AN ASSESSMENT OF PROBLEM-WILDLIFE MANAGEMENT IN MANITOBA

BY

TRACY A. MACONACHIE

A Practicum
Submitted to the Faculty of Graduate Studies
In Partial Fulfilment of the Requirements of the Degree for

MASTER OF NATURAL RESOURCES MANAGEMENT

Natural Resources Institute
University of Manitoba
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FACULTY OF GRADUATE STUDIES

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Abstract

Increased urbanization and modern agricultural practices have resulted in some human-wildlife interactions becoming problematic. Problem-wildlife are not so much "problems", as wildlife whose natural behaviours are interfering with human activities. By definition, problem-wildlife cause property damage or are a threat to public health and safety. In reality, whether a species is a problem can vary from individual to individual as a result of personal experiences and a willingness to tolerate some inconvenience. Manitobans' were found to spend considerable amounts of time and money purposely interacting with, and managing their properties for, wildlife. Yet human-wildlife conflicts management in the province cost more than $16 million dollars per annum. At least half of the wildlife agencies contacted could not provide dollar values for their problem-wildlife activities, so the annual cost of Manitoba's problem-wildlife is, in fact, much greater. Trying to solve human-wildlife conflicts, however, can be equally as problematic. There are a number of public and private wildlife-related agencies and organizations and a myriad of federal, provincial and municipal legislation, all of which have resulted in a complex, and confusing, web of jurisdictions and responsibilities. To compound the problem, there has been virtually no Manitoba-specific research conducted on problem-wildlife or its management. Education and improved communication are perhaps the most effective and efficient methods to: a) reduce human-wildlife conflicts; b) increase human tolerance and ability to manage their own conflicts with wildlife; and c) improve communication among the public and wildlife managers. To an electronic information database was created to provide the general public, as well as wildlife managers, with basic problem-wildlife management information so that conflicts with wildlife can be more effectively and efficiently resolved.

Dedication

This document is dedicated to my maternal grandmother.

You never doubted that I could accomplish anything I set my mind to.

You held my hand while I reached for the stars. This star is for you.

We need another and a wiser and perhaps a more mystical concept of animals. Remote from universal nature, and living by complicated artifice, man in civilization surveys the creature through the glass of knowledge and sees thereby a feather magnified and the whole image in distortion. We patronize them for their incompleteness, for their tragic fate of having taken form so far below ourselves. And therein we err, and greatly err. For the animal shall not be measured by man. In a world older and more complete than ours they move finished and complete, gifted with extension of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendour and travail of the earth.

Henry Beston "The Outermost House"

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Chapter One Report Introduction

1.1 Introduction

Urbanization, modern agricultural practices and resource exploitation have effectively re-shaped environments in North America over the last one hundred years. Any change, whether naturally-occurring or due to human activity, affects wildlife. Beneficial changes for one species may be detrimental for others. Fortunately, many species are adaptable and have found niches where they can survive and thrive. Changes resulting from urbanization in particular, influence the local environment by eliminating, altering or creating new habitats and by affecting wildlife directly (Leedy & Adams, 1984). Human interactions with wildlife have similarly changed. As recently as the mid-twentieth century, it was necessary to leave urban areas to view wildlife though this had limited appeal for most North Americans (Filion et al., 1993). Fifty years later, one no longer needs to seek out wilderness areas to encounter wildlife. Wildlife now lives in our backyard. Studies have shown that 19 million Canadians engage in wildlife-related activities each year, spending more than five billion dollars and 1.3 billion days in the process. And this number has been increasing over the last two decades (Filion et al., 1994). What has not changed as rapidly is our relationship with the wildlife we encounter. Born of Western Society's Judeo-Christian roots, wildlife has been, and continues to be, viewed as subordinate to humankind. The phrase "problem-wildlife" is indicative of this particular bias. The only "problem" related to wildlife is that some of their natural behaviours are problematic for humans. Humans have changed the environment and wildlife has had to adapt. Humans, however, have not been required to adapt to the wildlife that are becoming more common in their everyday lives. We have yet to co-exist equitably with wildlife.

1.2 Issue Statement

Everyone interacts with wildlife in some manner. Sometimes these interactions are problematic. In Manitoba, conflicts between humans and wildlife are managed by all three levels of government as well as non-governmental organizations, private industry and private individuals. There exists, however, considerable confusion when attempting to resolve human-wildlife conflicts.

1.3 Purpose

The purpose of this document is to assess problem-wildlife management in Manitoba in order to facilitate the resolution of human-wildlife conflicts.

1.4 Objectives

1. To review and assess:
   (a) the methods currently employed to manage human-wildlife interactions;
   (b) the benefits and costs associated with human-wildlife interactions;
   (c) Manitoba's management response to human-wildlife conflicts.
2. To document the general public's perceptions of wildlife and the management of human-wildlife conflicts in Manitoba.
3. To design an electronic problem-wildlife information system for use by the general public and provincial government wildlife managers.
4. To develop recommendations to improve the efficacy of human-wildlife conflict management in Manitoba.

1.5 Methodology

With an average population density of two people per square kilometre, Manitoba is regarded as a "rural" province even though most Manitobans reside in urban areas. Urban human-wildlife conflicts differ greatly from rural conflicts, as do the attitudes and expectations of rural versus urban residents. As such, any analysis of human-wildlife interactions (problematic or not) requires that both urban and rural interactions be considered individually in order to understand the province as a whole. Chapter Two reviews the literature on the evolution of human-wildlife interactions in North America, the management of conflict interactions and how North American society values such interactions (Objectives 1a and 1b).

Chapter Three examines the results of two surveys. The first was a survey of wildlife agencies and organizations in Manitoba. These agencies were contacted regarding their wildlife-related activities, annual problem-wildlife expenditures and management concerns (Objective 1c). To determine the cost of problem-wildlife to Manitobans, wildlife-management agencies and organizations from the private, public and non-profit sector were contacted regarding their jurisdictional responsibilities, their management activities, the annual cost incurred as a result of these activities and areas of concern, if any. The agencies were selected from federal, provincial and municipal directories and on the advice of Manitoba Conservation's Wildlife and Ecosystem Protection Branch. Each agency was contacted and an interview was arranged. If requested by an agency representative, specific questions were provided instead of an interview. Veterinary clinics in and around Winnipeg were sent a questionnaire and a cover letter requesting their participation. Additional background material was obtained from the various agencies' annual reports and websites.

The second survey examined the general public's perceptions of human-wildlife interactions in Manitoba. Survey respondents were questioned regarding their interactions with wildlife, their attitudes toward conflicts with wildlife and their perceptions of the management of problem-wildlife species (Objective 2). The survey was conducted during from November 1997 to March 1998 in the hope that potential respondents were more likely to be in their homes during this period and have the necessary leisure time to participate. The rural surveys were mailed prior to the start of the telephone survey so as to ensure both survey methods had an equal grace period for responses. As the purpose of the survey was to investigate attitudes about problem-wildlife specifically, the sample areas were chosen from those identified as having problem-wildlife activity. As problem-wildlife is both an urban and a rural concern, the survey was conducted rurally in a "problem" area identified by the Manitoba Crop Insurance Corporation while the urban survey area was based on automotive accident reports from the Manitoba Public Insurance Corporation and on the recommendation of Manitoba Conservation's Wildlife and Ecosystem Protection Branch. The mail-out rural survey was sent to all 490 farms along the R0L 1L0 postal code route, along with a letter of introduction and a business reply mail envelope for responses. A reminder was mailed to all potential respondents one month after the initial survey mailing. The urban phone survey sample of 490 residences was obtained by identifying the residential streets in the R3R postal code mail route and then randomly selecting potential respondents from the list until all the streets had been sampled. The names, addresses and phone numbers of the phone survey sample were obtained from the 1996-97 "Who Called Me" telephone directory provided by Manitoba Telecom Services; random sampling was accomplished using a simple pair of dice. The sample was geographically limited so there was no way to include unlisted phone numbers in the sample. Businesses and

apartments were purposely omitted. Phone calls were made between 1900 hours and 2100 hours, Monday through Thursday. Three call-backs were made before the number was discarded, so that the sample would not disproportionately reflect the people who are home most of the time, such as housewives and retired persons. Respondents were provided with the opportunity to participate in written form if they preferred. "Not-at-homes" and refusals were assumed to be not dissimilar to those who were successfully interviewed. The phone survey was pre-tested for question variation, meaning, question order, interview "flow", timing and respondent interest and attention. Demographic questions were purposefully placed at the end of the survey because of their sensitivity. All respondents were provided with the opportunity to request a summary of the results of this survey.

Chapter Four discusses the value of public education when resolving human-wildlife conflicts and describes the development of the People and Wildlife System (PAWS), an Internet-based problem-wildlife information database (Objective 3). An investigation of the problem-wildlife management literature was conducted to determine the extent of information available to be referenced on the website. Next staff from Manitoba Conservation's Wildlife and Ecosystem Branch were consulted in order to incorporate the needs and objectives of the Branch in the system's design. A number of hierarchial structures were tested to determine their technical efficiency and user appeal. Once this design phase was completed, a demonstration version of the PAW System was reviewed by the Wildlife and Ecosystem Protection Branch's Problem and Captive Wildlife Manager and the design was finalized. The system was constructed using Hyper-Text Markup Language (HTML) to ensure that the site could be translated by a variety of web browser software packages.

Conclusions and recommendations to improve the efficacy of the province's problem-wildlife management are presented in the final chapter (Objective 4). The recommendations were based on the conclusions reached after reviewing the literature and the results of the agency and public perception surveys. Supporting documents are included in the appendices.

Chapter Two Problems with Wildlife

2.1 Living with Wildlife

In every cultural tradition, at one time or another, animals have been linked with supernatural forces which were believed to control both the natural world and the destiny of humans. As such, animals have been revered as companions of the gods, or have been worshipped as gods themselves. Every culture has also developed methods for dealing with the threat posed by wildlife to human safety and survival. As a result, humankind's relationship with animals, in general, and wildlife in particular, continues to this day to be influenced by practical as well as moral (often religious) considerations.

Fifty million years ago, the forests dwindled and our ancestors moved out onto the savannah and had to adapt to survive. These hunter-gatherers were primarily gatherers until such time as they mastered the use of tools to protect themselves and then as the means to hunt for food (McCade & McCade, 1984). They painted depictions of their prey on rocks and cave walls as petitions to the gods for a successful hunt or as a testimonials of a hunter's divine favour. Kay (1998) notes that these hunters became efficient enough as predators that large concentrations of prey species, such as ungulates, were to be found only in the "no-man's land" along the territorial boundaries of human populations. To improve their chances of success they also employed simple management practices such as controlled burns of specific vegetation to promote desirable prey species, such as ungulates (Conover, 2002).

With the shift from hunting-and-gathering to agriculture in the Middle East 10,000 to 15,000 years ago, agriculturalists devised means and methods to protect their crops

(both in the field and when stored) from depredation. Because crops were planted, tended and harvested by hand, fields were small and could be destroyed very quickly by a relatively small number of birds or mammals. The ability to grow, harvest and store grain was the basis for the success of the Egyptian civilization which at the time was unparallelled in the Old World. The cat's role as an Egyptian fertility deity may have derived from the perception that the feral cat was a protector of grain because it killed the rats that infested the granaries. Originally a lion-headed deity, Bastet came to be depicted as a cat around 2000 BCE, about 500 years before the appearance of the domestic cat. The Egyptian cat cult was so strong that the punishment for killing a cat was death (Conway, 1993; Saunders, 1995). In addition to cats and the favour of Bastet, Egyptians also used poison (Fitzwater, 1990) and traps (Drummond, 1992) to reduce rodent populations. During this same period, the Chinese were making ceramic traps (Anonymous, 1967 in Conover, 2002) even though in the Far East the rat was (and still is) revered for its quick wit and its ability to acquire items of value and as such was considered a symbol of wealth and good luck. In India, specialized snares were being used to strangle rodents (Drummond, 1992) even though the god Ganesh, who is invoked before any undertaking in order to ensure success, rides on a rat and killing the god's companion could perhaps nullify a petitioner's request (Conway, 1993).

In the Judeo-Christian tradition, the hierarchy of beasts and the superiority of humans over animals was established by God at the time of Creation. Despite this, in medieval Europe, superstition held sway when faced with wildlife-related problems. According to Conover (2002), it was the practice of the time to try to reason with the rodent(s) causing the problem. A "rat letter" was written asking the rat(s) to vacate the premises and then was left printed side up so that the rat(s) could read it. A more direct

method was to capture and torture an offending rat then let it go so that it could warn its companions of the consequences of staying. Music and poetry too were employed to lure rodents to their deaths: the Irish were supposed to be able to rhyme rats to death (Fitzwater, 1990) while the story of the Pied Piper of Hamelin was based on a true incident in the German town of Hameln in the 14th century. In case these methods were less than successful, poisons were in regular use and governments enacted laws and imposed bounties (and fines for noncompliance) to manage bird and mammal species deemed to be "vermin" (rodents, crows, rooks, ravens, etc.) (Wright, 1980; Fitzwater, 1990; Conover, 2002).

When Europeans arrived in North America, they were accustomed to the highly agriculturally developed landscape of Europe and as a result viewed the wilderness and its creatures as hostile. The leader of the Plymouth Bay colony described it as "a hideous and desolate wilderness, full of wild beasts and wild men" (Geller, 1974 in Conover 2002). Having fled Europe to escape religious persecution, the Puritan colonists brought the Judeo-Christian view of humankind's supremacy with them:

> "And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth"
>
> Genesis 1:26 (King James Version)

And so they embarked upon a divinely favoured course of action to "tame" or "conquer" the wilderness of the New World (Conover, 2002). Wildlife management in the English colonies was utilitarian and consisted of eradicating "bad" species and harvesting "good"

species, those that were commercially valuable (e.g. beaver) or were sources of food (e.g. deer). Targeted for eradication were those wildlife species that from a practical standpoint, threatened the colonists' health, food supplies and property. Preventing such losses often meant the difference between the colonists starving or surviving for another year. These moral and practical considerations are most eloquently demonstrated in the colonists response to predators. One of the first laws enacted in the New Haven Puritan colony was to establish a bounty on wolves and foxes. Other colonies followed suit targeting such species as wolves, cougar, blackbirds and Passenger Pigeons. The intent of the colonists was to eradicate, not manage, predatory species that might threaten their survival. As wolf populations declined in the New England colonies, bounties increased dramatically in order to ensure the death of what wolves remained (Conover & Conover 1987, 1989). Blackbirds and Passenger Pigeons would forage on crops in the thousands; the colonial governments response was to offer a bounty for every thousand birds killed (Walcott, 1936, in Conover, 2002).

The prevalent philosophy was that Man created a better world by taming the wilderness and bring civilization to the New World. Westward expansion ensured that the "ambivalence and over-exploitation of natural resources" became the dominant pattern across North America. Predators such as wolves and cougars were "symbols of the savage wilderness" that early Americans sought to conquer (Kellert & Berry, 1980; Kellert & Westervelt, 1982). By the late 1800s / early 1900s, it had become clear to most that wildlife populations were not inexhaustible and as a result of the poor living conditions and low wages brought about by the Industrial Revolution, Americans were beginning to romantically view the "lost" wilderness as a Paradise Lost. In the early to mid-1800s, sport hunting, as opposed to hunting as a subsistence or commercial activity, had emerged as

a favourite recreation of the upper classes and is considered to be one of the first steps toward wildlife preservation. It was felt that hunting, like warfare, "provided an arena for forming and testing the character of Americans that would substitute for the now vanishing frontier (Reiger, 1975; Belanger, 1988 & Dunlap, 1988, in Conover, 2002).

Today we would classify such sport hunting as an indirect wildlife-related commercial activity and though it was an important precursor of the wildlife conservation/preservation movement, it is still a utilitarian use of wildlife, though the definition of what is "good" or "bad" wildlife changed to include a) formerly "bad" species considered "good" sport-hunting species and b) any species that preyed upon or competed with "good" species. As a "test of character" it too can be argued that this is a utilitarian use of the wildlife resource. The wildlife being hunted are hunted not for any quality of their existence, but rather to authenticate the quality of the hunter's existence. The attitudinal change was mostly a rationalization for a change in the use of wildlife. Bounties still existed, poisons and traps were still common place for wolves and cougars, but governments outlawed "unfair" or "unsporting" activities such as baiting when hunting for sport. It was not until the post-Civil War era that a truer preservation ethic began to take hold in some segments of American society. Inspired by European romanticism it recalled a more spiritual, equitable and reverential relationship with the wilderness and wildlife (Anderson, 1991).

For the first half of the 20th century, environmental and wildlife concerns were superceded by a very real need to survive. During World War I, the United States Congress, for the first time, hired professional hunters to kill wildlife that threatened the crops needed to stave off food shortages both in the U.S. and world-wide. During times of economic crisis such as wartime or depression, wildlife interests in particular, are sacrificed

(Dunlap, 1988 in Conover, 2002; Anderson, 1991). As wildlife are potential competitors for resources, concern for wildlife is important only when the loss of such resources is considered to be affordable. The latter half of the 20th century, in contrast, was dominated by a complete reversal in the fortunes of wildlife in North America. With prosperity, improved transportation and the advent of television, North Americans became much more intimately involved in the future of wildlife than ever before in their history. With increased prosperity, North Americans predictably became more interested in wildlife through increases in leisure time and disposable income spent on outdoor recreation. Better highways and more affordable personal transportation facilitated the opportunity for more North Americans to visit national parks and other wilderness areas.

Combined with the wealth of information available to the general public via the television, North Americans discovered the "wild" in their backyards. Conover (2002) noted that "television produced a national constituency for wildlife making wildlife problems no longer just local problems". Combined with an increasingly urban population with little or no experience with wildlife and difficulties that can arise when human and wildlife interest collide, this new-found concern for wildlife and its management has resulted in a monumental clash of ideals in society. At the two extremes of this debate are those who advocate a utilitarian view of wildlife and its management and those who embrace the defence of "Mother Earth" with an evangelical fervour. Hunting in particular is a point of contention between these two camps (Satchell, 1990; Reiger, 1992; Cawley, 1993 in Conover 1994). Between these two extremes is the rest of North American society, which, to varying degrees, has accepted the "new environmental consciousness" that the environment is a fragile, interconnected organism on which all life, including humankind, is dependent, and that damage to or the elimination of its parts is perilous to the whole.

These beliefs have resulted in improved protection from over-exploitation for game species as well as the adoption of science-based wildlife management. The result has been an increase in game and fur species, i.e., commercially valuable species, to near pre-colonial levels (Conover, 2002). With these increases have come the establishment of populations of urban wildlife as well as increases in human-wildlife conflicts. It has been observed that North Americans have been encroaching on wildlife habitat since the arrival of the first Europeans but now this trend is being counter-balanced by the adaptation of wildlife into human habitats (Conover, 2002). Rural residents may continue to hold more utilitarian views on wildlife than their urban brethren, but they are more physically intimate with (as well as dependent on and appreciative of) their environment. Urban populations on the whole are more distant from natural interactions with the environment and with wildlife in particular. Few are impacted economically by wildlife and even fewer have had contacts that could pose a threat to their health or safety. As such they can afford to hold more idealistic views of wildlife and human-wildlife interactions. Backyard wildlife may soon come too close for comfort for most urban residents, and history has shown that when wildlife becomes a threat to property, health or safety, society will sacrifice wildlife to protect its interests.

2.2 Human Conflicts with Wildlife

Interactions between people and wildlife in the urban, suburban and rural environment continue to increase. Many of these encounters are positive and eagerly sought by people and thus provide a key base of support for wildlife. However, many are also considered a nuisance or damage problem, especially in the urban environment.

Increased urbanization, increased populations of "urban" wildlife and decreased funding for government sponsored animal damage programs have all contributed to increased demand for wildlife damage management.

2.2.1 Problem-Wildlife

Problem-wildlife are defined here as "individual animals, wildlife species, or populations which are causing property damage, a concern for human health and safety, or are public nuisances" (Leedy & Adams, 1984). These problem-wildlife species vary according to the individual and/or the geographic location. For example, problem-wildlife issues in rural Manitoba differ greatly from those in the more urban areas of the province (McKay, pers. comm., 1999). In rural areas the focus is on the effect on an individual's economic survival. In Winnipeg, a person's livelihood is rarely in jeopardy.

Intensive agricultural practices, urbanization and resource development over the last 50 years have resulted in substantial loss of natural habitat for some wildlife species as well as the creation of new habitat suitable for different species (Jones, 1991). In particular, urban areas have created new niches and have become important habitats for some species. Many animals can efficiently adapt to urban areas because they find all the resources there that they need to survive: "The basic wildlife needs are food, water, cover and a place to live and reproduce" (Leedy & Adams, 1984).

