsizi, Omineca) in the northern and central interior. Caribou occupy about 85 percent of their historic distribution in British Columbia. Mountain Caribou occupy about 60 percent of their historic range. Mountain Caribou may make four migrations each year, moving down to lower elevations in early winter, back up to higher elevations in late winter, down to lower elevations again in spring, and finally back to high elevations for the summer. The range of movement up and down varies, however, and

the deepest snow areas, such as Revelstoke, usually have the widest range of vertical migrations. Northern Caribou migrate twice a year, traveling more than 140 km in some cases. The migration patterns of Boreal Caribou are largely unknown. British Columbia has about 16,500 Caribou.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Caribou in British Columbia*, Victoria, 6pp.



2.5 Cougar (Puma concolor: ssp: oregonensis, missoulensis, vancouverenis)

Appearance and Size

In British Columbia, the average adult male weighs about 46 kg and the average adult female weighs about 37 kg. Several cougar taken have weighed between 70 kg and 78 kg. Large adult males may measure 2.7 m in length, including a 76 cm tail. The fur is short and ranges in colour from reddish-brown to a grey-brown, with light underparts. Very young kittens are spotted, with ringed tails. This coloration is gradually lost as young cougar reach adulthood. Adults are unmarked. One black cougar was reported several years ago in the North Okanagan area, while white or very light-coloured cougar are infrequently reported.

Life History

Cougar are polygamous and only the female tends the young. Females reach sexual maturity at 2 to 3 years of age. Breeding takes place at any time of the year, and one to six kittens are born after a gestation period of about 3 months. The female gives birth to her young in a rocky crevice or den, protected by roots or windfalls, Kittens are born with their eyes closed, but these open 10 to 14 days after birth. The kittens nurse for at least five to six weeks. Kittens will take meat at about six weeks of age.

Abundance and Distribution

Cougar are found throughout British Columbia. Distribution extends north from the United States /British Columbia border to the Big Muddy River on the Alaska Highway, south of about 54 degrees latitude; and from the British Columbia-Alberta border west, to and including, most coastal islands. To date, cougar have not reached the Queen Charlotte Islands. The territory or home range maintained by individual adult cougar ranges up to, or greater than, 260 km². The female cougar maintain winter territories of 13 km² to 52 km². Females with kittens require larger ranges than females without kittens, and some overlap of female ranges occurs. Males occupy larger territories, in the range of 65 km. Resident males do not overlap ranges. Transient cougars move through occupied ranges, but avoid resident cougar. Cougar distribution is governed by the distribution of deer, its major prey species. Summer observations are scanty, but as the snow recedes cougar probably spread out from the lower slopes and valley bottoms to inhabit virtually all elevations within their general distributional boundaries. During winter months, cougar follow deer down to the lower elevations. Cougar seem to prefer the rough, rocky, semi-open areas surrounding the major deer winter ranges in the Interior, but they do not confine their activities exclusively to this type of habitat. Cougar







2.6 **(Oyote** (*Canis Iatrans Say: ssp: incolatus, lestes*)

Appearance and Size

Coyote fur is generally a tawny grey, darker on the hind part of the back where the blacktipped hair becomes wavy. Legs, paws, muzzle, and the back of the ears are more yellowish in colour; the throat, belly, and the insides of the ears are whiter. The tail, darker on top and lighter on the underside, is lightly fawn-coloured towards the tip, which is black. The coyote's fur is long and soft and well suited to protect it from the cold. Because it is light-coloured in winter and dark in summer, it blends well with the seasonal surroundings. The coyote's ears are wide, pointed, and erect. It has a tapering muzzle and a black nose. Unlike most dogs, the top of the muzzle on coyotes forms an almost continuous line with the forehead. The yellow, slightly slanting eyes, with their black round pupils, give the coyote a characteristic expression of cunning. The canine, or pointed, teeth are remarkably long and can inflict serious wounds. The neck is well furred and looks oversized for the body. The typical male coyote weighs from 9 kg to 23 kg, has an overall length of 120 cm to 150 cm, including a 30 cm to 40 cm tail, and stands 58 cm to 66 cm high at the shoulder. The female is usually four-fifths as large.

Life History

Coyotes appear to be monogamous, and couples may remain together for several years. Both sexes can breed at one year of age under good conditions, although both sexes usually breed somewhat later in life. The mating occurs mainly during February and March. Gestation lasts from 2 months. On average, the female bears three to seven pups, covered with fine brown fur, whose eyes remain closed for the first eight or nine days. Weaning, or making the transition from the mother's milk to other food, begins about one month after birth. The adults then feed the pups by regurgitating half-digested food. At about three weeks of age, the pups begin to romp around under the adults' watchful supervision. When fall comes, the young coyotes may leave their parents to claim their own territory. If there is an abundant food supply, pups may stay with the adults to form packs, or clans.

Abundance and Distribution

The coyote is one of the few mammals whose range is increasing, despite extensive persecution by people. In British Columbia, the coyote still inhabits its traditional habitats, the aspen parkland and short- and mixed-grass prairie in the Peace River. However, it has spread south and west into the mountains, and the southern and northern Interior. Coyotes are now found even in urban centres on the British Columbia Mainland, including Vancouver.