When the density of a species increases in an area due to habitat change, peoples' attitudes toward wildlife tend to change. Studies have shown contradictory evidence that some species are soon perceived as nuisances because of their potential to cause property damage (Kay & Patterson, 1991) whereas others have found that not only was wildlife valued as personally important to some people, but that some residents tolerated

considerable damage because of their affection for the offending species (O'Donnell & Van Druff, 1987; Leuschner et al., 1989).

When wildlife and humans interact there is the potential for the development of positive relationships through programs such as endangered species protection, public appreciation and conservation education. When wildlife causes property damage, or is a threat to human health and safety, the relationship sours. Conover (1994) found most urban residents actively managed their property to encourage some wildlife species and deter others. Similar to other studies (Dawson et al., 1978; O'Donnell & Van Druff, 1983) results indicated a higher preference for birds than mammals. Yet some mammals (deer and rabbits) had positive preference ratings and some birds (starlings and pigeons) had negative ratings. Curiously, house sparrows have in general a negative preference rating but when asked what species people with bird feeders enjoy watching, sparrows were reported to be one of the most entertaining (Conover, 1997b).

2.2.2 Property Damage

Problem-wildlife issues in Manitoba, as elsewhere, focus on property damage. For example, many residents contact the Manitoba Conservation's Wildlife Branch because raccoons, skunks or rabbits are living in their yard and are damaging property. Another common problem for residents are tree squirrels on their property or living in their house. Some people want to know if the Wildlife Branch can help stop raptors (merlins) from eating the songbirds in their yard. Others want to know how to remove the grackles from their yard.

Conover (1994) has suggested that wildlife damage in rural environments has reached levels which discourage some private landowners from continuing to manage their

properties with the local wildlife in mind. Landowners may feel that wildlife managers are unaware of the extent of agricultural losses and thus are insensitive to their needs (Decker et al., 1984; Conover & Decker, 1991). If this misunderstanding results in the development of inconsistent policies or actions regarding wildlife damage, it may create an additional source of conflict between landowners and wildlife managers. Tables 2.1 through 2.3 list the most common types of rural and urban damage due to birds, small mammals, rodents, ungulates and carnivores. Generally, all the species identified contribute to agricultural depredation, by feeding and/or contaminating standing and stored crops and by predating on livestock. In addition, the bird species are responsible for defacing human structures and are a hazard to air traffic; carnivores are increasingly becoming a threat to human safety as human development encroaches on their habitat; rodents and other small mammals are responsible for most of the property damage noted and are the primary reservoirs for zoonotic diseases such as rabies, giardia and hantavirus.

2.2.3 Public Health

The issue of public health and safety is important to address, especially as wildlife continues to adapt to environments modified by human activity. In general, public health concerns refer to the wildlife diseases which could affect humans and domestic animals. Public safety issues are concerned primarily with wildlife-vehicle collisions and other direct encounters between humans and wildlife.

Public health concerns are managed by the health agencies of all three levels of government: federal, provincial and municipal. Diseases of wildlife can cause significant illnesses and death to individual animals and can seriously affect wildlife populations. Wildlife species can also serve as natural hosts for certain diseases that affect humans

(zoonoses). The disease agents or parasites that cause zoonotic diseases can be contracted from wildlife directly via bites or contamination or indirectly through a vector species (e.g. mosquitoes or ticks) that have previously fed on an infected animal (McLean, 1994). Of the zoonotic diseases, rabies is the primary concern of health officials at this time (Frolick, pers. comm., 1998; Horne, pers. comm. 1998). Table 2.4 is a listing of the most common wildlife diseases that can affect humans. Of the twenty-five diseases listed in this table, most can be contracted from rodents and birds either through direct contact (e.g. bite) or indirectly via an agent that had contact with the host (e.g., tick, mosquito). All can result in severe illness in humans and many are fatal. Conversely, oftentimes zoonotic diseases are mis-diagnosed because the symptomology is easily mistaken for a more common illnesses such as "the flu".

Rabies (rhabdovirus) is an acute viral disease that can affect all warm-blooded animals and is usually fatal. Currently, rabid animals (usually skunk, raccoons and foxes, primarily from Ontario) are infrequent visitors to Manitoba. There is great potential for a problem however considering that in 1986 2,000 Ontarians were treated for rabies (Rosatte et al., 1987). Most human cases of rabies in North America have been contracted from rabies-infected dogs, even though pet species (cats and dogs) have the lowest occurrence of reported rabies among all species tested. In the U.S. human cases have decreased to an average of one person per year. Rabies in wildlife has been increasing dramatically and now accounts for 91% (1991) of the reported animal rabies cases. Since 1992, raccoons have replaced striped skunks as the major wildlife host in the U.S. primarily due to the expansion of raccoon rabies in the New England states (McLean, 1994).

Table 2.1 Types of Damage due to Birds & Bats (after Dolbeer et al, 1994)

Species	Property Damage	Public Health & Safety	Nuisance Activities	Agricultural Depredation	Other Damage
Blackbirds & Starlings		fecal accumulations promote histoplasmosis fungal growth; roosts near airports are a flight hazard	roost congregations are large, noisy & produce substantial fecal accumulation	feeding damage to corn, sunflowers; depredation of fruit crops	contamination of livestock feed; feedlot depredation in winter
Ducks, Geese & Sandhill Cranes		nest defense a danger in suburban environments	grazing & defecation in parks & golf courses	grazing on winter wheat & rye reduces subsequent yields; trampling damage to swathed/maturing small grain crops	
Crows, Ravens & Magpies			roost congregations are large & noisy; substantial fecal accumulation	can kill lambs & other livestock by pecking at their eyes	nest predation of all species of birds
Eagles				occasionally kill livestock (lambs & kids)	
Gulls	defacement of human structures	serious threat to flight safety; contamination of water supplies	scavenge at landfills; danger when begging for food from humans	depredate commercial fisheries, aquaculture operations & fruit crops	nest predation of duck species (eggs & ducklings)
Hawks & Owls				poultry & game fowl predation	
House Sparrows & Pigeons	defacement of human structures	feces carry a variety of diseases; nests in buildings a hazard		consumption of stored grain; minor damage to small grain crops	contamination of grain when feeding at grain storage
Woodpeckers	damage wood siding & utility poles		territorial knocking on metal gutters (etc) can annoy homeowners	sometimes damage trees (reducing commercial quality)	
Bats	occasionally a rabies reservoir; histoplasmosis in guano				

Table 2.2 Types of Damage due to Ungulates & Carnivores (after Dolbeer et al, 1994)

Species	Property Damage	Public Health & Safety	Nuisance Activities	Agricultural Depredation	Other Damage
Deer, Elk, Moose & Wood Bison				graze on ripening corn & other field crops; browsing & antler-rubbing damage to trees altering growths rates, & yields	raiding haystacks & cattle feedlots especially in winter
Badgers	dens in crop fields can damage machinery; digging can damage earthen dams or dikes			occasionally kill small lambs & poultry	destroying nests of ground-nesting birds
Black Bears	search for food can result in damage (or destruction) of tents, campers, buildings & vehicles	searching for food at garbage dumps, around cabins & campsites a serious hazard to humans		will prey on sheep & goats; presence is enough to stampede sheep causing death; will damage/destroy apiaries	
Bobcats & Lynx				occasionally prey on sheep, goats & poultry	reportedly preys on bird eggs
Cougar		increased reports of human attacks area as a result of urbanization		will prey upon horses, cattle, sheep & goats	
Coyotes	reports of chewing damage to irrigation systems & plastic piping	complaints of pets being killed & increase in reported human attacks due to urbanization		most common & most serious predator of livestock; will damage fruit crops	
Domestic dogs		"pack" attacks are not uncommon in rural and urban areas		can be a problem to livestock, especially sheep	
Feral Domestic Cats				depredate livestock (prey duck-size and smaller)	will prey on nesting birds (particularly vulnerable to cat predation)

Table 2.2 Types of Damage due to Ungulates & Carnivores (continued)

Species	Property Damage	Public Health & Safety	Nuisance Activities	Agricultural Depredation	Other Damage
Feral Pigs / Hogs	rooting & wallowing can damage farm ponds & irrigation dikes	present a definite danger to humans if cornered or approached		rooting & wallowing can damage agricultural crops & timber; will prey upon young sheep & goats	
Foxes				predation is primarily on poultry though they will kill young livestock; will consume fruit & eggs	serious nest predator of ground-nesting birds (eggs, chicks & adult birds)
Polar Bears	destruction of buildings; predation of tied dogs; raiding food caches; destruction of plastic/rubber products & snowmobile seats	threat to human life has been low			
Raccoons		currently a major vector for rabies	garbage cans & dumps can be a major urban source of food	field crops or gardens near wood areas may suffer severe damage; will eat & waste ripening corn equally; will, on occasion, prey on lambs & poultry	serious nest predator of cavity-nesting birds (eggs, chicks & adults birds)
Skunks	digging damage (for insects) to lawns, golf courses & meadows	currently a major vector for rabies	objectionable odour occurs when skunks take up residence under/near buildings	can prey on poultry; may depredate apiaries	serious nest predator (eggs)
Weasels & Mink	will burrow under buildings, stored hay, whatever			predation on poultry usually killing many, but eating only the heads; will prey on eggs	serious nest predator (eggs, chicks & adult birds)
Wolves		few documented attacks on humans, even fewer in recent decades		livestock predation is usually to cattle as they prefer larger prey	

Table 2.3 Types of Damage due to Rodents & Other Small Mammals (after Dolbeer et al, 1994)

Species	Property Damage	Public Health & Safety	Nuisance Activities	Agricultural Depredation	Other Damage
Beavers	dam-building activities damage road culverts & water-control structures	susceptible to parasites that cause *giardia*		food storage & dam-building activities flood timber stands & crops	
Chipmunks	damage flower bulbs, garden seeds & ornamental plants	potential reservoir for plague	nesting under human dwellings	reforestation problems by consuming seeds, seedlings & terminal buds; burrowing & feeding occasionally damage garden crops	can destroy eggs & nestlings of smaller bird species (infrequent)
Commensal Rodents (Norway Rats, Roof Rats & House Mice)		reports of infants bitten not uncommon; many viral & bacterial diseases transmitted to humans via food & water contaminated by rodent feces & urine		consume & contaminate millions of bushels of stored grain annually; will predate on poultry chicks & occasionally larger livestock	
White-footed Mice & Deer Mice	invades human dwellings & damage contents for nest materials	recently implicated in *hantavirus* transmission to humans		important seed predators causing reforestation damage; can cause significant losses to corn seedlings	
Ground Squirrel	burrowing damage to irrigation levees	potential reservoir for plague in endemic areas		cause serious losses to tree seeds & seedlings; cause damage to pastures, rangelands & grain fields	important predator of waterfowl eggs
Meadow Mice, Field Mice & Pine Mice		potential reservoir for plague & tularemia		gnawing damage to bark & roots of trees, field & garden crops	
Moles	surface burrows damage farm machinery		burrows can damage lawns & golf greens (aesthetics)	undermining & exposing the root system reducing forage crop production; minor damage to small grain & vegetables from feeding	

Table 2.3 Types of Damage due to Rodents & Other Small Mammals (continued)

Species	Property Damage	Public Health & Safety	Nuisance Activities	Agricultural Depredation	Other Damage
Muskrats	burrowing damage in pond dams, levees & irrigation canals			can (at times) damage field & garden crops growing near water	
Pocket Gophers	gnawing damage to irrigation lines; mounds cause farm equipment breakages	damage to underground pipes, cables & electric wires can be a hazard		feeding on root systems causing damage to crops, rangeland & tree plantings; debarking trees by tunneling through snow in winter	
Porcupines	will damage anything with perspiration salt – saddles, harnesses, belts, tool handles			feeding damage on garden plants & truck crops; feeding on inner bark often kills upper part of tree	
Prairie Dogs	gnawing damage to irrigation systems; mounds can increase soil erosion & damage to farm machinery	potential reservoir for plague		feeding & trampling damage to crops planted near colonies (for food, nest materials & clear sightlines for protection)	
Rabbits & Hares		known vector of tularemia & can carry larvated eggs of several ascarid roundworms		feeding damage to tree-plantings, ornamental, garden & agricultural crops	
Tree Squirrels	feeding & digging damage to ornamental plants (including bulbs & seeds), fruit, trees & shrubs; will invade buildings to nest	gnawing on electrical wires, power lines, telephone lines; gnawing & nesting can short out transformers			serious nest (eggs) predator of small bird species
Woodchucks	gnawing & scratching damage to ornamental shrubs; will invade buildings to nest		tend to burrow under buildings (potential for cave-ins) & landscaped areas (aesthetics)	feeding & trampling of forage crops seriously reducing production quality & yields	

Table 2.4 Important Wildlife Diseases that Affect Humans (McLean, 1994)

Disease	Parasite	Method of Transmission	Wildlife Hosts	Type of Human Illness
Rabies	Virus	Animal bite, aerosol	Striped skunk, raccoon, foxes, bats & other mammals	Paralysis, convulsions, coma, death
Hantavirus	Virus	Animal bite, aerosol	Deer mice, other wild & commensal rodents	Fever, headache, muscle aches, nausea, vomiting, back pain, respiratory syndrome
Leptospirosis	Bacteria	Urine contamination, ingestion	Conmmensal & wild rodents, rabbits, foxes, skunks, raccoons, opossum, deer	Fever, jaundice, pain in abdomen, joints, or muscles, neurologic, nausea, may be fatal
Brucellosis	Bacteria	Contamination, ingestion (milk)	Hoofed animals (coyote)	Intermittent fever, chills, headache, body aches, weakness, weight loss
Rat-bite Fever	Bacteria	Rodent bite	Commensal rodents	Abrupt onset with chills & fever, headache, muscle ache, followed by rash on legs & arms, arthritis
Salmonellosis	Bacteria	Ingestion of bacteria in food contaminated with feces	Rodents, swine, cattle, wild birds, poultry, pet turtles	Sudden onset of headache, fever, abdominal pain, nausea, diarrhea, vomiting
Ornithosis (Psittacosis)	Chlamydia	Inhalation of contaminated air	Parrot & sparrow-like birds, pigeons, waterfowl, domestic birds	Fever, chills, headache, muscle pain, loss of appetite, sweating, pneumonia
Histoplasmosis	Fungus	Inhalation of spores	None, grows in soil enriched by feces under bird & bat roosts	Mild fever & influenza-like illness, pneumonia, hepatitis, endocarditis, death
Cryptococcosis	Fungus	Inhalation is suspected	None, grows in droppings in pigeon nests	Meningitis, lung, liver and bone infection; skin lesions or ulcers
Trichinosis	Nematode	Ingestion of uncooked meat containing larval cysts	Swine, bear, wild & domestic carnivores, wild & domestic rodents	Nonspecific gastroenteritis, loss of appetite, nausea, diarrhea, swollen eyelids, fever, chills, muscle aches
Ascarid Roundworm	Nematode	Ingestion of nematode eggs (raccoon feces contamination)	Raccoons	Larval stage invades & damages body organs, including brain
Plague	Bacteria	Contamination from skinning animals, fleas	Wild rodents (prairie dogs, ground & tree squirrels, chipmunks), rabbits, carnivores	Fever, headache, sever, discomfort, shaking chills, pain in groin or arm pits (due to swollen lymph nodes), death
Tularemia	Bacteria	Contamination from skinning animals, tick, biting insects	Wild rodents, rabbits, hares, carnivores, birds, hoofed animals	Mild illness to severe meningitis, pneumonia, ulcer at inoculation site, swollen lymph nodes, death

Table 2.4 Important Wildlife Diseases that Affect Humans (continued)

Disease	Parasite	Method of Transmission	Wildlife Hosts	Type of Human Illness
Colorado Tick Fever	Virus	Tick	Wild Rodents (sciurids, porcupine), hares, rabbits, marmots, carnivores	High fever, headache, muscle ache, lethargy, biphasic symptoms
Rocky Mountain Spotted Fever	Rickettsia	Tick	Wild rodents, rabbits, hares, carnivores, birds	Rapid onset, fever, headache, muscle aches, nausea, vomiting, abdominals pain, rash, loss of muscle control, possibly fatal
Ehrlichiosis	Rickettsia	Tick	Unknown, possibly dogs & other carnivores	Fever, headache, nausea, vomiting, muscle aches, fleeting rashes
Lyme Disease	Bacteria	Tick	Wild rodents (peromyscus, chipmunks), raccoons, deer, rabbits birds	Skin lesion (EM), fever, headache, fatigue, muscle ache, stiff neck, cardiac & neurologic manifestations, arthritis
Relapsing Fever	Bacteria	Tick	Wild rodents (chipmunks, tree squirrels), particularly in cabins & caves	Rapid onset, severe headache, muscle weakness, rigor, joint pain, recurring fever
Babesiosis	Protozoa	Tick	Wild rodents (white-footed mice, meadow mice)	Gradual onset, loss of appetite, fever, sweating, fatigue, general muscle aches, prolonged anemia, sometimes fatal
St. Louis Encephalitis	Virus	Mosquito	Birds (songbirds & waterbirds), some rodents	Fever, headache, musculoskeletal aches, malaise, low fatality
Eastern Equine Encephalitis	Virus	Mosquito	Birds (songbirds & waterbirds), bats	Fever, intense headache, nausea, vomiting, muscle aches, confusion, coma, high fatality
Western Equine Encephalitis	Virus	Mosquito	Birds (songbirds & waterbirds), jackrabbits, rodents	Fever, headache, nausea, vomiting, malaise, loss of appetite, convulsions, low fatality
California Encephalitis	Virus	Mosquito	Eastern chipmunk, tree squirrels, red foxes, deer mice	Fever, irritability, headache, nausea, vomiting, loss of muscle control, confusion, coma, low fatality
Louse-borne Typhus	Rickettsia	Body louse, animal contact	Humans, flying squirrels	Onset variable, fever, headache, chills, general pains, prostration, skin rash after 5 to 6 days
Flea-borne Typhus (Murine)	Rickettsia	Rat flea	Domestic rats, wild rodents, opossum	Fever, severe headache, chills, general pains, possible skin rash

2.2.4 Public Safety

The primary public safety issue in Manitoba is wildlife-related vehicle collisions. The most serious of these collisions involves white-tailed deer. Deer-related vehicle accidents occur not only when a deer and a vehicle collide, but also when motorists attempt to avoid deer. Human fatalities occur in a small percentage of deer-related vehicle accidents, but the cost of vehicle damage is substantial. In 1991, 538,000 deer-related vehicle collisions were reported in 35 American states. Only half of all deer-vehicle accidents are reported or documented (Romin & Bissonette, 1996). Conover et al., (1995) extrapolated these findings over the missing 15 states to obtain an estimate of 1.5 million deer-vehicle collisions per annum in the United States. According to Conover's information, the average vehicle repair bill after such an accident is about US$1,500.00. This amounts to a national amount of over one billion dollars (U.S.) annually. In terms of human cost, it has been estimated that 30,000 people are injured each year in the United States and that another 211 lose their lives (Conover et al., 1995). As both the deer population and the volume of human traffic increases, so too will the incidence of deer-related accidents (Stout et al., 1993).

2.3 Managing Human-Wildlife Conflicts

Problems addressed by wildlife management have changed dramatically during the 20th century. Some species have emerged from a period of scarcity to a state of overabundance. Wildlife managers now face many situations marked by an urgent, growing demand to reduce conflicts between people and species of wildlife that were scarce just a few decades ago. Managers are finding that they must attempt to work within

a complex interface of biological, sociological, political and bureaucratic forces. They are dealing with the difficulties of managing wildlife and people to optimize benefits to a society that is living with wildlife, and experiencing the diverse benefits and problems associated with such intimacy.

2.3.1 Problem-Wildlife Management

Wildlife management is often thought of in terms of protecting, enhancing and nurturing wildlife populations and the habitat needed for their well-being (Dolbeer et al., 1994). As well, many species at one time or another require management actions to reduce conflicts with people or with other wildlife species. Examples of this include an airport manager modifying habitats to reduce gull activity near runways, or a biologist trapping an abundant predator or competing species to enhance survival of an endangered species. Problem-wildlife management can therefore be defined as managing wildlife and people to optimize the benefits of living with wildlife.