Map 2.5



2.7 Mule and Black-tailed Deer (Odocoileus hemionus: ssp: columbianus, hemionus, sitkensis)

Appearance and Size

Mule Deer have a reddish brown coat that changes from tawny brown in summer to dark or grizzled brown in winter. They have a dark brown forehead, a whitish face with a black muzzle, and a white throat patch. Their ears are large, about two-thirds the length of the head, with black borders and white hair on the inside. They have a large white rump patch with a narrow black-tipped tail. Each year male Mule Deer grow and shed a set of antlers. Their antlers have two main beams, each of which forks again into two beams (dichotomous branching). Mule Deer attain heights of 90 cm to 95 cm high at the shoulder. While most adult males, or bucks, weigh 68 kg to 113 kg, some may reach 180 kg. Females, or does, usually weigh between 50 kg to 75 kg. Blacktails are smaller than Mule Deer and slightly darker in color, with a small rump patch and a tail that is dark brown or black for most of its length. Adult males in good condition weigh between 48 kg to 90 kg, while females weigh between 40 kg to 65 kg. Sitka blacktails tend to be smaller and darker than Columbia blacktails.

Life History

Deer are a very prolific species. Mating (rutting) occurs in late autumn, November and December. This is a time when bucks increase their displays of dominance and mature bucks engage in battles for females. Bucks are capable of breeding as yearlings, but older bucks do most of the mating. After a six to seven month long gestation period, fawns are born from late May through June. While young does often only have one fawn, twin fawns are the rule, and triplets do occur. Does usually produce offspring throughout their lives. More than 90 percent of does produce fawns every year. Usually, 45 to 70 percent of fawns die and few Black-tailed and Mule deer live more than eight to ten years.

Abundance and Distribution

Except for the rut, most Black-tailed and Mule deer tend to travel alone or in small groups. Black-tailed Deer numbers vary greatly depending on habitat conditions, winter severity, and predators numbers. Deer have adapted to all climates. They inhabit every kind of ecological zone, from alpine to valley bottom, and from dense coastal rainforests to dry interior rangelands. Deer population in recent decades has ranged between 150,000 and 300,000. Blacktails are abundant in southern areas where the climate is favourable such as Vancouver Island, the islands in Georgia Strait, and the Sechelt Peninsula. Their numbers decline northward along the mainland coast. About 150,000 black-tailed deer inhabit the coastal areas



of B.C. Sitka blacktails were introduced into the Queen Charlotte Islands in the early 1900's and have flourished there. About 165,000 Mule Deer inhabit the interior of the province. While most prefer the dry valleys and plateaus of the southern interior, Mule Deer are common in the south-central interior. About 20,000 to 25,000 occupy northern ranges.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Mule and Black-tailed Deer in British Columbia*, Victoria, 6pp.





2.8 White-tailed Deer (Odocoileus virginianus: ssp: dacotensis, ochrourus)

Appearance and Size

White-tailed Deer have a coat mostly reddish brown in summer but which changes to grey or greyish-brown in winter, with a contrasting white hairy covering on the belly, inside of the legs, underside of the tail, around the eyes, and on the chin and throat. The most striking feature of this deer, and the source of its name, is its triangular foot-long tail. On top, the tail is brown with a prominent white fringe, but the underside is snowy white. Whitetail bucks have distinctive antlers that fall off and grow back every year. Each antler has a main beam that rises from the top of the head, curves slightly backward, then turns out and forward over the face. Each main beam holds one to several unbranched tines, or points. Male fawns have no visible antlers, but yearlings may have either a single spike or antlers with four to eight tines. Older bucks always have several tines. Mature, White-tailed Deer stand about 90 cm tall at the shoulder. Adult males, or bucks typically weigh 68 kg to 102 kg. Adult females, or does weigh 45 kg to 73 kg. Weights vary considerably depending on age, the season, and the condition of the range.

Life History

Mating (rutting) occurs in the Fall, peaking in November when most does come into heat. During the rut, bucks travel incessantly. Most breeding involves yearlings and older animals. The gestation period for White-tailed Deer is about six to seven months. After the gestation period, does drive off their young of the previous year and give birth to new fawns. Most fawns are born in late May or June. Twin births are common, but single births and triple births are not uncommon. While some whitetails live more than 20 years, few survive more than ten. Most bucks in hunted herds are less than four years old.

Abundance and Distribution

In good years, White-tailed Deer numbers may exceed 65,000 in British Columbia. Whitetails are at the far northern edge of their vast North American range and many of them die during severe winters here. However, they come back in increasing numbers if several mild winters occur in a row. This pattern is most pronounced in the Peace River region. The White-tailed Deer does not occur everywhere in British Columbia. They are most abundant along valley bottoms in the Kootenay and Okanagan regions, particularly near the US border. In the North, they are most numerous along the Peace River and the lower reaches of tributaries like the Halfway, Beatton, Moberly, Pine, and Kiskatinaw Rivers. For most of the year, valley bottoms

are the main habitat for White-tailed Deer in British Columbia. In the East Kootenay area, deer find winter range on south- to southwest-facing slopes and on fans and terraces where shrub stands have developed after wildfires, logging, or landclearing for agriculture. The distribution of Whitetailed Deer is largely governed by climate, particularly snow depth.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Whitetailed Deer in British Columbia*, Victoria, 6pp. (Photo: BC Parks)



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2.9 Roosevelt Elk & Rocky Mountain Elk (Cervus elaphus nelsoni, Cervus elaphus roosevelti)

Appearance and Size

Elk have distinct winter and summer coats. In winter, the head, neck, and legs are dark brown, and the sides and back are a much lighter gray-brown. Adult males (bulls) tend to have a lighter, creamier body colour than adult females (cows). In summer, the coat is a rich reddish-brown, with little or no undercoat. Both sexes have heavy dark manes and a yellowish-white rump patch bordered by a dark brown or black stripe. Adult bull Elk stand about 140 cm high at the shoulder and weigh 265 kg to 410 kg. Cows stand about 130 cm high and weigh 190 kg to 270 kg. Roosevelt Elk and Rocky Mountain Elk look quite similar but Roosevelt Elk are slightly larger and darker. Mature bull Elk have rich-brown antlers, ranging in length from 110 cm to 160 cm, with ivory tips and usually five other pointed tines. Yearling bulls tend to have unbranched spike antlers.

Life History

Elk are social animals. Up to 20 or more cows, calves, and yearlings live in groups that remain apart from the smaller groups of bulls, except during the autumn mating (rutting) period. As the mid-September rutting period approaches, bull Elk become more active and aggressive. They seek out the cow groups and establish harems of several cows that they jealously herd and guard. Most cows are bred from mid to late September. Elk have a gestation period of eight months. Calves are born in late May and early June. Single births are most common and twins are rare. While Elk can live as long as 20 years, most die by age 10 or 12.

Abundance and Distribution

While Elk usually live in mountainous areas, they occur both in the dense coastal old-growth rainforests and grassy interior valleys with scattered tree cover, keeping to areas where winter snows remain shallow. There are about 45,000 Rocky Mountain Elk in the British Columbia interior. About 15,000 occur in northern BC, 25,000 in the Kootenay region and 1000 in the Thompson-Okanagan area. A few hundred occur in other scattered herds. Elk are most numerous in the east and west Kootenay regions north to about Golden and west to Grand Forks. Native populations also occur along the east slope of the Rockies and adjacent foothills from the Wapiti River drainage to the Liard River, with a major concentration in the Muskwa and Tuchodi River areas. Since 1917, transplants, some from outside the province, have altered Elk distribution, supplementing some existing populations and resulting in new herds in several locations: southern Vancouver Island, the Queen Charlotte Islands, the Sechelt



Peninsula, Powell River, Princeton, Lytton, Okanagan Lake, Granby River, Lower Arrow Lake, Williston Lake, and the Kechika River valley. About 3,000 to 3,500 Roosevelt Elk are located on Vancouver Island, with small herds in Phillips Arm, Sechelt and Powell River.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Elk in British Columbia, Victoria*, 6pp.

ntain Elk (Photo: BC Parks)





2.10 Alaskan Moose, Northwestern Moose and Shiras Moose

(Alces alces: ssp: andersoni, gigas, shirasi)

Appearance and Size

All three moose subspecies found in British Columbia are similar in appearance. The biggest moose live in northern B.C. while the smallest ones live in the southeast. Adult bulls stand nearly 2 m tall at the shoulder and have the most massive antlers of any member of the deer family. They are larger and have longer legs, a shoulder hump, and a dark brown to blackish coat. They have no rump patch, but they have a bell of skin and hair under the throat and a large, overhanging upper lip. Adult cows weigh on average about 340 kg to 420 kg; adult bulls weigh 450 kg to 500 kg. The maximum recorded weight is 595 kg. Moose have long legs to help them travel through fallen timber, muskeg, and deep snow. Their winter coat of long guard hairs and undercoat of fine wool allows them to survive in cold climate.

Life History

Moose are essentially solitary animals. Their only lasting social bond is the bond between mother and calf, which lasts for only a year. During that time the cows protect the calves from predators and lead them to the best habitats. In expansive northern shrublands, Moose commonly form groups of up to eight to ten during the rutting period. This habit is less common in forested habitats. Moose mate from September to November, but more than 80 percent of calves are conceived during two weeks in late September and early October. Moose have a gestation of about eight months. In late May and June, the birthing period approaches and pregnant females seek seclusion and chase away their young of the previous year. Under normal conditions, single births are generally most common. The proportion of adult cows that produce twins is closely associated with their nutritional condition.

Abundance and Distribution

Moose are one of the most widely distributed ungulates in British Columbia. Found across almost the entire interior of the province, they are most abundant in the central and subboreal interior, the northern boreal mountains, and the boreal plains of northeastern British Columbia. Moose are also common in mountainous valleys, except for a few dry southern valleys like the Thompson and Okanagan. Moose are not found on Vancouver Island and are usually absent from the coastal regions, but they penetrate as far as the tidewater at the heads of several inlets from Bute Inlet northward. British Columbia is estimated to have about 175,000 Moose. Over 70 percent live in northern British Columbia and the rest in the

Cariboo-Chilcotin, Thompson-Okanagan, and Kootenay regions. Population densities vary greatly from place to place, mostly in response to snow depth and the supply of winter browse. Moose move about within familiar summer and winter home ranges. In a given season, their home range seldom exceeds 5 km² to 10 km².