Wildlife damage control is an increasingly important part of the wildlife management profession because of expanding human populations and intensified land-use practices. Concurrent with this growing need to reduce wildlife-people conflicts, public attitudes and environmental regulations are restricting the use of some of the traditional tools of control such as toxicants and traps. Agencies and individuals carrying out control programs are being more carefully scrutinized to ensure that their actions are justified, environmentally safe, and in the public interest. Thus, wildlife damage control activities must be based on sound economic, ecological, and sociological principles and carried out as positive, necessary components of overall wildlife management programs (Dolbeer et al., 1994).

Wildlife damage control programs can be thought of as having four parts: (1) problem definition; (2) ecology of the problem species; (3) control methods application; and (4) evaluation of control. Problem definition refers to determining the species and number of animals causing the problem, the amount of loss or nature of the conflict, and other biological and social factors related to the problem. Ecology of the problem species refers to understanding the life history of the species, especially in relation to the conflict. Control method application refers to taking the information gained from parts one and two to develop an appropriate management program to alleviate or reduce the conflict. Evaluation of control allows an assessment of the reduction in damage in relation to costs and impact of the control on target and non-target populations and the environment. Emphasis is increasingly being placed on integrated pest management whereby several control methods are combined and co-ordinated with other management practices in use at that time (Dolbeer et al., 1994).

Wildlife management is rarely simply a case of managing the activities of wildlife. It is actually the stewardship of wildlife species and their habitat (Caughley & Sinclair, 1994). Management can be either manipulative, that is, using direct or indirect means to influence population numbers (control) or custodial which aims at minimizing external influences on population or its habitat (education and incentives). In either case, a wildlife population can be managed by: a) increasing the population; b) decreasing the population; c) harvesting a population for a sustained yield; d) monitoring a population in the event that human intervention is required. Caughley & Sinclair (1994) note that: "It is not the function of the wildlife manager to make the necessary value judgements in determining the [management] goal any more than it is within the competence of a general to declare war".

In other words, wildlife managers are not necessarily provided with heightened

aesthetic judgement *just* because they work with wildlife. To help wildlife managers sift through the social, political, economic and ecological influences, decisions analysis has often been employed to reveal the effect on these influences on management goals and policies. The answers to these questions ensure that an option is feasible and helps to predict its success or failure. According to Caughley & Sinclair (1994), a feasible management option can be identified by answering the following questions: 1) where do we want to go?; 2) can we get there?; 3) will we know when we have arrived?; 4) how do we get there?; 5) what penalties do we face?; 6) what benefits are gained?; 7) will the benefits exceed the penalties? The success of a management option is not, however, gauged by a simple reduction in the density of a target species, but rather by a reduction in the deleterious effects of the target species.

Wildlife damage control is an increasingly important part of the wildlife management profession because of expanding human populations and intensified land-use practices. Concurrent with this growing need to reduce wildlife-people conflicts, public attitudes and environmental regulations are restricting the use of some of the traditional tools of control such as toxicants and traps. Agencies and individuals carrying out control programs are being more carefully scrutinized to ensure that their actions are justified, environmentally safe, and in the public interest. Thus, wildlife damage control activities must be based on sound economic, ecological and sociological principles and carried out as positive, necessary components of overall wildlife management programs (Dolbeer et al., 1994).

Wagner et al., (1997) suggest that wildlife damage management (or problem-wildlife management) techniques can be divided into three general categories: 1) managing the offending animal or its habitat; 2) modifying human activities (education); 3) increasing human tolerance of wildlife (education and incentives/compensation).

2.3.2 Rural Problem-Wildlife Management

To the farmer, agricultural land is an input in a production process: land is needed to produce crops or graze animals. Yet the meaning of "The Land" to many, if not most, transcends its production value. In the case of wildlife and wildlife-related damage on farms, farmers believe that once a property has been acquired they have the right to protect and control the environment. In purchasing the land, they have also purchased the legal rights to the property and to all the product produced on that property. Historically, landowners were able to eliminate "pests" and predators through whatever means they choose. Given that there were rarely limits placed on the removal of "pests", poisoning, trapping and shooting were the most common methods because they were the most economical.

Losses due to wildlife are a direct economic burden on the agricultural producer. Increased numbers of livestock predators, grain-eating birds and burrowing rodents such as prairie dogs and ground squirrels, can have a devastating effect on the producers already minimal profit margin. Collateral costs of wildlife-related damage such as repairing damaged property, is an additional financial burden for the producer. As long as wildlife numbers remain at an acceptable level and do not create more than an acceptable amount of damage to the property owner, wildlife and agricultural producers can live in harmony. Once these thresholds have been breached, conflict arises and the equilibrium of the past, mutually-accepted situation is destroyed. In addition, producers concerns about wildlife damage may also affect their response to environmental issues and whether wildlife programs designed to maintain or improve wildlife habitat on private property will succeed (Wade, 1987; Conover, 1994).

Birds annually destroy many millions of dollars worth of agricultural crops in North

America. Fish-eating birds can cause major losses at fish-rearing facilities. Economic losses from bird strikes to aircraft are perhaps more substantial than those in agriculture in cost if not in frequency (Steenblik, 1983). Unlike most mammals, which are secretive when causing damage, birds are often highly visible and their damage conspicuous. For this reason, subjective estimates often overestimate losses as much as tenfold (Weatherhead et al., 1982). Thus, objective estimates of bird damage to agricultural crops are important in order to accurately define the magnitude of the problem and to plan appropriate, cost effective control actions (Dolbeer, 1981).

Ungulate damage to various agricultural, forestry, and ornamental crops caused by feeding, trampling, and antler rubbing is an increasing problem. Deer browsing in winter on buds of apple and other fruit trees can reduce yields the following year (Austin & Urness, 1989) or adversely alter the growth pattern of tree limbs (Harder, 1970). Similar browsing on nursery plants and in Christmas tree plantations can reduce or eliminate their market value (Scott & Townsend, 1985). Browsing of hardwood saplings and young fir trees in regenerating forests can reduce growth rates, misshape trees, and even cause plantation failures (Crouch, 1976; Tilghman, 1989). Deer also feed on a variety of agricultural crops while elk in some areas raid haystacks and feedlots (Eadie, 1954).

Rodents and other small mammals are seldom observed in the act of causing damage, and their damage is frequently difficult to measure. Nonetheless, assessments of damage that have been made indicate rodents and non-predatory small mammals cause tremendous annual losses of food and fibre in North America. Most wild mammals are secretive and not easily observed; many are nocturnal. Often the investigation must rely on various signs, such as tracks, trails, tooth-marks, scats or burrows to determine the species doing the damage. Trapping may be necessary to make a positive identification

of small rodents, as frequently more than one species is involved.

Mammalian predators have always been a concern to livestock producer. Predation is rarely observed. For this reason, the accurate assessment of losses to specific predators often requires careful investigative work. The first action in determining the cause of death of an animal is to check for signs on the animal and around the kill site. Size and location of tooth marks will often indicate the species causing predation. Extensive bleeding is usually characteristic of predation. Tracks and droppings alone are not proof of depredation of the species responsible. They are evidence that a particular predator is in the area and, when combined with other characteristics of depredation, can help determine what species is causing the problem.

2.3.3 Urban Problem-Wildlife Management

There is a general impression that once a forested or agricultural area is "urbanized", it loses its value as wildlife habitat. While such development modifies up to one million acres of agricultural and forest land annually in North America, it does not destroy all of the wildlife habitat values of the land. With proper management, urban wildlife populations can be accommodated, not only in publically-owned areas like parks, but in residents' backyards (Leedy & Adams, 1984). The density of tree squirrel populations in some urban-suburban areas, especially where urban forests or large mature trees have been undisturbed, may exceed populations in non-urban areas.

The term "urban wildlife" has increasingly been used to identify wildlife species that have adapted to urban environments and are somehow less wild than non-urban wildlife species. Van Druff et al., (1996) characterized the uniqueness of urban wildlife as follows:

a) humans, because of their density and ability to modify the environment, are major

influences on urban environments;

b) urban areas contain a mosaic of wildlife habitats identified by small parcel size, diverse ownership, intense human management, and the potential to experience rapid changes;

c) non-native (exotic) wildlife species (e.g. rock doves) are conspicuously abundant in densely developed areas;

d) species diversity is lower though the density of these species is greater;

e) additional causes of mortality including free-roaming cats and dogs, vehicular traffic and urban infrastructure such as buildings;

f) individual wild animals in urban settings are often more habituated to humans and human activity, especially where there is the potential to acquire food;

g) humans may become familiar with and vested in, individual animals as a consequence of frequent, often close, contact;

h) urban humans are less aware and less knowledgeable about individual wildlife species and their behaviours.

The above characteristics can also result in urban wildlife becoming problematic. Unlike non-urban wildlife damage, the wildlife problems experienced by urban residents may be "a one-time or infrequent and isolated, event" (Van Druff et al., 1996). Chronic problems can occur however, in urban areas such as airports and landfills. Most frequently, urban problem-wildlife situations arise from, or are exacerbated by, one or more of the following conditions:

a) artificial feeding, whether intentional or not, acts as an attractant for wildlife;

b) excessive vegetation and human litter provides security for problem-wildlife and their activities;

c) poorly designed or deteriorating human structures can become refuges for species;

d) poor environmental planning can result in the presence of wildlife for example a landfill located near an airport;

e) wildlife can be vectors or reservoirs for zoonotic disease transmission;

f) the public's lack of knowledge about wildlife and the agencies available to assist with problems.

There are five wildlife species that are most commonly cited in the literature as urban problem-wildlife: tree squirrels, cotton-tail rabbits, white-tailed deer, raccoons and Canada Geese. Tree squirrels because of their climbing ability can cause damage ranging from relatively minor (damaging bird feeders) to extremely dangerous (damaging electrical wiring resulting in power outages and fires). Damage caused by cotton-tail rabbits, although severe at times is restricted to damage vegetation around human habitation. White-tailed deer, by dint of their size, can cause considerable damage. Increased urban populations have resulted in increased potential for deer-related aircraft strikes and extensive damage to gardens and other ornamental vegetation. Raccoons have adapted perhaps better than any other species to urban environments. They are attracted to the abundance of food, present where humans live - unsecured garbage and vegetable gardens being chief among the sources. The danger is that such activities bring raccoons into close proximity with humans which in turn puts humans at risk from zoonotic disease transmission or injury. Raccoons are known reservoirs for a number of diseases including rabies and Lyme disease. Canada Geese are a relatively recent problem-wildlife concern in large urban centres in Canada and the United States where several hundred thousand geese reside year-round. Such large flocks damage and foul open areas such as golf courses and as geese are very territorial when nesting, can become a hazard to humans

when they come into close contact (Van Druff et al., 1996).

Recent studies conducted in Canada and the United States indicate that the desires of urban residents often are species specific and multidimensional - residents want a reduction in wildlife problems and an enhancement of the positive aspects of local wildlife (Conover, 1997b). When asked whether they wanted more, less or no change in the numbers of different wildlife species in their neighbourhoods, most respondents were satisfied with existing populations of most wildlife species (Conover, 1997b). Species receiving positive ratings (defined as more people wanting these populations to increase than decrease) included rabbits, deer, ducks, Canada geese, hummingbirds, woodpeckers, blue jays, American robins and cardinals (Conover, 1997b).

Relatively uncommon species received higher preference ratings than abundant species. Interestingly, both Canada geese and deer received positive ratings. Populations of both species have increased dramatically in metropolitan areas during the last few decades and are beginning to cause considerable problems. Nonetheless, these problems apparently are not so widespread that most metropolitan residents view them as pests. Public opinion is divided about urban deer and geese; most people enjoy these animals but others view them as nuisances. Consequently, management of urban deer and geese is likely to be controversial (Conover, 1997b). Only 4% of these respondents reported a problem with deer (2.4 million households when extrapolated). U.S. metropolitan residents gave deer a higher preference rating than any other mammalian wildlife species. In the same survey, only 15% reported that they wanted fewer deer in their neighbourhoods, the rest wanted deer populations to remain the same (64%) or increase (27%). In fact, when asked whether they wanted more, less or no change in the numbers of different wildlife species in their neighbourhoods, most respondents were satisfied with existing populations

of most wildlife species (Conover, 1997b).

Species receiving negative ratings (defined as more people wanting to see these populations decrease rather than increase) included moles, bats, raccoons, skunk, tree squirrels, woodchucks, ground squirrels, mice, opossums, pigeons, starlings, house sparrows, blackbirds and snakes (Conover, 1997b). Animals that typically inhabit buildings (mice, raccoon, opossums, starlings, house sparrows, pigeons) tended to have low preference ratings. Such animals were often reported as nuisances in metropolitan areas (Fitzwater, 1988; Marion, 1988 in Conover, 1997b). Those homeowners who may wish to discourage wildlife should make their yards less attractive or exclude animals by fencing, screening, etc. Most residents, however, like to see wildlife around their homes and are willing to put up with limited animal damage or nuisance which can often be controlled without discouraging desirable wildlife (Leedy & Adams, 1984).

More than half of the respondents (61%) reported they or their households had a problem with a wildlife species in the prior year. Moles, raccoons, skunk, squirrels, mice, pigeons and starlings were cited most often as being the cause of the problems. These respondents reported they or their households suffered a mean of US$63.68 in damage caused by wildlife in the preceding year (Conover, 1997b). Results further indicate that metropolitan households spent a mean of $60.42 and 22.2 hours encouraging the presence of wildlife in their neighbourhoods. This amounted to $3.6 billion and 1.3 billion hours when extrapolated to the nation's 60 million households in the 100 largest metropolitan areas (Conover, 1997b).

Most respondents (61%) stated they or their households actively tried to manage wildlife around their homes or neighbourhood in the prior year. Additionally 42% reported that they tried to solve the wildlife damage problems and spent an average of $32.48 in

such attempts. Respondents reported that they spent 7.2 hours trying to solve wildlife problems. Unfortunately 52% reported that their efforts to solve the problems were unsuccessful (Conover, 1997b). Most respondents (57%) reported that in the prior year they had tried to enhance wildlife populations in their neighbourhood by doing such things as erecting bird houses, feeding birds in the winter or providing specific plants to attract wildlife. Respondents annually spent an average of $60.42 and 22.2 hours trying to enhance neighbourhood wildlife populations. Most respondents (88%) felt their efforts to encourage wildlife were successful (Conover, 1997b).

2.3.4 Wildlife-Related Vehicle Accidents

Vehicle accidents involving wildlife have occurred for decades, probably since the advent of the automobile. During the past 30 years, these accidents, particularly deer-related vehicle accidents, have attracted enough interest to warrant a number of studies investigating the physical and biological factors associated with them, such as weather and driving conditions, roadside vegetation and seasonal deer migration patterns. However, very little inquiry has been made concerning their economic costs. Lehnert and Bissonette (1997) attributed most deer-vehicle collisions to be due to a lack of motorist response to crosswalk warning signs and the tendency for foraging deer to wander when in search of roadside vegetation. Aircraft too have been involved in collisions with wildlife. The first recorded bird strike occurred on April 3rd, 1912, when an airplane flying low over a California beach collided with a gull and crashed into the ocean. The pilot drowned when he was trapped in the wreckage of the aircraft. This was also the first recorded crash in aviation history. Most collisions cause little or no damage, some have resulted in human casualties or heavy damage to aircraft or both (Solman 1981; Blokpoel, 1976).

Deer-Related Vehicle Accidents (DRVAs)

Motor vehicle collisions involving deer are a safety concern anywhere deer and people co-exist. The incidence of deer-related vehicle accidents (DRVAs) has increased as deer populations (and traffic volumes) have grown Deer-related vehicle accidents occur not only when a deer and vehicle collide, but also when accidents result from motorists attempts to avoid deer. Human fatalities occur in a small proportion of DRVAs, but the cost of vehicle damage is substantial (Stout et al., 1993)

Public awareness of DRVAs may intensify in areas where the density of deer and motorists creates a greater incidence of accidents. Associated perceptions about the threat of a deer to public safety may influence public attitudes and behaviours toward deer, including public preferences regarding size of deer populations. The prevalence of various vehicle-mounted "deer whistles" intended to frighten deer away from moving vehicles is evidence of people's concern, although the effectiveness of such devices is disputed (Romin & Dalton, 1992; Bomford & O'Brien, 1990). The most serious consequences of DRVAs perceived by respondents was the threat to human safety (72%) (Stout et al., 1993).

Studies from New York indicate that more people are concerned about deer-car collisions than about Lyme disease even though New York has the greatest number of reported cases of Lyme disease nationwide (Connelly et al., 1987; Decker & Gavin, 1987). Respondents generally regarded DRVAs as potentially dangerous and expensive events that were important and serious. At least half of the respondents indicated DRVAs were a known risk, familiar, feared and dreaded (Stout et al., 1993). Managing deer in consideration of public perceptions of risk differs from managing deer in consideration only of the actual incidence of DRVAs (Stout et al., 1993).

The most common precautions taken were related to being alert to the presence of deer at deer crossing signs (76%) and reducing speed where deer are crossing roadways (88%). Few motorists reported major changes in driving behaviour such as reducing night driving (11%) or avoiding roads where deer are commonly seen (11%) (Stout et al., 1993). In 1991, 538,000 deer-vehicle collisions were reported in 35 states (Romin, 1994; Romin & Bissonette, 1996). Furthermore, only about 90% of all deer-vehicle collisions are reported or documented by state authorities (Decker et al, 1990; Romin, 1994).

A study of incidence and costs reported and unreported DRVAs in Tompkins County, New York, during 1988 yielded a conservative estimate of 57,000 DRVAs statewide causing $50 million in vehicle damage (Decker et al., 1990). Conover et al., (1995) estimated that 1.5 million deer-vehicle collisions occur annually in the United States. The average vehicle repair bill after a deer-vehicle collision was about $1,500 (Conover et al., 1995). Thus the total damage to automobiles from deer collisions exceeds $1 billion annually. Romin & Bissonette (1996) estimated that 120 human fatalities per year in the United States result from deer-vehicle collisions. Using published human injury and fatality rates, Conover et al., (1995) estimated that in the U.S. 29,000 people are injured and 211 lose their lives in deer-vehicle collisions annually.

Wildlife-Related Aircraft Strikes

Birds have been a potential hazard to aircraft since the beginning of air travel. Bird strikes were a minor risk in the early days as the few planes in the sky travelled at relatively low speeds. Damage was, therefore, limited to shattered windshields, dented leading edges, broken propellers and some damage to fuselages. The cost of repairs was small, and aircraft operators and airport authorities accepted bird strikes as a normal flying

hazard. In time, as the speed of the aircraft increased and engine noise levels dropped with the development of advanced turbine engines, birds could no longer sense approaching aircraft in time to get out of the way. As turbine engines were more likely to be damaged than piston engines, strike rates and engine damage increased. Birds became a serious threat to aircraft safety as strikes became more frequent and more serious. Mammals within the airport boundaries are also a potential hazard to flight safety. Many of the smaller mammals are prey for either birds (raptors) or other mammals and, therefore, increase the possibility of a wildlife incident. Mammal strikes can be as costly as bird strikes (Transport Canada, 1994). According to Conover (2002) there are an average of 3.7 human fatalities and 1.2 injuries per year due to bird strikes in North America.

The parts of the aircraft most often struck were the nose, the engine and the wing. The impact of a bird striking a high speed aircraft is quite dramatic; when one considers that an aircraft flying at 500 kt/s striking a large bird suffers an impact of nearly 1.5 million feet per lb of energy. New generation jet aircraft are fast and quiet, thereby reducing the opportunity for a bird to avoid the approaching threat. Large flocking birds are considered to be the greatest threat to aircraft among the many different species of birds that are commonly involved in collisions with aircraft. A large number of high mass birds being struck by a jet aircraft travelling at high speeds normally exceeds the design capability of air-frames and engines (Transport Canada, 1994).

Because 80% of bird strike incidents occur in the airport environment during takeoff, climb, final approach, landing and taxi phases of flight, prevention of bird strikes begins at the airport. According to Linnell et al., 1996; Cleary et al., 1997), only 25% of bird strikes are reported, either because pilots are unaware of the strikes or are too busy to report them

to the proper authority. In addition to bird strikes, there is another potential (and underestimated) wildlife hazard, the hazard posed by deer and other mammals living in the vicinity of airports. All reported incidents of deer inside airport perimeters and adjacent to active runways result in disruptions to normal airport operations. These include minor takeoff and landing delays, temporary runway closures while airport personnel investigate situations, flights diverted to alternate runways, and aborted takeoffs and landings to avoid collisions with terrestrial wildlife (Transport Canada, 1994). It is extremely difficult to spot deer before impact, leaving little time for evasive action. In cases where there is enough time, not all attempts will be successful as the deer may panic and react unpredictably. Deer may be at higher risk of being struck if an aircraft's landing lights are shining at them. It is believed that this can temporarily blind them or fascinate them to the point of immobilization (Transport Canada, 1994). Deer collisions are not however a common occurrence in Canada or the United States (there were none at Winnipeg International Airport between 1994 and 1996) but they are a hazard because of their potential to disrupt the routine and safe operation of an airport.