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Moose in British Columbia*, Victoria, 6pp. (Photo: BC Parks)



2.11 Porcupine (Erethizon dorsatum: ssp: myops, nigrescens)

Appearance and Size

Porcupines have a short, stocky body. They have a short, blunt-nosed face with small eyes. The ears are small and round, almost concealed by the hair, which also covers the spines. The shoulders are humped, making the back look arched. The short legs are bowed, and the animal stands bear-like with its entire foot planted firmly on the ground. The claws are long and curved. The muscular tail is thick, short, and rounded at the tip.

The porcupine's coat consists of a soft, brown, woolly undercoat and coarse, long guard hairs. At the base, each guard hair is brown, becoming darker near the tip, which may be white in eastern populations and yellow in the western ones. The guard hairs conceal the quills until the porcupine is aroused. The quills are longest on the back and tail and when raised push the guard hairs forward, forming a crest. On the face the quills are about 1.2 cm long; on the back they may be up to 12.5 cm in length. There are no quills on the muzzle, legs, or underparts of the body. Next to the beaver, the porcupine is Canada's second largest rodent. Adult males reach an average weight of 5.5 kg after six years; the females reach 4.5 kg. The total length averages 68 cm to 100 cm, and the height at the shoulders is about 30 cm.

Life History

Porcupines are solitary animals. Porcupines first breed when they are one or two years old. In the southern part of their range, they mate in September. In the more northerly latitudes, they mate in late October to November. The gestation period is about 7 to 8 months. Birth occurs sometime between March and May depending how far north the porcupine is located. Single births are most common and twins are almost unknown. After a couple of days, the baby porcupine can climb, although it tends to spend more time on the ground. After a week or so, the female leaves the baby for longer and longer periods while she feeds on the emerging green plants. Weaning, or making the transition from mother's milk to other food, takes seven to ten days. By the Fall, most young porcupines live apart from their mothers.

Abundance and Distribution

Except for Vancouver Island, the Gulf Islands, and the Queen Charlotte Islands, Porcupines can be found throughout British Columbia.

Adapted from: Canadian Wildlife Service, 1993, Hinterland Who's Who, Mammals: Porcupine, Ottawa, Ontario







2.12 Bighorn Sheep (Ovis canadensis, Ovis dalli: ssp: dalli, stonei)

Appearance and Size

California and Rocky Mountain bighorns look similar, but the California subspecies is slightly darker in colour, and in rams the horns flare outward more than those of Rocky Mountain rams. Bighorn Sheep have a rich brown coat with a contrasting ivory–white rump patch, a white muzzle, and white trim on the back of all four legs. The brown coat fades to a drab grey-brown by late winter. The adult ram's massive, brown, spiralled horns grow throughout the sheep's life, and can be as long as 127 cm around the curve and as thick as 40 cm around the base. Ewes have slightly curved horns about 30 cm long. Adult rams stand about 100 cm high at the shoulder, and usually weigh 90 kg to 135 kg. Ewes are about two thirds the size of rams.

Life History

Bighorn Sheep are among the most social of British Columbia's hoofed mammals. They breed between early November and mid-December. Most ewes do not breed until they are two years old and rams until they are seven or eight years old. Gestation lasts about 6 months, and lambs are born from the last week in April to early June. As lambing time nears, pregnant ewes leave their social group and isolate themselves in rugged lambing cliffs near the winterspring range. They usually produce a single lamb that weighs 3 kg to 5 kg, but some well-nourished females produce occasional twins. Bighorn Sheep can live as long as 20 years, but most do not live beyond 12 to 14 years.

Abundance and Distribution

The main native herds of California Bighorns total about 3000 animals. They occur in the Okanagan area (Ashnola, Vaseaux Lake-Penticton Creek, Shorts Creek); on the east side of the Fraser River from Lillooet to Williams Lake; west of the Fraser around Churn and Lone Cabin Creeks; in the Bridge River watershed; in the Taseko Lake-Chilko Lake area; and at the Junction of the Chilcotin and Fraser Rivers. California Bighorns have been introduced in a number of locations, including the Grand Forks area, Kamloops Lake, and Dog Creek. There are about 2500 Rocky Mountain Bighorns. In the East Kootenay region, their herds occur in the Kootenay ranges on the east side of the Rocky Mountain Trench, from Radium south to Bull River; the Galton Range on the east side of the Trench from Elko to the Montana border; the Front ranges along the west side of the Elk River north of Sparwood; the west slope of the Rockies from Crowsnest Pass to Fording River; and the Kootenay River headwaters near Mount

Assiniboine Park. More isolated herds also occur near Golden and north of McBride. New herds have been established near Chase, Castlegar, and Spences Bridge, which are outside of the historic range of this subspecies, and animals from an introduction in Washington State have spread into the Salmo area.

Adapted from: British Columbia Ministry of Environment, Lands and Parks, 2000, *Bighorn Sheep in British Columbia*, Victoria, 6pp.



2.13 Wolf (Canis lupus: ssp: nubilus, occidentalis)

Appearance and Size

Wolves in British Columbia vary in colour. A single pack may contain animals that are black, white, shades of grey-brown and tan, but never spotted. Wolf colors vary widely, and solid-colored wolves are common. They are often a grizzled grey-brown, similar to some German shepherd dogs. A wolf's winter coat is very woolly, and can be two and one-half inches thick with individual hairs as long as five inches. Dogs descended from wolves. Consequently, for some breeds, they appear similar. Wolves have longer legs, bigger feet, and a narrower chests than large domestic dogs. While a domestic dog's tail may curl, a wolf's tail does not.

Life History

Wolves are social animals: they not only hunt in packs or groups but live most of their lives with other wolves. The wolves' habit of hunting in packs has resulted in the development of complex patterns of social behaviour. Wolves differ from domestic dogs in their reproductive cycles. Male dogs can breed at any time of year and females every six months, whereas both male and female wolves in the wild can breed only once a year. Wolves usually reach sexual maturity in their second year. It is possible for younger animals to have pups, but this is not normally the case. Breeding time varies with the latitude but most commonly occurs in March and April. After a nine-week gestation, litters of five or six pups (sometimes eight or more) are born. The pups remain inside whelping dens for approximately two weeks. By mid-autumn they are travelling with the pack and participating in hunting and other pack activities.

Abundance and Distribution

Wolves are territorial. The sizes of their territories vary greatly and are dependent on the kind and abundance of prey available. The pack bond is strongest during winter, when the wolves travel and hunt together. In summer, when the pups are young, the adults seldom go on long forays. They may hunt together occasionally after meeting at the den or home site where the pups are being cared for. Wolves are common in lightly settled portions of British Columbia.

Adapted from: Canadian Wildlife Service, 1993, *Hinterland Who's Who, Mammals: Wolf*, Ottawa, Ontario and National Park Service, 2004 Wolves in the North Cascades, North Cascades National Park, Sedro Woolley, Washington.







3.0 COST OF WILDLIFE-RELATED MOTOR VEHICLE ACCIDENTS

3.1 Wildlife-related Motor Vehicle Accidents

The cost of wildlife-related motor vehicle accidents to the residents of British Columbia is substantial. The financial impact on the province can be broken down into the following:

- Reported Accidents
- Unreported Accidents
- Accident Clean-up
- Lost Provincial Hunting License Revenues
- Lost Value of Wildlife

3.2 Reported Accidents

In addition to killing wildlife, wildlife-related motor vehicle accidents represent a serious threat to the motoring public. Accidents involving large ungulates and carnivores can result in human fatalities, injuries, and damage to motor vehicles (Figure 3.1 & Table 3.1). Any accident may also result in multiple human fatalities.

Figure 3.1



Relative size of moose, deer and bear compared to 1.8m human and mid-sized automobile. (Adapted from Maine Interagency Work Group on Wildlife/Motor Vehicle Collisions, 2001)

Table 3.1 Wildlife-related Fatal, Injury and Property Damage Only Accidents

Year	Fatal Accidents	Total Number of Deaths	Injury Accidents	Property Damage Only Accidents
1987	1	1	198	2,226
1988	0	0	256	2,596
1989	1	3	199	2,590
1990	1	1	237	2,821
1991*	1	2	241	1,925
1992	2	6	238	1,975
1993	0	0	248	1,954
1994	3	9	256	2,072
1995	3	5	221	1,678

*Note: In 1991, the minimum reportable aggregate property damage accident value increased from \$400 to \$1000. Source: Highway Accident System, Highway Safety Section, Engineering Branch, BCMoT

In British Columbia, the majority of motor vehicles are insured by the Insurance Corporation of British Columbia (ICBC). On average, ICBC processes approximately 6600 wildlife-related accident claims a year¹. In 2000, the average cost of these claims was about \$2200. Between 1997 and 2002, ICBC paid out over \$144.5 million in animal-related motor vehicle accident claims (Table 3.2). In 2000, ICBC had over 8,800 wildlife-related accident claims.

Table 3.2 ICBC Animal-related Motor Vehicle Accident Claims (1997 to 2002)

	1997	1998	1999	2000	2001	2002	Total
Claims (\$millions)	17.9	19.9	21.3	26.3	28.3	30.8	144.5

Source: Insurance Corporation of British Columbia, 2004

ICBC estimates its accident claims capture 75% of the number of wildlife-related accidents that occur in British Columbia. Few people in British Columbia do not carry comprehensive insurance. With ICBC insurance policies, there is no penalty for a comprehensive claim so such claims do not affect policy premiums. Of the 25% of the number of British Columbia wildlife-related motor vehicle accidents ICBC estimates go unreported to it, ICBC estimates 10% involve out-of-province vehicles, 10% involve vehicles with less than \$100 in damage, and 5% of the accidents are reported to other insurance companies in British Columbia.

The societal costs of motor vehiclerelated accidents have also been estimated by the British Columbia Transportation Financing Authority



Vehicle damage from accident with elk (Photo: Deborah Webster)



Wreckage from vehicle accident with elk (Photo: Deborah Webster)

and the impact to the Province is considerable (Table 3.3).