2.4 Valuing Human-Wildlife Interactions

Valuation can be defined as (1) the act of valuing, or estimating, the value or worth of something; or (2) estimation, usually a personal estimation, of the merit, importance, or character of something. The value of a particular wildlife species can be thought of as its effect on a person's economic state, sense of well-being, or quality of life. Values can be either monetary or intangible. Monetary values are those to which a dollar value has been assigned rather than incurred (Gauther, 1991; Conover, 1997a). People vary in the values

they derive from, or assign to, a wildlife resource. An agricultural producer may place a low or negative value on deer if they damage crops; as a deer hunter, this same person may place a high or positive value on deer because of the pleasure experienced while hunting. "The societal value of any wildlife resource is the sum of all net values held by all the members of that society" (Conover, 1997a).

Giles (1978) suggests that there are 25 methods to calculate a value for wildlife which can subsequently be categorized as: 1) the value of wildlife to humans; 2) the market value for wildlife; 3) the cost of managing wildlife; 4) the cost humans incur to participate in wildlife activities; 5) the cost of managing wildlife-related activities. At present there is not one "best" method, but rather, combinations of methods dependent upon the circumstances and participants. Giles (1978) observed that "it was a sad day when 'economic value' of wildlife was allowed to be translated as 'monetary value'. Economics deals with more than money. It is a study of resources, their values and how they are assigned and allocated". But a dollar value can be placed on wildlife. The appropriateness of that value however is debatable because: 1) there are both advantages and disadvantages when assigning dollar values to wildlife; 2) any value that can be assigned will only ever be an estimate; 3) any value based on currency is subject to the vagaries of the economic system just like any other economically traded commodity. However, money is society's dominant means for measuring value. The question is: Is a particular application monetary or economic? The true task of today's wildlife manager is to evaluate and assess both the economic and monetary value of wildlife and wildlife-related activities. For problem-wildlife managers the value of wildlife to humans needs to be balanced with the cost of managing said wildlife.

2.4.1 The Value of Wildlife to Humans

The enormous amount of time committed to fish- and wildlife-related activities is an indication of the significant enjoyment that wildlife contributes to the daily lives of a majority of Canadians. Important benefits to the Canadian economy result from the considerable spending on these activities. The public remains strongly committed to the protection and conservation of wildlife in Canada. Gauthier (1991) found public support for the maintenance of abundant wildlife populations to be consistently high across the country indicating the social and economic importance of wildlife to Canadians. A national survey of 80,000 Canadians in all ten provinces, 15 years of age and older, was conducted by the Federal-Provincial Task Force on the importance of wildlife to Canadians. The survey was conducted in 1981, 1987 and 1991 before it was broadened to assess the importance of nature to Canadians. The 1991 survey found that 69.5% of Canada's citizens enjoyed wildlife around their homes and 90% of Canadians participate in wildlife-related activities (Federal Provincial Task Force, 1989; Filion et al, 1993). In 1991, 19 million Canadians devoted a total of 1.3 billion days and spent $5.6 billion pursuing nature-related activities including birdwatching, wildlife photography, hunting and fishing. In addition, 1.8 million tourists from the United States travelled to Canada and spent $800 million to participate in similar activities. Most Canadians (84.7%) participated in some sort of indirect wildlife-related activity, such as watching wildlife films or television programs, reading wildlife books or magazines, visiting zoos, game farms, aquariums, or natural history museums, and purchasing wildlife art, crafts, or posters. More than two-thirds (69.5%) of Canadians participated in wildlife-related activities around their homes or cottages, such as watching, photographing, feeding, or studying wildlife. They committed an average of 74 days per participant to these residential activities during the year and in total spent $445.6 million to

participate. More than one-third (35.9%) of Canadians encountered wildlife incidentally while on trips or outings taken for some other purposes such as business or vacation. They encountered wildlife on an average of 19 days during the year on these voyages. Their extra expenditures associated with watching, photographing, feeding, or studying the wildlife encountered amounted to $113.9 million. Nearly one in five Canadians (18.7%) took special trips or outings away from their homes in order to watch, photograph, feed, or study wildlife. They devoted a total of 84.3 million days to these primary non-consumptive trips or outings, or an average of 22 days per participant, and spent $2.4 billion on travel expenses and special equipment for these voyages. Almost one in ten Canadians (9.0%) joined or contributed to wildlife organizations. A further 20.9 percent who did not join or contribute in 1991 expressed an interest in doing so at some time in the future. An estimated $151.2 million were spent on wildlife organizations in the form of donations and membership fees during the year. About one in fourteen Canadians (7.4%) hunted waterfowl, other birds, small mammals, or large mammals. A further 8.2% of Canadians who did not hunt in 1991 expressed an interest in participating in the future. Canadians committed a total of 24.3 million days to hunting in 1991, or an average of 16 days per hunter. Hunters spent an estimated $1.2 billion on food, lodging, transportation, equipment, and other items (Filion et al, 1994).

There has been substantial growth in the number of participants and in the amount of leisure time spent on wildlife-related activities since similar surveys for 1981 and 1987. Total expenditures on wildlife-related activities increased by 32.9% between 1981 and 1991. A comparison of the results of the 1991 survey with those from the previous surveys shows that the growth of participation in wildlife-related activities increased by 32.9% between 1981 and 1991. The number of participants in wildlife-related activities as a whole

and the population of Canada both increased by approximately 13% over the decade. Participation in primary non-consumptive trips or outings remained relatively stable between 1981 and 1991, whereas participation in hunting declined. In 1991, the popularity of primary consumptive trips or outings was greatest in the westernmost part of Canada, whereas the popularity of hunting was greatest in the Atlantic Provinces. The participation rate in primary consumptive trips or outings which stood at 18.7% of the Canadian population in 1991, tended to increase from east to west, with the highest rates in Alberta and British Columbia. The hunting participation rate was 7.4% nationally and was highest in several of the eastern provinces and in Quebec, Manitoba, and Saskatchewan. Between 1981 and 1991, the growth of participation in wildlife-related activities as a whole kept up with or exceeded population growth in the Atlantic Provinces, Ontario, Manitoba and Alberta (Filion et al, 1993).

The *Survey on the Importance of Wildlife to Canadians* shows that most Manitoba residents participated in wildlife-related activities during 1991 and devoted significant amounts of time and money to these activities (Filion et al, 1993). In 1991, 755,000 Manitoba residents aged 15 years and over (93.2% of the population) participated in a wide range of wildlife-related activities. An estimated 721,000 residents participated in indirect activities, 575,000 participated in residential activities, 152,000 took at least one primary non-consumptive trip or outing, 302,000 encountered wildlife incidentally during other trips or outings, and 67,000 Manitoba residents hunted wildlife. Wildlife organizations had 78,000 members and contributors.

The profiles of participants in non-consumptive activities resemble that of the general population, except that those who took primary non-consumptive trips or outings or encountered wildlife incidentally were more concentrated among Manitoba residents

under the age of 45. Hunting was a more common activity among men, rural residents, and Manitoba residents under the age of 45 years, particularly those between 25 and 34 years of age. A comparison of results of the 1991 survey with those from similar surveys in 1981 and 1987 shows that participation in wildlife-related activities as a whole increased by 10.1% over the decade. Manitoba's population grew by 6.4% during the same period. Participation in primary non-consumptive trips or outings increased between 1981 and 1987, then declined somewhat in 1991, while participation in hunting declined throughout the period (Filion et al, 1993).

An overview of the 49.7 million days on which Manitoba residents took part in wildlife-related activities. In 1991, they spent 40.6 million days on residential activities, 2.9 million days on primary non-consumptive trips or outings, 5.3 million days on incidental wildlife encounters, and 954,000 days hunting. In terms of average days per participant, men spent more time than women on all wildlife-related activities. The average number of days participants engaged in residential activities increased with age, whereas for hunters the average amounts of time spent were highest in the younger age groups. The average amount of time spent varied across the age groups for the other wildlife-related activities. Rural residents recorded greater amounts of time on average than urban residents for all wildlife-related activities. The total number of days spent on all wildlife-related activities increased by 24.2% between 1981 and 1991, from 40.0 million in 1981 to 49.7 million in 1991. The number of days spent by participants on primary non-consumptive trips or outings increased between 1981 and 1987, then decreased in 1991, whereas the number of days of hunting participation declined throughout the period (Filion et al, 1993).

Table 2.5 Number of Days Manitobans Engaged in Wildlife-Related Activities (1991)

		Residential wildlife-related activities	Primary non-consumptive trips or outings	Incidental wildlife encounters
Total Days		40,589,000	2,878,000	5,268,000
Average Days per Participant		70.5	18.9	17.4
Gender	Male	68.3	22.6	18.7
	Female	72.6	15.4	16.2
Age Group	15-19 years	38.7	19.6+	16.7
	20-24 years	41.8	14.8+	13.3+
	25-34 years	52.2	19.0	15.4
	35-44 years	66.9	20.1	19.2
	45-54 years	83.9	16.0+	22.8
	55-64 years	95.0	22.6+	16.8
	over 64 years	108.5	18.6+	17.8+
Residence	Urban	62.6	16.6	15.5
	Rural	88.5	24.8	22.2

Source: Filion et al., (1993)

In 1991, Manitoba residents spent an estimated $158.6 million on various wildlife-related activities. They spent $63.4 million on this money on primary non-consumptive trips or outings (40.0% of all expenditures) and $44.3 million on hunting (28.0%). Other activities accounted for the remaining 32.0%. Average yearly and average daily expenditures per participant were higher for hunters than for participants in primary non-consumptive trips or outings. The total expenditures on wildlife-related activities increased from $158.7 million in 1981 to $195.3 million in 1987 and decreased to $58.6 million in 1991. If inflation is taken into account, we are led to the observation that there has been no real growth in expenditures on wildlife-related activities between 1981 and 1991. Further, there was an actual decline in expenditures when measured in constant dollars over and above inflation. The money spent by Manitoba residents during 1991 on wildlife-related activities

nevertheless represents a significant outlay that has important impact on the provincial economy (Filion et al, 1994).

Table 2.6 Expenditures by Manitoba Participants in Wildlife-Related Activities (1991)

	Primary non-consumptive trips or outings	Hunting	Other activities	All wildlife-related activities
Total Expenditures by All Participants	63,445.00	44,331.00	50,794.00	158,570.00
Average Annual Expenditures	417.00	663.00		
Average Daily Expenditures	22.00	46.00		

Source: Filion et al., (1994)

Kellert and Berry (1987) found that gender was the most significant indicator of peoples' viewpoints about animals. Women typically wanted to protect animals from suffering, had little interest or a dislike for killing wildlife and controlling animals through intensive training and had strong attachments to pets. Men typically wanted direct contact with wildlife and the outdoors and accepted killing wildlife for meat, fur and predator control. Interestingly, these results were consistent among wildlife professionals as well.

Most surveys have focussed on adults or households, but Schicker (1986) considered the perceptions and needs of the 52 million U.S. youth under age 18 living in urban areas. From direct contacts with these children, she emphasized the need for early hands-on contact with natural in residential woodlands that receive protection from development as a provision for the future. Younger Americans, especially those in urban

areas of 50,000 to 250,000 people, hold more wildlife protectionist views and show stronger emotional attachment to animals than do older citizens. (Kellert & Westervelt, 1983; Kellert, 1984).

2.4.2 The Cost of Managing Wildlife Damage

There is a lack of information available regarding "the extent of human lives lost, damage to property, and losses of economic and agricultural productivity caused by wildlife" (Conover, 2002). As a result, it is difficult to make decisions about managing problem-wildlife including the allocation of resources (Conover & Decker, 1991). Wildlife damage management can be divided into three general categories: managing the offending animal or its habitat, modifying human activities and increasing human tolerance of wildlife. Agricultural compensation programs fall into this last category and involve paying agricultural producers for all or a portion of the value of crops, property or livestock damaged by wildlife. Compensation programs eliminate the risk of direct injury to humans and wildlife from damage management tools like traps and pesticides, and may increase landowner tolerance of problems with threatened or endangered species (Olsen, 1991). Payment programs have been used in areas where the public places a high monetary value on game species, and license revenues may be used to pay for damages caused by game species (Engle, 1963; Rimbey et al., 1991).

Conover (1994) has suggested that wildlife damage has reached levels which discourages some producers from managing for wildlife on their property. Producers may also feel that wildlife managers are unaware of the extent of agricultural losses and are thus insensitive to their needs (Decker et al., 1984; Conover & Decker, 1991). In Conover's study, 89% of agricultural producers reported wildlife-related damage on their property in

the previous year and more than half (56%) felt that their losses exceeded their tolerance (Conover, 1994;). In the U.S., agricultural agencies also believe that wildlife-related agricultural losses increased from 1957 to 1987 (Conover & Decker, 1991). Agricultural producer's perceptions of the amount of damage caused and the type of wildlife responsible are useful for planning programs to minimize losses related to wildlife (Craven et al., 1992). Farmers with more of their livelihood at stake may be more concerned about damage (Decker & Brown, 1982; Siemer & Decker, 1991). If producers believe that wildlife cause their losses, those same producers are more likely to desire lower wildlife populations and may take whatever actions they believe necessary to alleviate their losses (Wywialowski, 1994).

There have been numerous studies conducted to estimate agricultural losses due to wildlife, however, the results vary from study to study. For example, Wade (1982) estimated that the direct loss of sheep and goats to coyotes in the United States ranged from US$75 million to US$150 million annually. A summary of other studies and surveys, estimated that the loss of sheep lambs and goats to predators to be over US$68 million in the 17 western U.S. states in 1984. Terrill (1988), using data from all 50 states, reported that annual losses of sheep and lambs to predators ranged from US$69 million to US$83 million in 1985 to 1987. In 1990, 490,000 sheep and lambs valued at US$21.7 million and 129,400 goats valued at US$5.6 million were lost to predators in the United States (National Agricultural Statistics Service, 1991). The most frequently cited study estimated wildlife-related losses to crops and livestock to be between US$450 and US$500 million per annum (Conover & Decker, 1991; Conover, 1994). The overall (extrapolated) estimate of total hours spent by landowners on wildlife-related damage was 269 million hours per year (Conover, 1997b).

Nationally in the United States, 55% of all respondents believed they had incurred wildlife-caused losses to their commodities. Based on the median value of producers' estimates of their losses, wildlife-caused losses cost producers US$461 million in 1989. While these losses generally represent less than 0.4% of the value of agricultural production, the losses were not equitably distributed and some producers may have sustained very high losses (Wywialowski, 1994). Because sheep may be more vulnerable to predators, sheep producers may sustain the highest wildlife-caused losses - the primary predator cited was the coyote, similar to results from Quebec (Clarke et al., 1982) and Missouri (Missouri Department of Conservation, 1992).

A common response to the inequitable distribution of wildlife-caused losses is to provide assistance in the form of compensation. Some producers of some kinds of commodities that are susceptible to high wildlife-caused losses such as sheep and fruit, may require assistance to maintain viable operations. If assistance is unavailable, some producers with high operating expenses associated with reducing wildlife-caused losses may need to produce another commodity, pass some of their costs to consumers or become insolvent (Wywialowski, 1994). Because the economic benefits of wildlife are unlikely to be distributed to the same people as the costs of sustaining wildlife losses, some means of reallocation between "gainers" and "losers" is both appropriate and socially desirable. Public assistance to alleviate the losses is one form of redistributing the benefits and costs of publicly-owned wildlife resource (Wywialowski, 1994).

Most compensation programs were established for damage caused by ungulates but programs compensating for damage by bears are also common (Wagner et al., 1997). Compensation programs involving ungulates included damage to cultivated crops, standing hay crops and pastures, stored hay and damage to other property including fencing and

irrigation equipment. Bear programs included livestock losses, damage to bee-keeping equipment, crops and other property. Reported expenditures in the United States for compensation ranged from US$1966 to US$1.07 million per state in 1993 compared with C$10,000 to C$1.2 million for Canadian provinces. Some provinces and states reported restrictions on payments for damage below a certain threshold including C$250 for ungulate damage and C$500 for waterfowl in Saskatchewan, C$100 in Manitoba and the Yukon, US$100 in Minnesota and US$1,000 in Idaho.

Although compensation initiatives are an intuitively appealing alternative to more traditional, lethal management options, they are not suitable for all situations (Musgrave & Stein, 1993; U.S. Department of Agriculture, 1994). Compensation does not stop the damage problem and may not be appropriate in situations where wildlife causes a risk to human health and safety (U.S. Department of Agriculture, 1994). Likewise, producers with a sense of responsibility for the well-being of their livestock may be less likely to accept compensation programs than producers with damage. The programs eliminate the risk of direct injury to humans and wildlife from damage management tools like traps and pesticides and may increase landowner tolerance of problems with species-at-risk (Wagner et al., 1997). They may also be a useful tool in situations where private lands include, or are adjacent to, habitat critical for the well-being of a wildlife species or population.

The existence of compensation programs seems to have a mollifying effect on the agricultural community. The animosity directed at program personnel would have been much higher if no such programs existed, and the pressure on programs to resolve depredation problems would have been even greater. There were some common complaints however. For example, livestock value limits were too low, fair market value at the time of the loss was paid rather than projected value at market time, and no

compensation was paid for missing livestock at farms with verified losses (Fritts et al., 1992). Additionally, programs rarely pay producers for the full value of all indirect costs associated with wildlife damage.

However, not all opinions regarding compensation programs are positive (Olsen, 1991). For example, when asked about compensation of livestock losses to coyote predations, 74% of the general public, 89% of sheep producers (sheep being a favoured coyote prey) and 93% of cattlemen disapproved of compensation as a management option (Kellert, 1979). Decker and Conover (1994) found that both farmers and non-farmers had a higher approval of hunting than of compensation programs. Most (69%) of farmers and 50% of non-farmers approved of hunting as a solution of damage whereas only 32% of farmers and 23% of non-farmers approved of compensation programs. In another survey, respondents' opinions were questioned about paying livestock producers for sheep killed by coyotes with general tax monies. Only 11% of sheep producers, 7% of cattlemen and less than 26% of the general public expressed any form of approval (Kellert, 1979). Likewise in a study by Arthur (1981), ground-shooting and fast-acting poisons received a higher rating for predator management than did compensation payments.

Opposition to compensation programs also comes from wildlife managers. Engle (1963) expressed the opinion of some resource managers in saying "The State's right of trust is to regulate and control the harvests and preservation of game; and the State is not responsible for damages caused by game". He believed that compensation programs were inappropriate for wildlife management and potentially vulnerable to abuse. Many managers believe that wildlife damage should be included in the cost of doing business. "Why compensate farmers for deer damage to a crop but not compensate the owner of a private business experiencing problems with birds roosting in a nearby tree?" (Wagner et al.,

1997). Additional difficulties can arise when deciding which types of damage to include in a compensation program. Landowners may also feel that wildlife managers are unaware of the extent of agricultural losses and thus are insensitive to their needs (Decker et al., 1984; Conover & Decker, 1991).

Chapter Three Public Perceptions & Management of Wildlife

Manitoba-specific data on human-wildlife interactions is either not readily accessible or non-existent. To properly assess problem-wildlife management, it was necessary to consider the costs incurred and the public perception of the "the problem".

3.1 Managing Human-Wildlife Conflicts in Manitoba

In order to determine (as much as possible) the cost of problem-wildlife to Manitobans, it was necessary to contact the various agencies and organizations involved in wildlife management in the province. Interviews with agency representatives were conducted to better understand the management difficulties facing professional wildlife managers. Of particular interest was information on costs incurred (both administrative and compensative), staff involvement, current areas of concern, and any multi-agency partnerships. The hypothesis was that this information would help provide an administrative overview of each agency, and in turn, the province.

3.1.1 Wildlife Management in Manitoba

In general, an Act establishes the legal requirements for government to follow in a particular field. Regulations define the scope and restrictions of these requirements while policies and procedures describe how the government intends to implement regulations in order to meet the mandate as defined in the Act. Seunarine (1994) found that wildlife management regulations in Manitoba (and in particular Winnipeg) are confusing for wildlife managers for of two main reasons: 1) There is an absence of legislation at the federal,

provincial and municipal level; 2) There is jurisdictional overlap at all three levels of government.

Federal and provincial legislation do not list many of the wildlife species that currently reside in the province. As a result government is loathe to accept management responsibility for a species not given status under legislation. For the species that have been given official status, jurisdictional responsibility is assigned variously between agencies depending upon the species, the situation and geographic location. For example, Canada Geese legislatively come under the jurisdiction of the federal government but because of staffing cutbacks, the Canadian Wildlife Service co-operates with Manitoba Conservation to manage species. Transport Canada however has permits for Environment Canada, Manitoba Conservation and the City of Winnipeg to manage the birds at the Winnipeg International Airport. If a goose should be accidentally killed on a highway it is the responsibility of Manitoba Transportation and Government Services, but if it is killed on a city street, Poulin's Exterminators, as the dead animal pick-up service contracted by the City of Winnipeg, will retrieve it. Should the goose be injured it cannot legally be rescued by the general public even though it will probably find its way to the Manitoba Wildlife Rehabilitation Organization, a non-profit, non-governmental agency. In any case, dead or alive, the bird must / will be reported to the nearest office of the Canadian Wildlife Service. This example illustrates the kind of jurisdictional confusion that frequently occurs when attempting to manage wildlife in Manitoba (Koonz, pers. comm., 1998; Stardom, pers. comm., 1998).

Tables 3.1 through 3.4 are a synopsis of the legislation affecting the management of wildlife in the province. Federal legislation focusses on the management of internationally-sensitive and migratory wildlife species. Provincial legislation works to

Table 3.1 Wildlife Legislation in Manitoba (Seunarine, 1994)

Federal	Provincial	Municipal
Canada Wildlife Act R.S.C. 1985	*Natural Resources Transfer Act* R.S.M 1987	*Pigeon Control By-Law* # 978/75
Parks Canada Act R.S.C. 1990	*Wildlife Act* R.S.M. 1987	*Pound By-Law* # 2443/79
Migratory Birds Convention Act R.S.C. 1985	*Endangered Species Act* R.S.M. 1989-90	*Keeping Animals By-Law* # 3389/83
Health of Animals Act 1990	*Ecological Reserves Act* R.S.M. 1987	*Parks & Recreation By-Law* #33219/82
	Public Health Act R.S.M. 1987	*Public Health By-Law* #4274
	Environment Act S.M. 1987-88	
	Animal Diseases Act R.S.M. 1987	
	City of Winnipeg Act R.S.M. 1989-90	

Table 3.2 Government of Canada Wildlife Legislation (Seunarine, 1994)

Legislation	Summary
Canada Wildlife Act	This the primary legislation involving the federal government in the management of wildlife in Canada. The value of this Act is that it provides an opportunity for increased cooperation between federal, provincial and municipal governments which in this time of government cutbacks is essential to accomplish the Act's mandate.
Migratory Bird Convention Act	This Act prohibits the purchase, sale or possession of any migratory game bird, migratory insectivorous bird, migratory non-game bird, nest or egg of such. This also includes the purchase, sale and possession of any part of these birds except when allowed by the Act (ie: hunting season). People are however, allowed to protect their property from damage by using approved "scare" techniques but the birds must not be wounded, captured or killed as a result of these activities. Only in special cases will the government issue permits to: 1) kill the birds when scare techniques are not reducing the property damage; 2) destroy the nest and/or eggs if they pose a threat to human health, safety or agriculture.
Health of Animals Act	This legislation deals exclusively with animal disease issues and enables the Minister of the Environment to act when there is a danger to human life, health, property or the environment as a result of this disease.

Table 3.3 Province of Manitoba Wildlife Legislation (Seunarine, 1994)

Legislation	Summary
Natural Resources Transfer Act	This Act gives the province proprietary rights over all the wildlife on Crown lands, though individual species and cases may be subject to federal legislation and jurisdiction. The province's Wildlife Act is an extension of the Transfer Act and was intended to avoid confusion between the roles of federal and provincial governments in the management of wildlife in Manitoba.
Wildlife Act	This is the principle legislative document for regulating and managing wildlife in Manitoba. Schedule A (Appendix 1) lists and classifies the province's "official" wildlife (referred to as "wild animals"). "Wildlife", however, covers all species not listed in Schedule A. Very simply, the legislation states that it is illegal to kill or capture or be in possession of any parts of wild animals or wildlife. The exception that applies to problem-wildlife is that residents are allowed to take/kill wild animals and wildlife in defence of their property and on their own land. The caveat is that the Crown must be notified (within a few days) in the case of wild animals. This does not mean that a resident can kill or capture the white-tailed deer that persists in eating his/her ornamental shrubbery. It does mean that should this same deer be eating the crop or inventory (ie: livelihood) of a resident, then the removal of the individual(s) may be considered justified.
Endangered Species Act	This Act states that no person can kill, injure, possess, disturb or interfere with a species-at-risk or its habitat, whether on private or Crown Lands.
Ecological Reserves Act	This legislation defines environment as "natural or man-made surroundings"; an ecosystem is "an ecological system consisting of living things, together with their respective environments". With these definitions, the intent of this Act is to protect significant ecological areas in Manitoba whether they be natural or man-made so long as they are part of a functioning ecosystem.
Public Health Act	This Act addresses health preservation and prevention of injury and disease for the people of Manitoba. It enables the provincial government to create regulations to destroy, confine and dispose of animals that may be considered a threat to human health and safety.
Environment Act	While this legislation officially recognizes non-human species as a part of the environment (section 1) and allows for regulations to be created to "ensure that the environment is maintained in such a manner as to sustain a high quality of life", it is primarily concerned with the quality of human life.
Animal Diseases Act	Act legislated to prevent animal diseases from being transmitted to humans, and to ensure that all animals are treated in a humane manner.
City of Winnipeg Act	This is provincial legislation that outlines the responsibilities and limitations of the municipal government, and is important for an understanding of the City's participation in managing the wildlife occurring within city limits.

Table 3.4 City of Winnipeg Wildlife Legislation (Seunarine, 1994)

Legislation	Summary
Pigeon Control By-Law	This municipal by-law states that no person can keep pigeons, racing pigeons or show pigeons in the City of Winnipeg without a permit - however the control and management of wild feral pigeons is not addressed by the by-Law. Therefore, pigeons are wildlife and fall legislatively under the Manitoba Wildlife Act
Pound By-Law	An animal, as defined in this legislation, is any husbandry animal but does not include the domestic cat and dog. The by-law addresses the regulation and control of owned animals within city limits and prohibits any animal to run at large.
By-Law Respecting the Keeping or Harbouring of Certain Animals	This by-law prohibits any person from keeping certain animal species within the City. In particular, it prohibits exotic species from being kept within the City.
City of Winnipeg Parks & Recreation By-Law	According to this legislation, any non-human creature residing in municipal parks are completely protected from people. It is illegal to tease, annoy, disturb, interfere, strike, maim or kill any animal in a City park, and people are prohibited from disturbing, robbing, injuring or destroying any animal habitat in a park. This is an important by-law because urban parks provide habitat for many wildlife species in Winnipeg.
By-Law Relating to Public Health	This by-law allows health officers to "remove, destroy or prevent all nuisances, sources of filth, and causes of sickness which may affect public health", and identifies the procedure for the public to follow with respect to disposing of dead animals.

protect wildlife as a whole, species-at-risk in particular, and "the environment" so as to sustain the province's high quality of life for humans. The City of Winnipeg's legislation is almost exclusively concerned with controlling privately-owned animal ownership within the City. Health legislation at all three levels of government is involved when there is a danger to human life, health, property or the environment as a result of a zoonotic disease.

In addition to the Wildlife and Ecosystem Protection Branch of Manitoba Conservation, several other government agencies respond to wildlife issues: Canadian Wildlife Service, Agriculture and Agri-Food Canada, Transport Canada, Manitoba Agriculture and Food, Manitoba Health, Manitoba Crop Insurance Corporation, Manitoba Public Insurance Corporation, City of Winnipeg Animal Services Branch and the Parks and

Recreation Department. Non-governmental agencies involved include the Manitoba Wildlife Rehabilitation Organization, the Winnipeg Humane Society, the Peregrine Falcon Recovery Project (Manitoba), Manitoba Wildlife Federation and Manitoba Naturalists Society. Pest control providers (formerly exterminators) and veterinarians also play critical roles (see Table 3.5).

Despite this wide array of government involvement, the public is frequently helpless in finding answers for wildlife inquiries as many of these organizations do not have the information the public is seeking or the resources and/or the authority to help, therefore it can be a confusing process for an individual to obtain assistance with problem wildlife. Recently, the Manitoba Round Table for Sustainable Development released the results of public consultations on provincial wildlife policies and revisions to the province's *Wildlife Act*. These consultations were required under *The Sustainable Development Act* before the Round Table could provide its recommended revisions to the Provincial Government. Policy Area 7 deals directly with human-wildlife conflicts, specifically the protection of human health and property. Included are revisions to 1) protect human life and property from problem-wildlife and its management and 2) to protect human life and well-being by enhancing biological diversity. Policy Area 6 proposes increased public awareness and education in an effort to enhance the public's understanding of, and appreciation for, wildlife and its importance in the environment. Should these revisions be adopted and implemented, it is possible that Manitobans will have better access to timely information and assistance when faced with a conflict with wildlife (Manitoba Round Table for Sustainable Development, 2000).

Table 3.5 Agencies Involved in Wildlife Management in Manitoba

Governmental	**Federal**	Agriculture & Agri-Food Canada
		Canadian Wildlife Service
		Parks Canada
		Transport Canada
	Provincial	Manitoba Agriculture & Food
		Manitoba Conservation
		Manitoba Health
		Manitoba Transportation & Government Services
		Manitoba Crop Insurance Corporation
		Manitoba Public Insurance Corporation
	Municipal	City of Winnipeg Animal Services Branch
		City of Winnipeg Parks & Recreation Branch
		City of Winnipeg Assiniboine Park Zoo
		City of Winnipeg Health Department
Non-Governmental	Ducks Unlimited	
	Manitoba Trappers Association	
	Manitoba Wildlife Federation	
	Manitoba Wildlife Rehabilitation Organization	
	Peregrine Falcon Recovery Project (Manitoba)	
	Winnipeg Humane Society	
Private	pest extermination companies	
	Veterinarians	urban veterinary clinics
		rural veterinary clinics

3.1.2 The Cost of Problem Wildlife in Manitoba

To most accurately calculate the cost of problem-wildlife in Manitoba, it would be ideal to include all problem-wildlife-related activities undertaken by all the private and public agencies, organizations and individuals involved. The reality in Manitoba is that almost all of the parties involved absorb most, if not all, of the costs they incur due to problem-wildlife.

Of the agencies, organizations and groups identified in Table 2.9, most had to calculate their problem-wildlife costs specifically for this document. Even so, nearly half were unable to provide a dollar value.

Agriculture & Agri-Food Canada

Agriculture Canada is involved in two aspects of problem-wildlife management in Manitoba: a) compensation for wildlife damage and b) disease prevention and control, specifically rabies.

Both of these management areas are in partnership with provincial government agencies - Manitoba Health, Manitoba Agriculture and Food, and Manitoba Conservation. When contacted, Agriculture and Agri-Food Canada directed queries regarding program costs to the Manitoba Crop Insurance Corporation (re: agricultural wildlife-related damage compensation) and Manitoba Agriculture and Food, Health, and Conservation (re: disease prevention activities) (Frolick, pers. comm., 1998).

Canadian Wildlife Service (CWS)

This federal agency is responsible for the management of all species listed in the Migratory Birds Convention Act and the federal Wildlife Act. Due to the limited Canadian Wildlife Service staff in Manitoba, they refer problem-wildlife inquiries to the nearest Manitoba Conservation office. When contacted, the Canadian Wildlife Service was unable to provide costs (actual or estimated) for their work with problem wildlife (Kubis, pers. comm., 1998 ; Labossiere, pers. comm., 1998; Rakowski, pers. comm., 1998; Wixstrom, pers. comm., 1998).

Parks Canada

Parks Canada administers two percent of Canada's land base and is the only federal agency directly involved with wildlife (rather than wildlife species) management. Wildlife research and management in Canadian National Parks is often a cooperative endeavour involving the Parks Canada and the Canadian Wildlife Service. Problem-wildlife costs in Manitoba's two federal parks were not available for publication in this document.

Transport Canada

Transport Canada is responsible for the Winnipeg International Airport and its on-going concerns with white-tailed deer and migratory birds, both of which can seriously damage an aircraft. Transport Canada's policy is to regard all wildlife on airports as potential hazards to airport and aircraft safety. As a result, this department has permits from all three levels of government to deter and remove wildlife (excluding endangered species) as required. Transport Canada has tried to reduce the attractiveness of the area for wildlife by allowing the land surrounding the airport to be farmed, erecting deer fencing and installing propane "bangers" to scare the birds.

In 1996, there were a total of 376 bird strikes at Canadian airports (military and civilian), including 23 at Winnipeg International, 5 at Canadian Forces Base Portage, 2 in Thompson and 1 each in Brandon and Gillam. Winnipeg International had the sixth highest incidence in Canada for 1996, exceeded by Toronto (76 strikes), Montreal/Dorval (57), Vancouver (35), Ottawa (31) and Halifax (27). Nationally the type of bird most often hit were gulls (25%), followed by sparrows (8%), snow buntings (4%) and starlings (4%). In Winnipeg, the breakdown is as follows: gulls (6), sparrows (2), hawks (2), swallows, lark (1 of each). The remaining 11 strikes species could not be identified. August is typically the

month when most bird strikes occur and most incidents occur between 10 and 11 a.m. (Transport Canada, 1994).

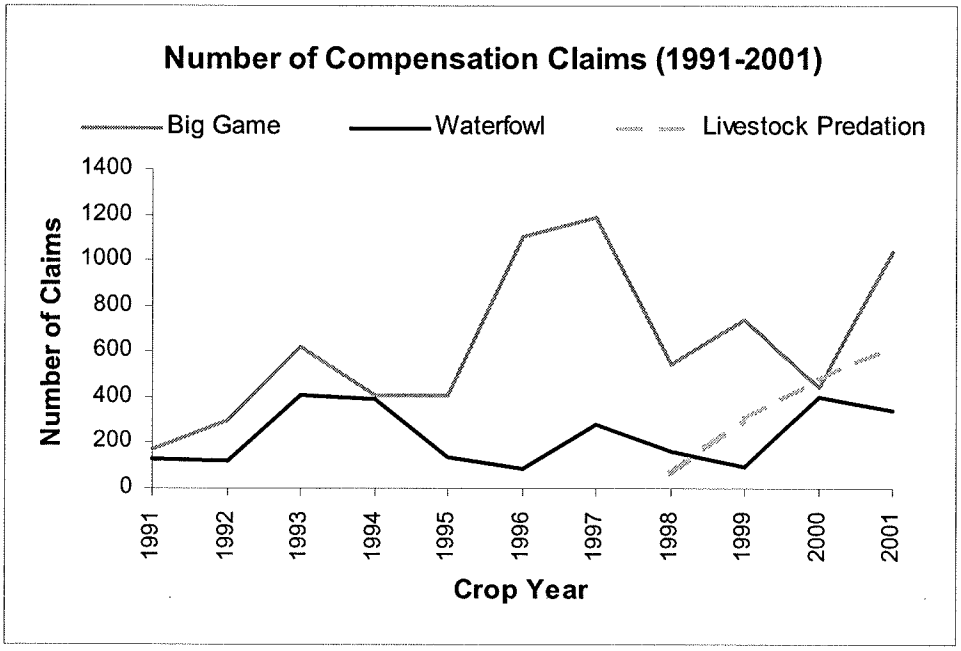
No hard costing data regarding wildlife and bird-strikes at the facility was available at the time of this publication (MacKinnon, pers. comm., 1998). It is estimated however, that economic losses due to bird-strikes to aircraft are at least $20 million annually for commercial U.S. air carriers (Steenblik, 1983) and the same again for U.S. Military aircraft (Merritt, 1990). The costs of down-time for inspection and repair of aircraft, in addition to the actual damage costs, include the cost of aborted flights, the re-scheduling and re-routing of passengers and cargo, overnight accommodation at the expense of the airline, and the deleterious effects on schedules of connecting flights. All of which are more significant to airline-operating budgets and public goodwill than the costs of replacing parts that are damaged by wildlife collisions.

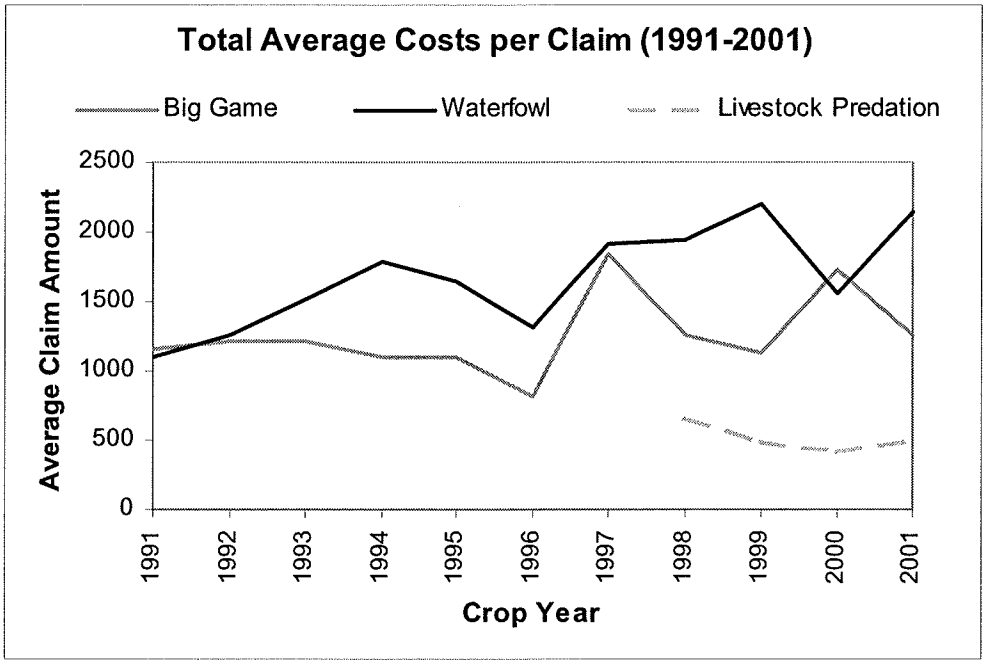
Manitoba Agriculture & Food

Through the Manitoba Crop Insurance Corporation, Manitoba Agriculture and Food is involved in providing wildlife damage compensation as well as providing advice and assistance to prevent/control wildlife damage in the agricultural sector (ie: Apiculture). There are two types of bees (honey and leafcutter) that are eligible for bear damage compensation which is administered by the Manitoba Crop Insurance Corporation. Annually $1,150 is spent on bear damage prevention support provided by the Apiculture Section of the Department (Dixon, pers comm., 1998).

Manitoba Crop Insurance Corporation

In Manitoba, compensation for crop or livestock damage due to wildlife is administered by the Manitoba Crop Insurance Corporation (MCIC). Their purpose is to provide protection to Manitoba's agricultural producers "against financial losses resulting from crop failure due to natural hazards beyond the farmer's control" (MCIC, 1997). The Corporation administers compensation programs that covers agricultural damage due to waterfowl (ducks, geese and sandhill cranes), big game (deer, elk, moose and wood bison) and predators (black bears, cougars, wolves, coyotes and foxes). The intent of the programs is to reduce the financial losses suffered by farmers and includes coverage for crops for which the Corporation has appraisal procedures. Compensation is paid on 100% of the assessed value of damaged production. No premiums are charged to farmers and no formal enrolment in these programs is necessary. The graphs below show the trends in waterfowl and big game compensation over the ten year period between 1991 and 2001.





Damages vary from month to month, year to year, and region to region, so the Corporation does not have a core of staff to handle only wildlife claims. The following are specific costs for Manitoba Crop Insurance Corporation's compensation programs averaged over the last 3 years. In addition to the direct administration costs (adjuster-related expenses), additional staff time is expended in general administration of the Programs (Schellenberg, pers. comm., 2002).