Table 3.3 Societal Costs of Motor Vehicle Accidents (BCTFA)

Accident Severity Class	Societal Cost
Fatality	\$4.17 million
Injury	\$97,000
Property Damage	\$6,000

Source: Highway Safety Improvement Program Manual, BCMoT

Gilfillan, G., 2001 <u>Personal Communication</u>, Project Manager, Winter Road Research & Development, Kamloops, B.C.
 Perkins, M., 1999, <u>Highway Safety Improvement Programs Manual</u>, British Columbia Ministry of Transportation





3.3 Unreported Accidents

Except for fatal accidents, not all wildlife-related motor vehicle accidents which occur in British Columbia are reported in the province. Some accidents involve tourists or visitors from outside British Columbia. In such cases, many wildlife-related accidents are reported in other jurisdictions. Other accidents involve minor damage vehicle owners either ignore or pay for the repairs privately.

If one assumes the 6600 accidents reported to ICBC represent 75% of the actual number of vehicle damaging, wildlife-related accidents that occurred on Provincial highways, one can estimate an additional 1650 vehicles were damaged in wildlife-related accidents.

If one assumes these motor vehicles accidents incurred an average of \$2300 in damages, the total unreported damage incurred by motor vehicles in British Columbia in 2002 totaled \$3.8 million.

3.4 Accident Clean-up

Ministry Maintenance Contractors incur costs due to staff and equipment time required for the clean-up of wildlife-related accidents and the disposal of animal remains. Depending on the size of the animal involved and the location of the accident, the cost of clean-ups can vary dramatically. While smaller animals, such as porcupine and skunks, may be handled by a single person in one vehicle, larger animals, such as moose, elk, and caribou, often require two or three people with two vehicles and a hydraulic boom.

If one assumes the following staff and equipment time costs:

- \$25 for small-sized animals (fox, porcupine, skunks, etc),
- \$100 for medium-sized animals (bear, cougar, deer, mountain sheep, etc), and
- \$350 for large-sized animals (caribou, elk, moose, etc);

Ministry Maintenance Contractors spent over \$600,000 dealing with wildlife-related accident clean-up and disposal in 2001.

Between 1993 and 2002, it is estimated Ministry Maintenance Contractors spent over \$5.6 million on wildlife-related accident clean-up and disposal. These expenditures do not include the costs incurred by the Maintenance Contractors for insurance premiums and lost employee productivity or the Workers' Compensation Board for compensation payments when workers get injured dealing with wildlife-related accidents.



Accident clean-up

(Photo: Alan Dibb)

3.5 Lost Provincial Hunting License Revenues

In British Columbia, hunting license sales generate millions of dollars for the Provincial Government each year. The value of hunting licenses varies greatly between species and whether or not the hunter is a British Columbia resident (Table 3.4).

If every wild game animal reported killed on provincial highways represented an opportunity to sell a hunting license, the Province of British Columbia lost between \$75,000 and \$610,000 in hunting license revenues in 2001. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia could have lost between \$300,000 and \$2.45 million in hunting license revenues in 2002.



Hunter with deer

(Photo: Bolten Studios)

Table 3.4 Provincial Hunting License Fees for Residents and Non-residents

Species	Resident fees (\$)	Non-resident fees (\$)
Bison	70	700
Black Bear	20	130
Bobcat	8	40
Caribou	20	230
Cougar	30	230
Deer	15	125
Elk	25	200
Grizzly Bear	80	1,030
Lynx	8	40
Moose	25	200
Mountain Goat	30	275
Mountain Sheep	50	400
Wolf	No Licence	50
Wolverine	8	40

Source: British Columbia Ministry of Water, Land and Air Protection (MWLAP), 2003



3.6 Lost Provincial Trapping Royalties

In British Columbia, trapping royalties generate thousands of dollars for the Provincial Government each year. The value of trapping royalties vary greatly between species. (Table 3.5)

Table 3.5 Schedule of Trapping Royalties per Pelt or Skin

Species	Royalty (\$)
Bison & Beaver	0.77
Black Bear	3.45
Bobcat	1.34
Coyote	0.72
Fisher	1.16
Fox	0.66
Lynx	2.46
Marten	1.15
Mink	0.52
Muskrat	0.07
Otter	2.77
Raccoon	0.40
Skunk	0.08
Squirrel	0.05
Weasel	0.15
Wolf	2.69
Wolverine	6.53

Source: British Columbia Ministry of Water, Land and Air Protection (MWLAP), 2002

If every furbearing wild game animal reported killed on provincial highways represented an opportunity to collect a fur royalty, the Province of British Columbia lost over \$4,600 royalty revenues between 1993 and 2002. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia could have lost over \$18,700 between 1993 and 2002.

3.7 Lost Value of Wildlife

The Wildlife Branch of the British Columbia Ministry of Water, Land and Air Protection (MWLAP) has done extensive analysis of the economic value of wildlife resources in the province.³ In British Columbia, participants in hunting and viewing make estimated current expenditures of about \$466 million each year that are directly associated with their wildlife-related recreation.