Programs	Avg. # of Claims	Average Program Expenditures (1998-2000)			Avg. Claim
		Compensation	Administration	Total	
Wildlife	738	901,700	193,567	1,095,267	1,222
Waterfowl	277	473,433	44,333	517,767	1,709
Predation	467	161,533	53,500	215,033	346
Total Average Costs		$ 1,563,666	$ 291,400	$ 1,828,067	

Ungulate damage to agricultural crops and stored commodities, usually by feeding, trampling and contamination, is an increasing problem in Manitoba. Deer and elk feed on various types of crops and are known to raid stored hay and cattle feedlots. The types and location of damage vary greatly from year to year, dependent primarily on weather conditions. In severe winters, deer and elk can cause significant damage to stored forage. In years when the fall harvest is delayed and cereal crops are over-wintered in the field, deer and elk feed heavily on unharvested crops. Damage from elk is most common in the Duck Mountain, Riding Mountain and the Interlake areas. Deer-related damage is widespread, but generally most common in the Red River Valley, south of Winnipeg, the Pembina Valley and the Virden areas. Black bear damage is most prevalent around the Duck and Riding Mountains. In years when natural food sources are in short supply due to a late, cool spring, numerous beehive yards are damaged by bears. (MCIC, 1997; Manitoba Natural Resources, 1997) Restrictive hunting regulations and other programs designed to maintain big game populations can directly affect individual farmers. According the Wildlife Act, it is illegal to kill deer, elk and moose in defense of property and therefore farmers are limited in what they can do for themselves in addressing depredation problems.

In Manitoba, as elsewhere, there exists among agriculturalists and wildlife managers a range of opinions regarding the efficacy of agricultural compensation programs for wildlife damage. Some agricultural producers seek compensation for every minor infraction of the "Queen's deer and ducks" while producers with substantial damage do not make claims because they do not wish to "bother" MCIC with their problems. Some seem to feel guilty for accepting public funds in the form of compensation. Others recognize wildlife damage as a risk of farming and some may feel that they have contributed to the problem and are therefore willing to bear the costs alone. Many are also very innovative and humane in their

efforts to minimize damage due to wildlife. There seems to be some personal threshold of tolerance but once it has been exceeded, producers expect full compensation. "We need to change the attitude toward wildlife as a resource, not a pest. But then it annoys me when the cute and defenceless rabbit chews on the lilies and beans in my garden" (Schellenberg, pers. comm., 2000).

Manitoba Conservation

This Department, and in particular the Wildlife and Ecosystem Protection Branch, is responsible for managing wild animals and wildlife as identified in the province's Wildlife Act. Because of a general lack of knowledge about wildlife the public is not familiar with which species the government is responsible for managing and which species must be handled on their own. The mission of the Wildlife and Ecosystem Protection Branch is to "ensure the long-term maintenance and enhancement of wildlife resources and their sustainable use".

As a result, the Wildlife and Ecosystem Protection Branch staff spend a great deal of time responding to questions and advising people how to manage wildlife. Recently the Branch began a concerted effort to inform the public in the area of human-wildlife conflict resolution so that they can solve problems on their own property, especially when the problem involves species not listed in Schedule A. In part, this has been necessary because of severe cutbacks in staffing and funding for the Department. Most problem-wildlife activities are handled by the local Conservation Officer and as a result fall under the jurisdiction of the department's Operation Branch. In the Wildlife and Ecosystem Protection Branch, the Captive and Problem Wildlife Manager is responsible for coordinating the province's management response to problem-wildlife species in partnership with the

Canadian Wildlife Service, Manitoba Crop Insurance Corporation, Manitoba Public Insurance Corporation, Manitoba Health, as well as the City of Winnipeg Parks and Recreation Department, City Naturalist, Assiniboine Park Zoo, the City Health Department, Animals Services, local pest service companies, veterinarians and non-profit organizations such as the Manitoba Wildlife Rehabilitation Organization and the Winnipeg Humane Society. The Department encourages property-owners to manage their own conflicts with wildlife and will provide advice and assistance where/when required (Joubert, pers. comm., 1998; McKay, pers. comm., 1998).

On an annual basis between five and twelve percent of the Department's expenditures can be attributed to problem-wildlife activities (Joubert, pers. comm., 1998).

Year	Total Operational Expenditures	Annual Problem-Wildlife Operational Expenditures			
		Administration	Compensation	Annual Costs	% of Total
1994/95	3,750,500	222,072	247,573	469,645	12.5 %
1995/96	4,017,300	283,757	136,435	420,192	10.5%
1996/97	3,956,600	179,368	50,334	229,702	5.8%

Fluctuations in the level of compensation is due to local environmental conditions. Such fluctuations also affect the cost of removal programs such as the beaver removal program. The following shows fluctuation in the cost of the beaver removal program over the last ten years (McKay, pers. comm., 2002):

Comparison of the Market Value of Harvested Beaver with the Cost to Remove Problem Beaver

Year	Market Harvest		Removal Program	
	Number Harvested	Market Value	Number Removed	Program Cost
1992/93	18,256	$ 273,840	2,403	$ 75,307
1993/94	27,107	$ 894,531	2,000	$ 30,000
1994/95	34,595	$ 934,065	6,870	$ 103,050
1995/96	23,656	$ 804,304	7,137	$ 111,480
1996/97	34,007	$ 1,462,301	3,408	$ 51,120
1997/98	35,424	$ 1,275,264	4,026	$ 60,390
1998/99	23,968	$ 662,236	5,273	$ 79,095
1999/00	21,012	$ 648,220	7,171	$ 107,565
2000/01	20,906	$ 656,716	8,114	$ 121,710
2001/02	23,000	$ 518,650	12,740	$ 191,100
Total	261,931	$ 8,039,127	59,142	$ 930,817

Manitoba Health

Manitoba Health operates in partnership with Manitoba Agriculture's Veterinary Services, Manitoba Conservation and Agriculture Canada on issues of zoonotic diseases from wildlife reservoirs. Their primary concern is rabies and as such only rabies prevention has hard costs associated with it. At least half of these costs are to prevent human rabies from infected cats and dogs (Horne, pers. comm., 1998).

Rabies Prevention	Expenditures
Rabies vaccine (purchase)	67,496
Rabies Immuno-Globulin (purchase)	29,929
Professional Services (vaccinations)	20,000
	$ 117,425

Manitoba Transportation and Government Services

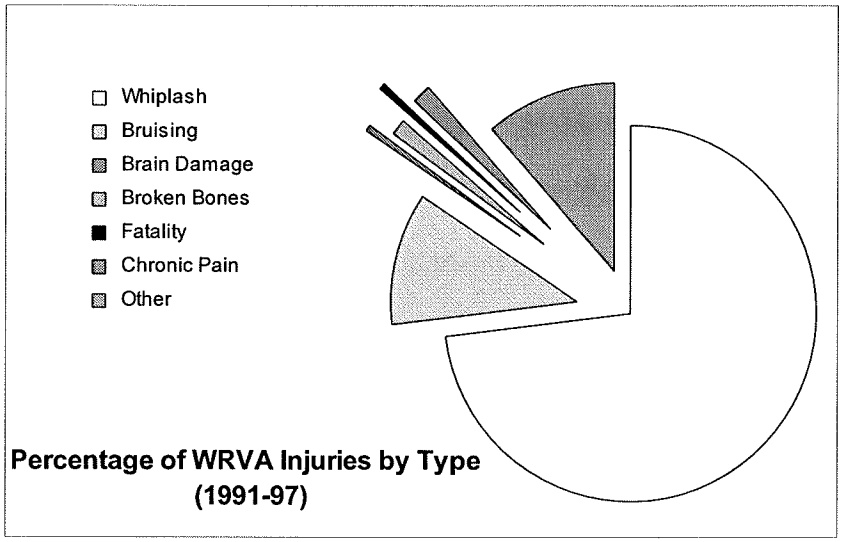
Manitoba Transportation and Government Services has two basic areas of responsibility: the provincial transportation system and services, and support services to other government departments and agencies. One of the Transportation Section's responsibilites is the construction and maintenance of Manitoba's roads. The major wildlife-related damage expenditure for the Department is the repair and re-construction of roads due to the flooding caused by the dam-building of beavers. Recent costs were not available for inclusion, but the following figures, from 1989, give some indication of the annual costs incurred by the Department (McKay, pers.comm., 2002).

Districts	1989 Costs
Northern	143,368
Whiteshell	15,792
Steinbach	6,848
Dauphin	5,776
Brandon	5,792
Total Costs	$ 177,576

Manitoba Public Insurance Corporation (MPIC)

The Manitoba Public Insurance Corporation was incorporated as a Crown Corporation under the Automobile Insurance Act in 1970 and was renamed the Manitoba Public Insurance Act in 1974. Under the provisions of this Act and regulations, the Corporation operates an automobile insurance division which provides for basic universal compulsory automobile insurance, extension and special risk coverages. In Manitoba, white-tail deer are involved in the majority of wildlife-related vehicle accidents (MPIC, 1998).

According to the Manitoba Public Insurance Corporation (MPIC), there are an average of 8,000 wildlife-related vehicle accidents per year in Manitoba. In 2000, 200 hundred drivers were injured in collisions with wildlife. The table below show the average wildlife-related vehicle accident expenditures during the 1990s. The pie-chart is a representation MPIC's average claims by injury: whiplash, bruising, chronic pain, broken bones, brain damage and fatalities for the same period. (Bell, pers. comm., 1998; Eguakun, pers. comm., 1998; MPIC, 1998).



Percentage of WRVA Injuries by Type (1991-97)

Claim Type	# of Claims	Average Annual WRVA Expenditures (1991-97)			Avg. Claim
		Compensation	Administration	Total	
Single-Vehicle	5,600	11,060,000	1,327,200	12,387,200	2,144
Multi-Vehicle	18	48,258	5,791	54,049	2,162
Bodily Injury	29	166,519	19,982	186,501	4,145
		$ 11,274,777	$ 1,352,973	$ 12,627,750	

Deer are the species most commonly involved though elk, moose, coyote, fox and the occasional bear have also been identified. There are approximately 200,000 white-tailed deer in Manitoba, 800 to 1,000 of which belong to the Winnipeg herd. On average 7,000 deer die annually in deer-related wildlife accidents (DRVAs) across the province, however, the highest density occurs in Winnipeg where 250 or twenty-five percent of the urban deer herd are killed each year. By comparison, 30,000 deer are taken annually by hunters (McKay, pers. comm., 2002). October and November are the worst months for wildlife-related vehicle accidents as it is the mating season for deer and elk. Motorists are twice as likely to hit a deer during this time of the year than during the Spring months. In 2000, there were 1,200 deer killed on Manitoba roads during the month of November. The most dangerous rural areas for DRVAs are within 100 km of Brandon, especially along Provincial Highway # 10 to the U.S. border, followed by Provincial Highway # 59 near Birds Hill Provincial Park, and the highways in the Dauphin and Steinbach areas. In Winnipeg, most of the deer are killed on the major thoroughfares around the Assiniboine Forest - Kenaston and Roblin Boulevards, Corydon, Grant and Wilkes Avenues. A major refuge for deer in the City is located along the Assiniboine River in the older residential neighbourhoods of Charleswood and Old Tuxedo, including Assiniboine Park.

Parks and Recreation Branch, City of Winnipeg

The Parks and Recreation Branch maintains the City's parks and natural areas with a holistic philosophy of parks as ecosystems. They have no any jurisdiction to manage wildlife however, so they must rely on other agencies. The only problem-wildlife information available through this Branch relates to tree damage due to beavers. According to the City Naturalist, the City's population of beavers is estimated at approximately 355 on the City's

eight waterways - the Red, Assiniboine, Seine and LaSalle Rivers and along Sturgeon, Truro, Omand's and Bunn's Creeks. The 1995 tree damage replacement costs were estimated at $200,000.00 (Hemmings, pers. comm., 1998).

Assiniboine Park Zoo, City of Winnipeg

The Assiniboine Park Zoo technically reports to the Parks and Recreation Branch of the City of Winnipeg, however, indigenous wildlife within the limits of the Zoo fall within the jurisdiction of Zoo management as they can pose a serious threat to the health and safety of the Zoo's captive animals. The diseases that cause the greatest loss or the most clinical problems are due to interactions with wildlife and include: avian tuberculosis (wild birds), tularaemia (wild rodents) and perhaps some parasitism (Glover, pers. comm., 1998). It is estimated that the financial impact of diseases acquired from wildlife reservoirs is approximately $5,000-10,000 per year in treatment while the prevention and animal loss costs probably account for $35,000 to 50,000. From a veterinary perspective, the Zoo is involved in the care and disposition of non-releasable (injured or orphaned) wild animals and occasionally consults with wildlife agencies related to the restraint of dangerous wild animals, usually within the City of Winnipeg. Prior to the formation of the Manitoba Wildlife Rehabilitation Organization facility at Glenlea, 90% of the wild animal admissions to the Zoo were mammals. Since then, 50-60% of admissions are birds, 30-40% are mammals and 5-10% are reptiles and amphibians. It is estimated that half of these admissions survive, but the half that do not, most (75%) are euthanized. Only 10-20% of all admissions are releasable. Prevention and control of indigenous wildlife in the Zoo are usually handled by Zoo staff, though assistance from other agencies may be sought. The following is a breakdown of the average annual expenditures due to wildlife-related activities in the

Assiniboine Park Zoo:

Wildlife-Related Activities		Cost
Zoo Animals	Disease Treatment	10,000
	Prevention and Animal Losses	50,000
Wildlife	Veterinary Services - 3 weeks	3,000
	Animal Health Technician - 3 weeks	2,000
	Pharmaceuticals & Non-Reusable Supplies	4,000
	Feed Supplies	600
	Zookeeper - 1.5 staff / 52 weeks = 78 weeks	50,000
	Additional Staff (for trapping & removal) - 4 weeks	2,500
		$ 122,100

Animal Services Branch, City of Winnipeg

This municipal division is mainly responsible for enforcing the Pound By-Law to regulate domestic pets in Winnipeg, however, they frequently receive calls from the public in regard to urban wildlife issues. In addition, they provide livetraps for small mammals, assist Manitoba Conservation to trap problem animals and handle public requests for assistance. At this time, annual costs are not available for publication in this report (Dack, pers. comm., 2001).

Health Department, City of Winnipeg

The City Health Department is involved with wildlife only in the inner city area and only with health concerns from rodents and insects. They too are an agency contacted by the public for information, especially in the area of problem-wildlife. They were not however, able to provide information of the annual cost to respond to the wildlife-related queries.

Manitoba Wildlife Rehabilitation Organization (MWRO)

The Manitoba Wildlife Rehabilitation Organization was established in 1984 and originally operated out of volunteers' homes. In 1993, a rehabilitation centre was constructed at the University of Manitoba's Glenlea Research Station just south of Winnipeg on Provincial Highway # 75. Currently there are three full-time staff members at the Centre and 50 active volunteers. The organization has a volunteer Board-of-Directors which oversees a variety of committees charged with animal care, education, fundraising and strategic planning. The Manitoba Wildlife Rehabilitation Organization provides assistance to orphaned and injured animals in the province as well as providing information (upon request) to the public on wildlife issues. The organization receives approximately 7,000 phone calls per year, most of which are requests for advice regarding fledgling birds, nuisance situations, etc. Annually, they handle between 1,200 and 1,500 birds and mammals. Veterinary services are donated by local vets. As a not-for-profit wildlife rehabilitation organization, MWRO funds its operations via donations, grants and year-round fundraising activities. The following is a partial breakdown of the organization's operating expenses for the 1997 operating year (Bloom, pers. comm., 1998; Tretiak, pers. comm., 1998).

Wildlife-Related Expenditures	**Costs**
Centre Staff Time	24,986
Rehabilitation Services & Supplies	2,743
Fundraising Activities	21,543
Capital Expenses	6,412
Operating Expenses	12,685
	$ 68,369

Winnipeg Humane Society (WHS)

Established in 1984, the Winnipeg Humane Society is governed by a volunteer Board-of-Directors who set guidelines and policies for the day-to-day operations at the shelter. Over the last 108 years, the Society has maintained its primary mission of addressing animal welfare issues and providing care to unwanted pets. Primarily involved with the welfare of non-wild animals in the province, they are not involved with individual wild animals unless the welfare of an animal is at stake at which point they notify the proper government agency. The Society responds to approximately 2,000 wildlife-related inquiries and receives several hundred (500-800) wild animals at their shelter. These animals are usually held at the Society for less than 24 hours before they are released (the ones that survive) to the Manitoba Wildlife Rehabilitation Organization for further care and rehabilitation (MWRO is paid a monthly fee for this service). There are fifty individuals on staff (thirty full-time, twenty part-time) and veterinary services are contracted on an hourly basis, primarily for spay/neuter services. Recent wildlife costs of $28,500.00 account for only one-and-one-half percent of the Society's annual budget of $1,900,000.00 (Burns, pers. comm., 2000).

Manitoba Trappers Association

The Manitoba Trappers Association is a non-profit organization that represents the interests of Manitoba trappers. Association members play a direct role in problem-wildlife management by administering beaver removal programs, assigning trappers to specific problem areas and working with Manitoba Conservation to develop problem-animal policies and programs. Although there is no direct cost to the Association, in terms of wildlife damage, problem-animal control results in an expenditure of $2,000 - $5,000 per year for

administering and assisting with wildlife damage situations.

Peregrine Falcon Recovery Project (Manitoba)

The Peregrine Falcon Recovery Project is a non-profit species recovery organization actively working to establish a sustainable population of Peregrine Falcons in Manitoba. Because of the nature of the Project's work and its association with Manitoba Conservation, they are frequently contacted by and provide assistance to the public regarding all species of birds-of-prey. Actual costs are not identified in the Project's financial records, but rather are absorbed by the Project and are considered to be part of their commitment to raptor conservation. The Project's problem-wildlife activities cost $3,000.00 per annum and account for forty percent of their annual financial and time budgets (Maconachie, pers. comm., 2002).

Manitoba Wildlife Federation

The Manitoba Wildlife Federation volunteers its services to address wildlife issues in the province. For example, they participated in an effort to remove 200 white-tail deer from Winnipeg (coordinated and supervised by Manitoba Conservation) and to help chase them from the airport. They also receive numerous requests from the public for information on wildlife issues and educational material.

Manitoba Naturalists Society

Indirectly involved with wildlife through the establishment of their Urban Environment Committee (which is responsible for trying to protect natural areas within Winnipeg), they are involved in providing information to the public and actively promoting environmental

awareness through their educational and informational programming.

Pest Control Providers

Private exterminators deal most commonly with mammals (raccoons, skunk, feral domestic cats, rabbits, voles, mice, ground- and tree-squirrels) and bird species (crows, starlings, sparrows, grackles and pigeons) which are damaging buildings or landscape on private property. At least one extermination company in Winnipeg is actively involved in habitat modification as an alternative to automatic extermination (Gosselin, pers. comm., 1999). The largest of the province's pest service companies is SWAT Team Pest Services Inc. with offices in Brandon and Winnipeg. SWAT accounts for approximately forty percent of the City's problem-wildlife business and are considered in the middle of the price range for pest control in Winnipeg. Expenses incurred by the other nine pest control companies are not available for publication in this report as the Winnipeg market is highly competitive and the companies are reticent to publish this data. The following is a very simple extrapolation of the average annual expenses provided by SWAT:

	SWAT Team (40 %)	**Extrapolated (100%)**
Live-trapping Services	83375	208437
Extermination Services	104500	261250
Problem Wildlife	$ 187,875	$ 469,687

Veterinarians

Private veterinary clinics and hospitals do not have any legal responsibility to treat injured or orphaned wildlife, although most admit to taking in wildlife brought to them by clients. Whenever possible clients are referred to other agencies - the Manitoba Wildlife Rehabilitation Organization, City of Winnipeg Animal Services and the Winnipeg Humane Society. Thirty-nine veterinary clinics in and around Winnipeg were contacted regarding their annual involvement with wildlife. Ten clinics responded to a request for information providing information on the number of wildlife cases per year, the number of staff involved, the length of staff time per case, disposition of the animals following care and the costs incurred. All staffing, equipment, and materials expenditures are absorbed by the individual clinics and therefore are not itemized in their financial records. The best available estimate is that $ 40,000.00 per annum is absorbed by the ten responding clinics. Extrapolating for all thirty-nine area clinics, the annual vet service costs for wildlife cases is approximately $ 156,000.00 annually.

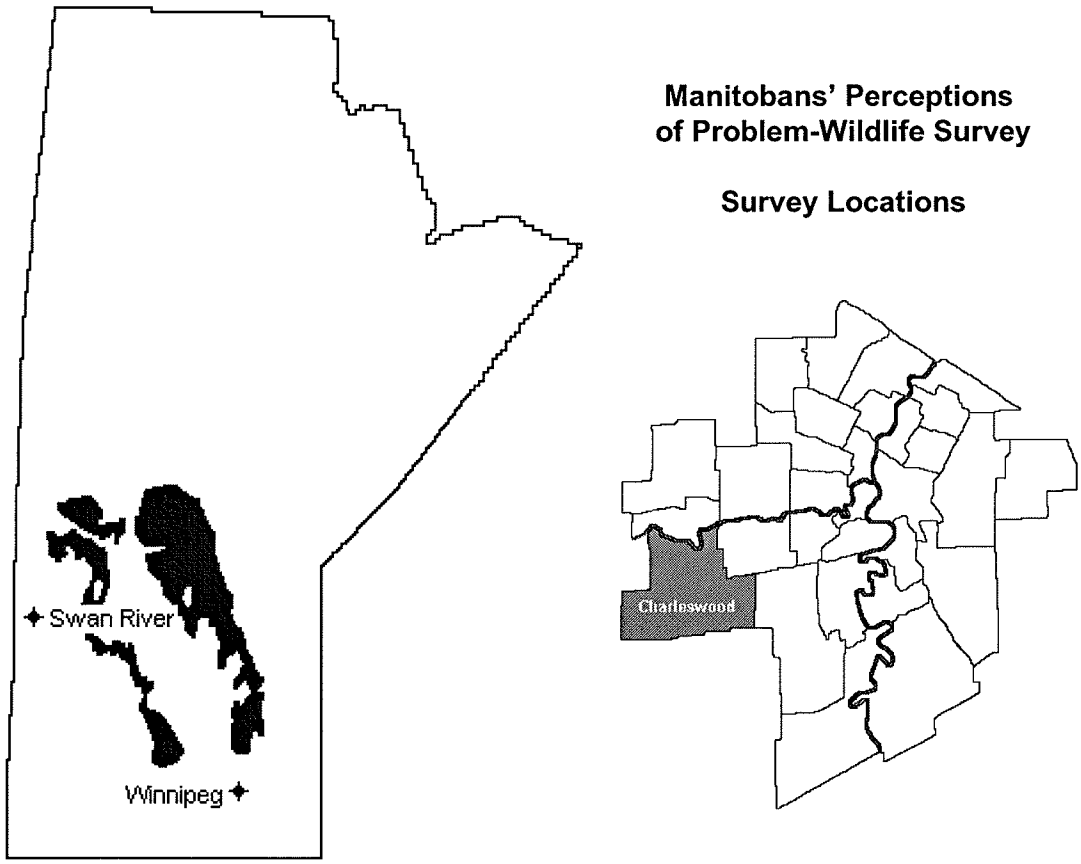
Table 3.6 shows Manitoba's estimated annual problem-wildlife expenditures as itemized above. Of the wildlife management agencies identified, just over half are able to provide some expenditure information but with the exception of the Manitoba Crop Insurance Corporation, Manitoba Public Insurance Corporation and the Manitoba Wildlife Rehabilitation Organization, all the estimates provided by agency representatives are estimates or extrapolations. Even with these conditions, Manitoba's annual problem-wildlife expenditures total almost twenty million dollars. A more accurate assessment of annual expenditures would require considerable effort on the part of the individual agencies.

Table 3.6 Estimated Annual Problem-Wildlife Expenditures for Manitoba

Agency / Participant	Administration	Compensation
Agriculture & Agri-Food Canada	----------	----------
Canadian Wildlife Service	----------	----------
Parks Canada	----------	----------
Transport Canada	----------	----------
Manitoba Agriculture & Food	1,050	----------
Manitoba Crop Insurance Corporation	291,400	1,563,666
Manitoba Conservation	321,481	144,780
Manitoba Health	117,425	----------
Manitoba Transportation & Government Services	177,576	----------
Manitoba Public Insurance Corporation	1,352,973	11,274,777
Parks & Recreation, City of Winnipeg	----------	200,000
Assiniboine Park Zoo	122,100	----------
Animal Services, City of Winnipeg	----------	----------
Health Department, City of Winnipeg	----------	----------
Manitoba Wildlife Rehabilitation Organization	68,369	----------
Winnipeg Humane Society	28,500	----------
Manitoba Trappers Association	5,000	----------
Peregrine Falcon Recovery Project (Manitoba)	3,000	----------
Manitoba Wildlife Federation	----------	----------
Manitoba Naturalists Society	----------	----------
Pest Control Providers (Winnipeg)	469,688	----------
Veterinarians (Winnipeg & surrounding area)	156,000	----------
	$ 3,114,562	$ 13,183,223
Estimated Annual Problem-Wildlife		**$ 16,297,785**

3.2 Manitobans' Perceptions of Human-Wildlife Interactions

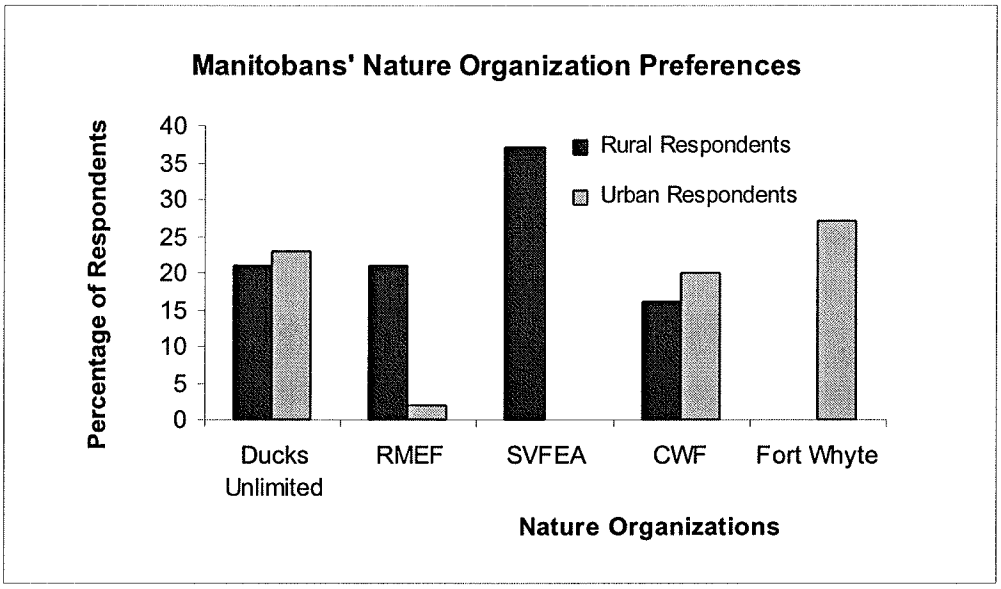
In order to research Manitobans' perceptions of problem-wildlife in the province, it was determined that a survey would be the most effective tool. A mail-out survey was used to solicit information from a sample of rural respondents in the Swan River area. A telephone survey was similarly conducted to query Winnipeg residents in the Charleswood area.



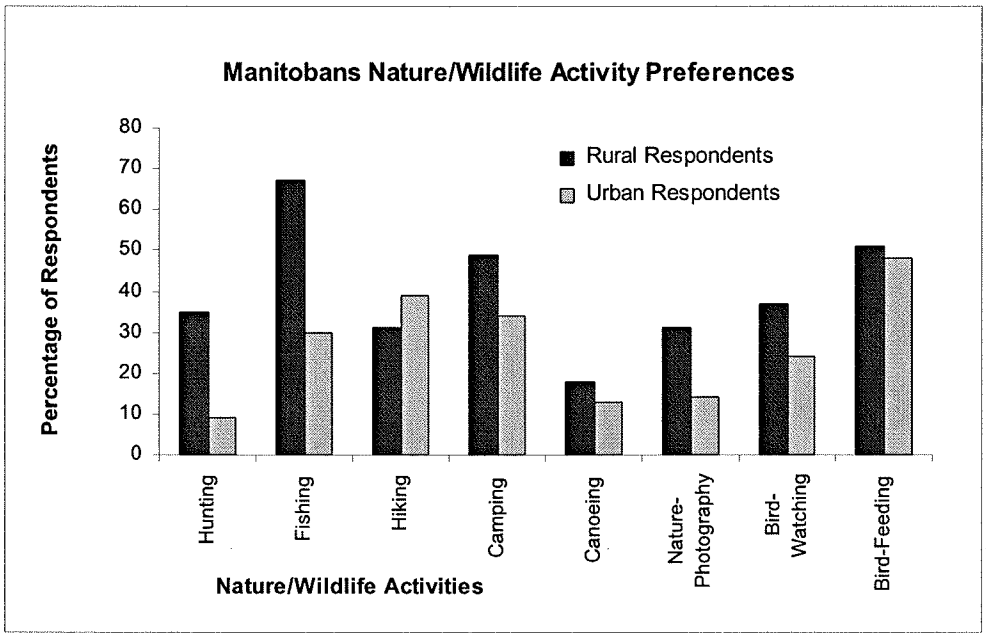
As the survey was designed to investigate attitudes about problem-wildlife in particular, the sample areas were chosen from those identified as having problem-wildlife activity. As problem-wildlife is both an urban and a rural concern, the survey was conducted rurally in a "problem" area identified by the Manitoba Crop Insurance Corporation while the urban survey area was based on automotive accident reports from the Manitoba Public Insurance Corporation and on the recommendation of Manitoba Conservation's Wildlife and Ecosystem Protection Branch. Ten percent (49 out of 490) of the rural surveys were returned compared with 33% (160 out of 490) of the urban surveys. As both surveys were conducted at the same time of the year and both took approximately the same amount of time to complete, it may indicate that potential rural respondents did not find the survey subject matter to be sufficiently relevant to participate.

3.2.1 Province-wide Perceptions of Problem-Wildlife

According to the rural and urban surveys, Manitobans' perceptions of human-wildlife interactions, 36% of the respondents province-wide supported a nature-or wildlife-related organization - considerably more than the 9% nationally. As the graph below shows, Ducks Unlimited garnered most of the support among both the rural and urban respondents. Reasonably enough the next two most popular organizations differed depending on whether the respondent was rural or urban. The support on a provincial scale demonstrates the influence of Manitoba's predominately urban population. It also confirms the results of more general studies that have reported that rural residents engage in more consumptive activities than do urban residents. Ducks Unlimited, the Rocky Mountain Elk Foundation and the Swan Valley Fish Enhancement Association are all organizations formed to conserve sport game species - ducks and geese, elk and local fish species. Urban



residents' interactions in general are less consumptive. Ducks Unlimited was identified because of Oak Hammock Marsh and its wildlife-viewing and interpretation activities. The national wildlife conservation organization, Canadian Wildlife Federation, was the second highest rated organization among urban residents followed by the Fort Whyte Centre, a



nature education centre in southwest Winnipeg. All three of the urban respondents' preferences are based on the non-consumptive activities of these organizations. Overall, rural respondents reported both more consumptive and non-consumptive activities than urban respondents (see graph above). Only hiking ranked higher among urban respondents, though many of these could be day-trip excursions, in which case, a higher rating among urban respondents would not be so surprising.

3.2.2 At Home on the Farm

The emphasis on "intensified industrialization of Prairie agriculture" since its inception a century ago has been a "sure formula for the destruction of wetlands, the clearing of woodlands, the abuse of marginal lands, the deterioration of soils" (Welsted et al., 1996). Cultivation of prairie grasslands for grain production and cattle-grazing has transformed southern Manitoba. As a result domestic species compete with wildlife for living space on farms. Wildlife however is at a disadvantage as their domestic counterparts are the farmer's source of income.

Although Manitoba has a total land area of 54.8 million hectares, only one-quarter (27% or 14.6 million hectares) is suitable for agriculture and is spread over an area that extends from The Pas to the U.S. border and from Beausejour to the Saskatchewan border. Of the three Prairie Provinces, Manitoba grows the greatest variety of crops because of its varied climate and topography. In 2001, Manitoba's cash receipts were estimated at a record $3.31 billion, 55% from crop production, 45% from livestock production (including honey, fur and P.M.U.).

It is rare in Manitoba for an individual farm to gain its entire income from a single crop; while some farms depend on only one livestock enterprise, most of them raise feed

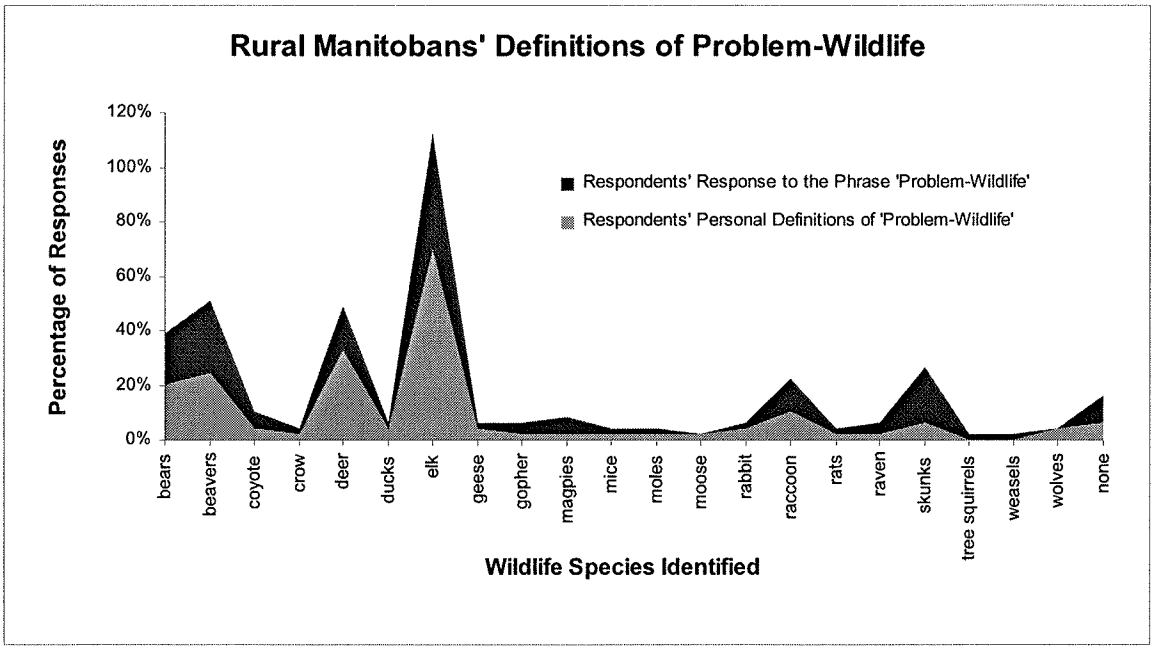
or forage crops. The typical Manitoba farm is diverse, and often changes its production patterns from year to year in response to market demand and weather conditions. Fifty years ago, one Manitoba farm fed 50 people, whereas today due to modern intensive agricultural practices - mechanization, monoculture, concentrated herbicide and pesticide use - that same farm can now feed 250 people.

The dominance of crops, especially grain crops, as sources of income on Manitoba farms is historic. Farms on which grain forms the main source of income predominate in all districts of good agricultural land. Wheat farms - farms on which 51% or more of the estimated income is derived from the sale of wheat - are the main type in the southwest and parts of the Red River Plain. In most districts of good farmland, however, wheat alone does not provide more than half the income; small grains (wheat, barley, oats, rye and others) in combination are the mainstays on most farms. Beef cattle are an important source of income in pockets of poor land in the grain-growing districts. Many grain farms also grow oilseeds, and some include potatoes, peas and other special crops in their rotations. Livestock farms dominate where lands are more suited to the growing of forages. Beef cattle farms (or ranches) tend to be single enterprise operations but a poultry or dairy farm may also derive significant income from hogs, or a farm on which more than half the income is from hogs may also grow canola (Welsted et al., 1996).

The average Manitoba farm is 361 hectares in size though some livestock operations are just large enough for a barn and a house, and some grain farms are several kilometers in size. Nearly all (98%) of the province's 21,071 farms are family-owned and operated. In general, 18% of farm operators were less than 35 years old, 51% were 35 to 54, and over 31% were over 55 years of age. Approximately 1 in 14 Manitobans lives on a farm (Manitoba Agriculture, 2001).

Rural Manitobans' Perceptions of Problem-Wildlife

According to the results of the rural residents' survey in the Swan River area, the five wildlife species (including birds, mammals, reptiles and amphibians) most frequently encountered around the respondents' homes are: deer (88%), elk (65%), non-waterfowl birds (59%), coyote (57%) and finally, bear and foxes (both 37%). When asked what kinds of interactions the respondents' regularly experience with the wildlife near their homes, 57% simply observed the wildlife, 22% reported damage and 16% experienced no interactions. When asked if any of these interactions were considered a "nuisance" or a "problem", 59% of the survey's respondents' answered affirmatively. Twenty-eight percent of these affirmative responses described their interactions with wildlife as being a "problem" or "nuisance". Forty-one percent were more specific and reported wildlife-related damage.



When asked what species came to mind when the phrase "problem-wildlife" was used, rural respondents identified elk (69% of the time), deer (33%), beaver (24%), bear

(20%) and raccoons (10%). Not unexpectedly, when these same respondents were asked what species they personally considered to be a "problem" or "nuisance", elk, deer, beaver and bears were again identified. As the graph above illustrates, there were some differences in the response rates however. Deer were encountered more than elk, but elk were more often identified as a problem-wildlife species. Although deer and elk were identified by most respondents when asked about the term problem-wildlife, respondents did not personally rate either as much of a problem. Skunks conversely were reported three times as often. As discussed in the introduction of this document, this survey area was chosen based on a greater than average number of compensation pay-outs by the Manitoba Crop Insurance Corporation. As such, it is interesting to note that two of the species that are compensated for in the area are not equally considered to be a problem by individual respondents. This could be a reflection of the affection farmers have for wildlife even though individual species may damage their property or economic livelihood.

When asked about their experiences solving problems with wildlife, only 31% of rural respondents answered that they had had occasion to contact a wildlife agency. Of those, 93% indicated that they had contacted Manitoba Conservation, the rest had contacted either their local Police Department or the Royal Canadian Mounted Police. Most respondents (47%) reported that they had received assistance though almost as many (33%) responded by saying "yes and no". Sixty percent were satisfied with the assistance they received while 13% again answered "yes and no" to the question. Rural respondents had no comment on what could have been done to improve assistance they received in this situation.

When asked generally about who they would contact for three specific situations - damage to property, a wildlife-related vehicular accident (WRVA), and an injured animal -

most (65%, 59% and 53%) of rural respondents indicated that they would contact Manitoba Conservation. Other agencies they would contact included: the Manitoba Crop Insurance Corporation for property damage; the RCMP for a wildlife-related vehicle accident and the local vet for an injured animal. For each of these situations, 6 to 8% of respondents indicated that they did not know who they would contact and another 14 to 18% did not provide an answer with regard to WRVAs and injured wildlife. Also of interest was what rural respondents would do to contact these agencies in emergency and non-emergency situations. The following are the results of this question.

Situation	Time of Day	Phone Agency Directly	Consult Phone Book	Police / RCMP	Did Not Know	No Answer
Non-Emergency	**office hours**	33%	8%	0%	27%	18%
	after hours	22%	8%	0%	27%	41%
Emergency	**office hours**	37%	0%	0%	31%	9%
	after hours	31%	0%	16%	31%	39%

This table shows that, for the most part, the rural respondents did not know how to contact a particular wildlife agency in the given situations. Many respondents noted that they would contact an agency after-hours in the hope that the agency would provide after-hours emergency information. None of the respondents reported that they knew such information would be available should they need it.

3.2.3 The Urban Jungle

It has been estimated that only five percent of the earth's terrestrial surface is occupied by urban areas (towns, cities and suburbs) and the majority (80%) of the human

population reside in these areas. The trend toward urbanization is predicted to continue. To survive, all wild animals must have food, water, cover in which to hide and space to live and reproduce. Good wildlife habitat includes all of these elements. Urbanization affects living conditions for wildlife in many ways. It influences the local environment e.g. temperature and precipitation: it eliminates, alters, or creates new wildlife habitats and it also affects wildlife directly, e.g. through death resulting from accidents on highways and streets and colliding with building windows. Wildlife species that can adapt to these kinds of changes, survive; those that cannot, relocate or perish.

Manitoba is the 6th largest province in Canada (649,950 km^2) and has the fifth largest population (1,091, 942 in 1991 though this only accounts for 4% of the Canadian total), giving it an average population density of only 2.0 people per km^2. It is the most easterly of the Prairie Provinces, yet much of its land surface is taken up with Canadian Shield and over 15% is water including some very large lakes. Also, although it is regarded as a rural province by most outsiders (and most residents), most of Manitoba's population is urban.