The expenditures by participants in wildlife-related activities and their impacts on income and employment are spread throughout the Province and make important contributions to many rural economies. In 1996, MWLAP estimated expenditures on resident hunting and wildlife activities supported about \$205 million of Provincial Gross Domestic Product and \$136 million of household income.⁴

³ Reid, R., 2001 <u>Personal Communication</u>, Economist British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, B.C.

⁴ Ibid

3.8 Lost Value of Wildlife for Resident and Non-resident Hunters

Approximately 100,000 British Columbia residents purchase hunting licenses annually and spend an estimated 1.5 million days hunting in the province each year.⁵ Approximately 4,500 non-residents spend about 46,000 days hunting in British Columbia each year.⁶

One measure of the value of wildlife lost due to motor vehicle-related accidents can be estimated by determining how much hunters are willing to pay to hunt.

MWLAP surveyed thousands of resident hunters in 1996 to determine their "willingness to pay" in order to obtain an animal from a certain species (Table 3.6). According to MWLAP, the "willingness to pay" by British Columbia hunters to obtain a certain species of animal can be considered the equivalent of the "true net market value" of that species. For non-resident hunters, the "net return" to the Province is determined to be the value of their expenditures less the cost to the Province for supplying the services they need.⁷

Table 3.6 Resident and Non-resident Hunters Net Value to British Columbia

Net Value to British Columbia Resident Hunters (\$)	Non-resident Hunters (\$)
950	2,340
2,960	2,930
2,050	3,400
1,270	7,450
3,250	3,290
1,250	1,680
eep 4,700	4,170
	Set Value to British Columbia Resident Hunters (\$) 950 2,960 2,050 1,270 3,250 1,250 eep 4,700

Source: British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program

For every wild game animal reported killed on provincial highways in 2002, the Province of British Columbia would have earned over \$6.1 million in the market value of the animals to resident hunters. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia would have lost over \$24.5 million from resident hunters in 2002.

The value of non-resident hunting in British Columbia is significant. Non-resident hunters contribute to the provincial economy by purchasing hunting licenses and supplies, and hiring hunting guides. If every wild game animal reported killed on provincial highways represented an opportunity for non-resident hunters to hunt in the Province, the Province of British Columbia would have lost over \$30.3 million in net returns in 2002. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia would have lost over \$121.4 million in net returns from non-resident hunters in 2001.

The true market value of wildlife may be more accurately determined by public auction, but only if all hunting opportunities were auctioned. As a fund raising initiative supported by the Alberta Provincial Government, the Rocky Mountain Elk Foundation has auctioned one non-resident elk hunting permit ("tag") and one non-resident bighorn sheep tag between 1995 and 2004. The successful bids on the tags are shown in Table 3.7.



⁵ Reid, R., 2001 <u>Personal Communication</u>, Economist British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, B.C.

⁶ Ibid



Table 3.7 Rocky Mountain Elk Foundation Elk and Bighorn Sheep Non-ResidentTag Auction Results

Auction	L									
Item	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Elk tag	\$20,800	\$19,870	\$18,200	\$20,874	\$26,265	\$30,519	\$24,585	\$30,854	\$34,544	\$20,035
(non-resid	ent)									
Bighorn	\$315,000	\$231,506	\$236,232	\$607,500	\$495,000	\$290,660	\$276,588	\$356,323	\$301,080	\$194,417
Sheep tag										
(non-resid	ent)									

Source: Arychuk, D., 2004, <u>Personal Communication</u>, Rocky Mountain Elk Foundation, Edmonton, Alberta

Since 2000, the British Columbia Ministry of Water, Land and Air Protection (MWLAP) has auctioned off mountain sheep hunting licenses in Reno, Nevada (Table 3.8).⁸ The auction is used as a fund raising initiative for the British Columbia Habitat Conservation Trust Fund (HCTF) to help support mountain sheep management⁹.

Table 3.8 MWLAP Bighorn SheepTag Auction Proceeds for the HCTF



Elk

(Photo: Tourism BC)

Auction Item	2000	2001	2002	2003
Bighorn Sheep tag (non-resident)	\$215,250	\$152,626	\$134,768	\$154,313

Source: McDonnell, K., 2004, <u>Personal Communication</u>, British Columbia Ministry of Water, Land and Air Protection

The Rocky Mountain Elk Foundation has also auctioned off mountain sheep hunting licenses for Alberta residents (Table 3.9). The auction results are indicative of what a Canadian may be willing to pay for an elk or bighorn sheep hunting opportunity.



Bighorn Sheep

(Photo: Mike Brown)

⁸ Reid, R., 2002 <u>Personal Communication</u>, Economist British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, B.C.

⁹ Ibid

Table 3.9 Rocky Mountain Elk Foundation Elk and Bighorn Sheep Alberta ResidentTag Auction Results

Auction Item	1998	1999	2000	2001	2002	2003
Elk tag (resident)	\$9,560	\$8,690	\$10,500	\$10,510	\$12,290	\$8,050
Bighorn Sheep tag (resident)	\$16,490	\$16,650	\$24,500	\$25,000	\$39,090	\$22,140

Source: Arychuk, D., 2004, <u>Personal Communication</u>, Rocky Mountain Elk Foundation, Edmonton, Alberta

Although the successful bids in the auctions for British Columbia and Alberta wild game animals continue to be considerably higher than the value MWLAP has generally determined for these types of animals, the auction results show certain species wildlife are considered very valuable by some hunters. One should note these auction results are extreme values and they are not representative of typical hunter values.

3.9 Lost Value of Wildlife for Non-hunting Residents

No species-specific figures are available for the value of wildlife to non-hunting residents.¹⁰ Regardless, the presence of wildlife generates considerable economic activity in British

Columbia. MWLAP estimates 863,000 provincial residents spent 18 million days in direct wildlife activities with the main purpose of watching, photographing, feeding and studying wildlife in the field in 1996.¹¹

The impact of motor vehicle-related accidents on wildlife species with critically low populations can have serious implications on wildlife viewing activities. Species, such as mountain goats and mountain sheep, which attract viewing attention, have low reproduction rates and limited areas of habitat. Consequently, the loss of even a few members of a small herd in motor vehicle-related accidents can threaten the survival of the herd and reduce the long-term



Dead mother bear and cubs

(Photo: Sylvia Campbell)

provincial economic benefits generated by residents viewing the herd.

MWLAP estimates British Columbia residents participating in direct wildlife activities, where the main purpose of a trip was to see wildlife in the field, spent almost \$392 million in 1996, contributing over \$174 million to the Provincial Gross Domestic Product.







3.10 Injured Wildlife and Orphans

In addition to the loss of wildlife as a result of motor vehicle-related accidents, there are other issues which arise, in particular the welfare of injured animals and orphaned offspring.

Injured Wildlife

While the most severely injured animals are euthanized as humanely as possible by conservation officers of the British Columbia Ministry of Water, Land and Air Protection or law enforcement personnel, most often the Royal Canadian Mounted Police in rural areas, the recovery of less severely injured wildlife is a growing concern in British Columbia.

In British Columbia, wildlife rehabilitation requires a specific



Wildlife accident fatality – Elk

(Photo: Brent Persello)

permit to possess, treat, release, and euthanize if necessary, wildlife. In general, to obtain a permit for a designated rehabilitation facility there must be a need in the community for such services and the individuals must have approved facilities for the species to be admitted, demonstrated training or experience, an established relationship with a veterinarian, liability insurance, and submit annual records of all wildlife treated. Individuals can also apply for permits to temporarily house and transport wildlife to designated rehabilitation facilities. Annual permits for B.C. rehabilitators are administered by Federal and Provincial agencies.

The Wildlife Rehabilitators Network of British Columbia, a non-profit volunteer-run organization, was founded in 1989 to assist in the recovery of injured wild animals, including those involved in motor vehicle accidents. The Network's membership includes licensed rehabilitation facilities and individual rehabilitators, rehabilitation volunteers, wildlife researchers, government and humane association representatives, veterinarians and other animal care personnel, and interested members of the public. (Appendix 1) The Network has provided valuable assistance to injured wild animals.

Orphaned Offspring

One of the most heart rendering impacts of wildlife accidents is the orphaning of young offspring when adult females are killed. Of the orphaned wildlife species, orphaned bears have received the closest attention by the BC Provincial Government. The majority of orphaned bear cub occurrences involve Black Bears as British Columbia has one of the largest populations of Black Bears in North America. Although the Province has



Black bear cubs

(Photo: Tourism BC)

the second largest population of Grizzly Bears in North America, orphaned Grizzly Bear cubs are encountered less often.

At present, there are no approved programs or protocols in North America to re-introduce orphaned grizzly bears cubs back into the wild. Upon the loss of their mother, most often due to human related activity, orphan grizzlies cubs are either reluctantly destroyed by



Mother bear with cub

(Photo: Chad Tenney)

conservation officers or relegated to a life in captivity (Macquisten, K, 2004). Historically, Provincial policy in British Columbia required that orphaned bears cubs be euthanized. Existing provincial policy states that orphaned bear cubs are not good candidates for translocation and should be killed in all situations. This policy exists for the following reasons:

- orphaned bear cubs are believed to be unlikely to survive and to be successful on their own if left in the wild;
- large predators such as bears are difficult for wildlife rehabilitators to deal with in captive environments;
- there is a public safety concern regarding the release of large and potentially dangerous predators that have been raised in a captive environment, if they rely on humans for food and lose their fear of people;
- there is a lack of agreement in the scientific community on whether bear rehabilitation is successful in returning bears to the wild; and,
- Black Bears are not a species of conservation concern and the Ministry of Environment, Lands and Parks has limited resources. These resources are more appropriately aimed at managing species that are at risk.

Despite this policy, however, Conservation Officers, wildlife staff or members of the public took 102 bears to rehabilitation facilities between 1990 and 2000, with the majority of these bears being cubs. There are a complex set of reasons leading to Conservation Officers placing bear cubs in rehabilitation facilities, including the public interest in this procedure, a change in some regional policy direction on this issue, more wildlife rehabilitations becoming interested, and the development of bear cub rearing and rehabilitation protocols in the U.S. (Orphan Bear Cub Review Committee, 2000)

To deal with this difficult situation, and to address public concerns, the British Columbia Ministry of Water, Land and Air Protection has been reviewing its policy and procedure on the handling of orphan bear cubs.