According to the Census of Canada, an "urban" area is a place that has attained a population of at least 1,000 and a population density of at least 400 people per km2 at the previous census. All territory lying outside urban areas is regarded as rural. Between 1971 and 1991, the total population of the province increased by more than 10%. Most of this gain resulted from population growth in urban areas, which experienced an overall increase of approximately 15% in the same period. The rural population remained essentially static, showing only 0.9% growth. Consequently, the urban portion of the province's total population increased from 69.5% in 1971 to 72.1% in 1991 (Welsted et al., 1996). This shift toward urban areas mirrors a similar pattern of urbanization occurring right across

Canada.

Whereas other Prairie Provinces (Alberta and Saskatchewan) are characterized by two metropolitan area (Calgary and Edmonton; Regina and Saskatoon), Manitoba is dominated by and, in the perception of many people living outside the City, overshadowed by a single metropolis, Winnipeg. Although the City has largely lost its major function as a "gateway to Western Canada", and its recent growth has lagged behind that of most other Western Canadian metropolitan centres, no other Prairie City exhibits the same level of urban primacy (Welsted et al., 1996).

Since the mid-20th century, more than half of the province's population has lived in this urban agglomeration. In 1971, 535, 233 people resided in Winnipeg, 54.2% of Manitoba's population of 988,247. Two decades later, the City contained 56.5% of the province's total population, for a 15.2% increase in the City's population. With increased diversification of the agricultural economy on one hand, and the uncertainty of the farm economy on the other, many people have left their traditional place of rural residence and moved into, or close to, Winnipeg.

By 1996, there were 42 urban centres in Manitoba. Since 1971, the fringe communities in the metropolitan area outside the city limits and beyond the jurisdiction of the City, have been growing more rapidly than the City itself. As mentioned earlier, Winnipeg's population grew by a modest 15.2% over a twenty-year period from 1971 to 1991, but the rural municipalities in the fringe area grew by 69.4%, essentially as a result of local population shifts. Winnipeg residents are choosing to move outside the City into these neighbouring communities. They are commuting into the City for the purposes of employment, while maintaining a residence marked by lower property taxes and a more relaxed rural lifestyle. Anther major population change that has occurred in Winnipeg in

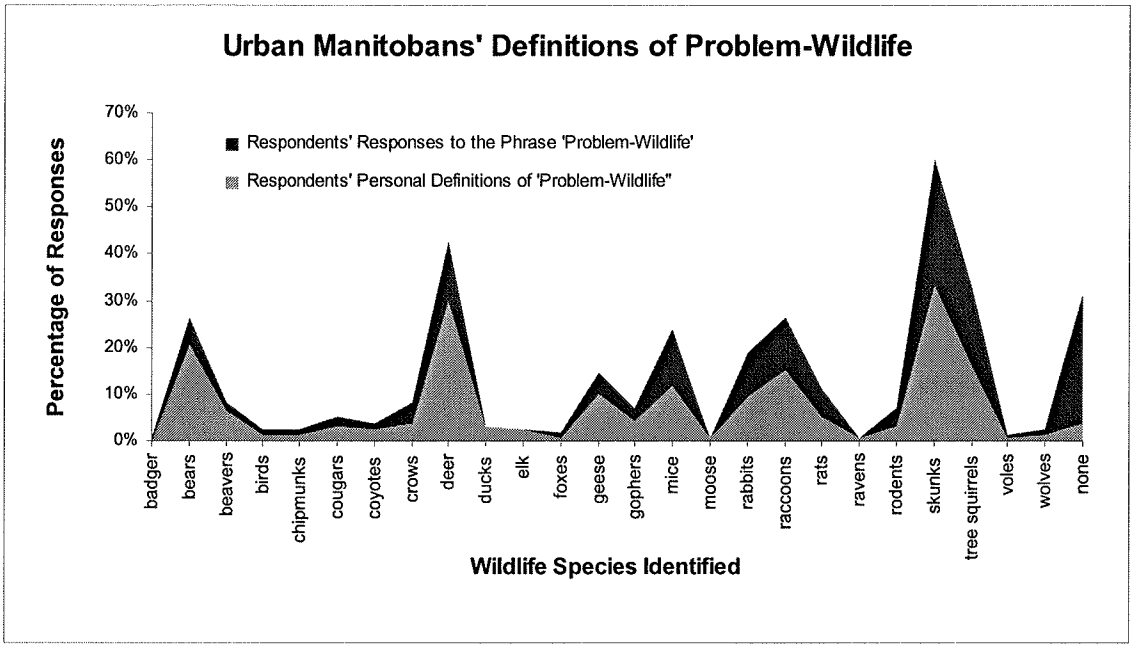
recent years, is the significant shift from inner city to suburbs (Welsted et al., 1996).

Urban Manitobans' Perceptions of Problem-Wildlife

When surveyed about their interactions with wildlife, only 39% of the Winnipeggers surveyed reported that their interactions with wildlife were problematic. The neighbourhood of Charleswood where the survey was conducted was chosen because it is a fifteen-minute drive from downtown; it is located on the banks of one of Winnipeg's two major rivers; it borders agricultural lands to the south; it is primarily residential; and it is an older neighbourhood with mature trees. As the purpose of this survey was to examine urban Manitobans' interactions with, and perceptions of, problem-wildlife, the presence of wildlife in the survey area was essential. Due to the environmental conditions in Charleswood, human-wildlife interactions are common.

Charleswood respondents reported a variety of wildlife species regularly found around their homes. Deer were cited most often (81%) followed by songbirds (71%), tree squirrels (66%), rabbits (53%) and raccoons (27%). Except that songbirds were identified rather than Canada Geese, these species were identified earlier as the most commonly cited urban problem-wildlife species. Like the rural survey respondents, Charleswood residents' primary interactions with wildlife are observational with 29% reporting that they fed songbirds on a regular basis.

When queried about the term problem-wildlife, urban respondents identified the following five species most often: skunk, deer, bear, tree squirrels and raccoons. As the graph below illustrates, the personal definitions of problem-wildlife of most Charleswood residents (28%) indicated that they did not consider their interactions with wildlife to be a problem or nuisance.



Species identified were mainly species that can be found in urban environments - skunk, tree squirrels, deer, mice and raccoons. In most cases, respondents' personal ratings of species were less than those for the term "problem-wildlife". This finding should not be considered remarkable perhaps as most (61%) urban respondents indicated that they did not consider their interactions with wildlife to be a problem. When asked specifically what species they consider to be a problem-wildlife species, 28% responded that they did not consider any species to be "nuisances or problem-wildlife". This may be due to the urban population's isolation from the natural world or that rarely is an urban resident's livelihood threatened by wildlife predation or depredation.

As with the rural survey participants, urban respondents were asked about their experiences solving their problems with wildlife. Again 31% of the respondents answered that they had had occasion to contact a wildlife agency regarding a problem-wildlife situation. Thirty-three percent of the affirmative responses indicated that they had

contacted Manitoba Conservation. Another 24% contacted the Police/RCMP and 14% each contacted the Manitoba Wildlife Rehabilitation Organization and the Winnipeg Humane Society and 10% contacted the City of Winnipeg. The majority of respondents (80%) reported that they had received assistance though only 61% said they were satisfied with this assistance. The most common complaint with the assistance they received was that they could not find or, be provided with, the phone number of the agency they needed to contact. Another suggestion to provide better customer service was to provide more information on preventing/solving future wildlife problems.

When asked generally about who they would contact for three specific situations - damage to property, a wildlife-related vehicular accident (WRVA), and an injured animal - Manitoba Conservation was identified in all three cases, but was not the respondents' first choice for any of the situations. For damage to property, respondents indicated that they would contact the City (23%), Manitoba Conservation (18%) and the Winnipeg Humane Society (11%). For WRVAs, The Police/RCMP were their first choice (44%), followed by Manitoba Conservation (17%) and then the City (12%). And finally, for injured wildlife, the Police/RCMP and the Winnipeg Humane Society were the most frequent answers (26% each), followed by Manitoba Conservation (16%). The Manitoba Wildlife Rehabilitation Organization whose mandate it is to rescue, treat and rehabilitate wildlife was only mentioned by 8% of urban respondents, but it was not identified by any rural respondents. Between 8 and 10% of urban respondents admitted to not knowing who to contact in these situations. Another 5 to 8% did not provide an answer. Overall, urban respondents indicated that they would/do contact a greater variety of agencies, organizations and groups than rural respondents. As with the rural participants, urban respondents were asked what they would do to if they had to contact these agencies in emergency and non-emergency

situations. Their responses are as follows:

Situation	Time of Day	Phone Agency Directly	Consult Phone Book	Police / RCMP	Did Not Know	No Answer
Non-Emergency	**office hours**	56%	20%	0%	22%	15%
	after hours	44%	20%	0%	23%	21%
Emergency	**office hours**	65%	14%	29%	22%	12%
	after hours	57%	11%	28%	21%	21%

Urban respondents showed a marked preference for calling the agency of their choice regardless of the situation or the time of day. It is possible, that because of the prevalence of voicemail and automated phone information systems in the urban business environment, urban respondents felt confident enough to call the agency without wondering whether assistance would be available. Urban problems with wildlife are less likely to be real emergencies (i.e., a danger to human health or safety), as a result urban respondents may have had less contact with the province's wildlife management agencies than rural respondents. Their answers may reflect assumptions rather than actual experience. Again, none of the respondents reported that they knew such information would be available should they need it.

Chapter Four Resolving Human-Wildlife Conflicts

4.1 Education as a Management Tool

What does it mean to solve a human-wildlife conflict? From a human dimensions perspective, a people-wildlife interaction or people-people interaction problem can be considered solved only when the stakeholders involved believe it to be so (Decker & Chase, 1997). Conover (2002) proposes four approaches to resolve human-wildlife conflicts by focussing on the human side of the conflict: 1) increase tolerance for conflicts through compensation; 2) alleviate conflicts by altering human behaviour; 3) alleviate conflicts by increasing human appreciation for wildlife; and 4) increase tolerance for conflicts through education. Approaches two through four can be accomplished by providing stakeholders with relevant, accurate and accessible information. Research has also shown that stakeholders are more likely to consider a public issue or problem to be solved acceptably when they have had a voice in the decision-making process. Furthermore, stakeholders' beliefs are changeable as they gain information and experience with the situation (Messmer et al., 1996, 1997). Undeniably, urbanization has isolated urban residents from frequent contact with the natural world, resulting in lower levels of knowledge about wildlife compared with rural residents. In spite of their relative lack of knowledge of the natural history of the wildlife around them, urban residents are aware of and value this natural resource. Increasingly wildlife managers are required to deal with the difficulty of managing both wildlife and people to optimize benefits to a society that is living with wildlife, and which is experiencing diverse benefits and problems as a result. The long-term success of any natural resource conservation effort will depend on public education and public support.

Wildlife agencies must become more pro-active in their approach to solving human-wildlife conflicts. Landowners must be encouraged to place a high value on the resources they control and become better stewards. The only way we will be able to have any real effect will be to educate our user groups so that they are aware of what is happening in their own backyards. Positive attitudes towards natural resources have been documented as a result of information-based programs at environmental education centres (Matthews & Lewandowski, 1987).

Education is an important component for any wildlife program (Matthews & Lewandowski, 1987; Blanchard, 1991). In order to help the public and private sectors to manage and conserve wildlife, there should be an understanding of why some animals adapt to human environments, why some do not, and why wildlife is important for maintaining an ecological balance (Adams et al., 1987). The importance of education in wildlife management is reflected in A *Wildlife Policy for Canada* (1990) which states that "effective conservation of wildlife relies upon a well-informed and involved public". When people learn, they change their behaviour. One way to cause behaviour to change is to educate. Other methods include public relations, propaganda, threats and rewards. To teach is to communicate or transfer information. Through education, people will understand that they have created much of the habitat that wildlife find attractive. Additionally, wildlife management agencies need to increase their visibility and credibility through enhanced communications. The need for public information is important to create awareness and foster appreciation for wildlife, to help bridge the gap between wildlife managers and the public and to help provide useful information (Young, 1991). Public information and education could also help residents manage their own problem wildlife encounters and rely less on government agencies.

In May of 1998, the Manitoba Round Table similarly proposed that the Manitoba Government "partner and cooperatively develop a public information system (e.g., 24-hour hotline, Web site) to: "1) to protect human life and property from the adverse effects of wildlife and management practices and related activities; and 2) to protect and enhance human life and well-being by maintaining and enhancing biological diversity". In particular, Policy 7.1 identifies the need to clarify and coordinate management activities between agencies, establish working relationships between wildlife managers and stakeholders and develop informational and educational initiatives for the general public. The Round Table's Wildlife Strategy also included a policy area "to enhance Manitobans' understanding of the relationships with wildlife, the environment, human health, society and the economy" through public education and awareness.

4.2 PAWS - the People and Wildlife System

4.2.1 Proposal

In 1996, The People And Wildlife System (PAWS) was proposed and undertaken to provide Manitobans and the wildlife managers at Manitoba Conservation with pertinent problem-wildlife management information via a website. To properly design this system, it was first necessary to examine the needs of these two groups. For the general public, this system needed to make available information about individual species, their legal status in Manitoba and techniques for managing some of their more problematic behaviours. According to Rose (1997), the number of children in the U.S. (and reasonably in Canada as well) who use the internet more than tripled from one million in 1995 to 3.9 million in 1996 and it was predicted that this number would have increased to 6.7 million by the end

of 1997. By mid-1999, the World Wide Web contained 800 million pages and although accurate counts of Web users remain difficult to come by, the latest statistics showed that 83 million Americans aged 16 and older regularly access the Internet (Phelps, 2000). About 200 million people worldwide use the Internet in some form, according the most reliable sources. Business, organizations and governments see the Web as a major tool to educate, inform, publicize, sell, communicate and recruit on an ever-growing scale. Estimates of total home Internet usage in homes with a personal computer is about 20 hours per week. A little more than half of the one billion hours spent on the computer are spent on-line (Phelps, 2000). DiCamillo and Schaefer (2000) found in their research that 75% of the males and 66% of the females had a computer at home and that 63% of those who had computers also had access to the Internet. Additionally, the Internet was chosen as the PAW System's communication medium because it: 1) enables a large amount of information to be made available to a large number of people relatively cheaply; 2) allows for information to be updated easily to reflect changes in legislation, jurisdiction and species status; 3) can also be used on an Intranet system without costly or complex modifications.

By providing a database of relevant wildlife and problem-wildlife information on the Internet, the general public has access to information that can enable them to better manage their own conflicts with wildlife. The limited research that has been conducted suggests that most homeowners who had a wildlife-problem indicated they did not try to solve the problem because they did not know how (O'Donnell and Van Druff, 1987). As discussed earlier, most Manitobans surveyed reported experiencing some problematic human-wildlife interactions and a third of those surveyed reported having been involved in a wildlife-related vehicle accident at some time. However, less than a third of these same respondents were able to identify the main agencies involved in dealing with wildlife-related

property damage (provincial government), wildlife-related vehicle accidents (Manitoba Public Insurance Corporation) or dealing with injured/orphaned wildlife (Manitoba Wildlife Rehabilitation Organization). An equal number of survey respondents admitted to not knowing who to contact for assistance. Respondents also assumed that a) these agencies provide 24-hour information/emergency service or b) that a telephone system operator would know who to contact. Neither of these assumptions are correct and have lead to considerable frustration on the part of both the general public and wildlife managers.

4.2.2 Design

After identifying the need for the PAW System, it was necessary to research the available problem-wildlife information. Basic species information was deemed to be essential because of the (predominantly urban) general public's lack of familiarity with wildlife. The wealth of sources currently available necessitated the need to either a) establish a standard format or b) use a single source. The Canadian Wildlife Service (CWS) publishes a wildlife series entitled *Hinterland Who's Who* that makes special note of the species' biology, distribution, behaviour and importance in/to Canada's national history. When contacted, CWS willingly provided a complete set of the series and after some consultation they gave permission to reproduce the series on the PAWS website as long as proper credit was given. Information for the problem-wildlife prevention and control webpages were less abundant, but here too an excellent source was revealed. The University of Nebraska publishes a two volume set entitled *The Prevention and Control of Wildlife Damage*, edited in conjunction with the United States Department of Agriculture's Animal Damage Control Unit. The manual is used by a number of wildlife managers at Manitoba Conservation's Wildlife and Ecosystem Protection Branch and though they are

an excellent reference source, they are too expensive to purchase for all the staff (wildlife managers, natural resource officers) who require them. When contacted, the manual's editors at the University of Nebraska were interested in the idea for an on-line database of problem-wildlife techniques. The manual contains information on how to exclude, deter, chemically repel, trap, shoot and poison individual problem-wildlife animals and the editors were concerned that these techniques are for use by trained wildlife professionals, not the general public.

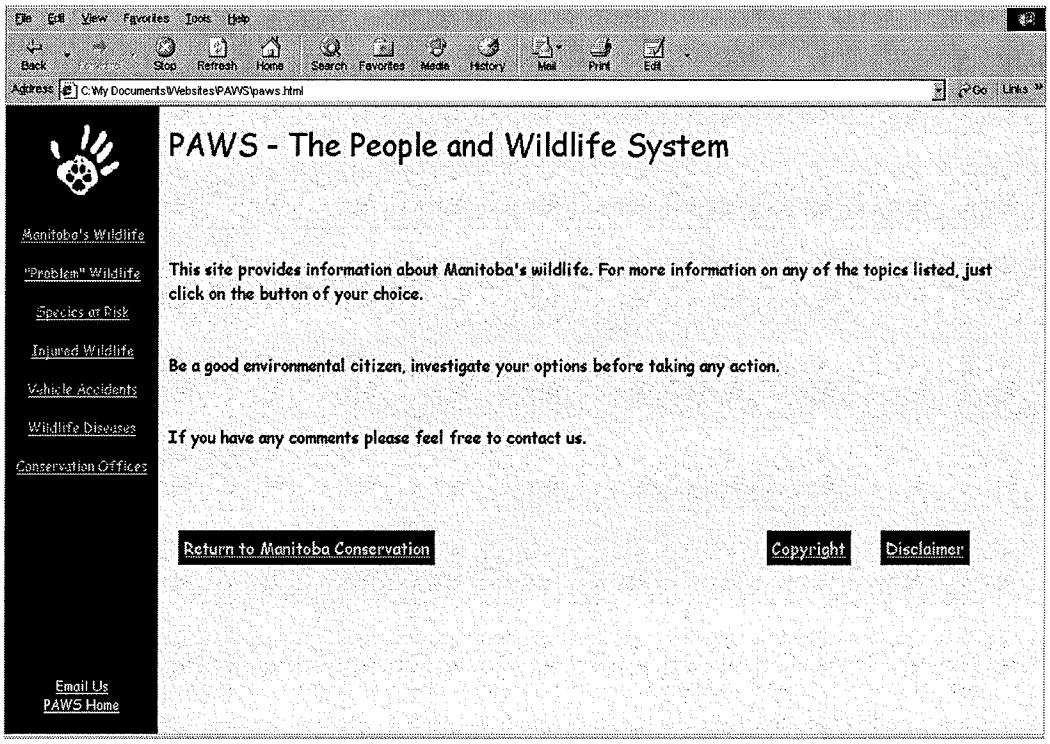
As the Internet is accessible to anyone, anywhere, lethal (or potentially lethal) preventative and control methods (i.e., shooting, trapping, use of toxicants and fumigants) were considered to be inappropriate to publish as wildlife and related legislation varies from one jurisdiction to another. Wildlife managers on the other hand, do require this information. Because their database is to be accessible only to Manitoba Conservation staff via the department's Intranet system, non-wildlife professionals will not have access. Informed that the intention of the PAW System was to provide lethal control information on Manitoba Conservation's internal Intranet only, they gave their consent to reproduce their publication with the same proviso as CWS - that proper credit be given to the editors of the manual. Another source of lethal control techniques was Alberta's Department of Wildlife, who also gave permission to reproduce their material with the proviso that it never be made available to the general public in any form. Lethal control methods are a necessary tool for the wildlife manager, but in our increasingly urban and wildlife-protectionist society, illustrating/demonstrating, for example, the correct method to construct a submerged trap to kill problem beaver by drowning, could cause a negative public backlash for wildlife managers at a time when public support and goodwill are essential in the face of fiscal constraint and departmental downsizing.

4.2.3 Development

Now that a basic design had been formulated and excellent reference source material has been acquired, the development of the actual system could begin. There are a variety of types of web browser and web publishing software packages. The decision was made to forego using the web publishing software as they were developed for use with more recent (and more powerful) versions of the more popular web browser software. As the purpose of the PAW System was to be available to as many people as possible, Hyper-Text Markup Language (HTML) source code language was used to construct the webpages as it is read/understood by all web browser softwares and versions.

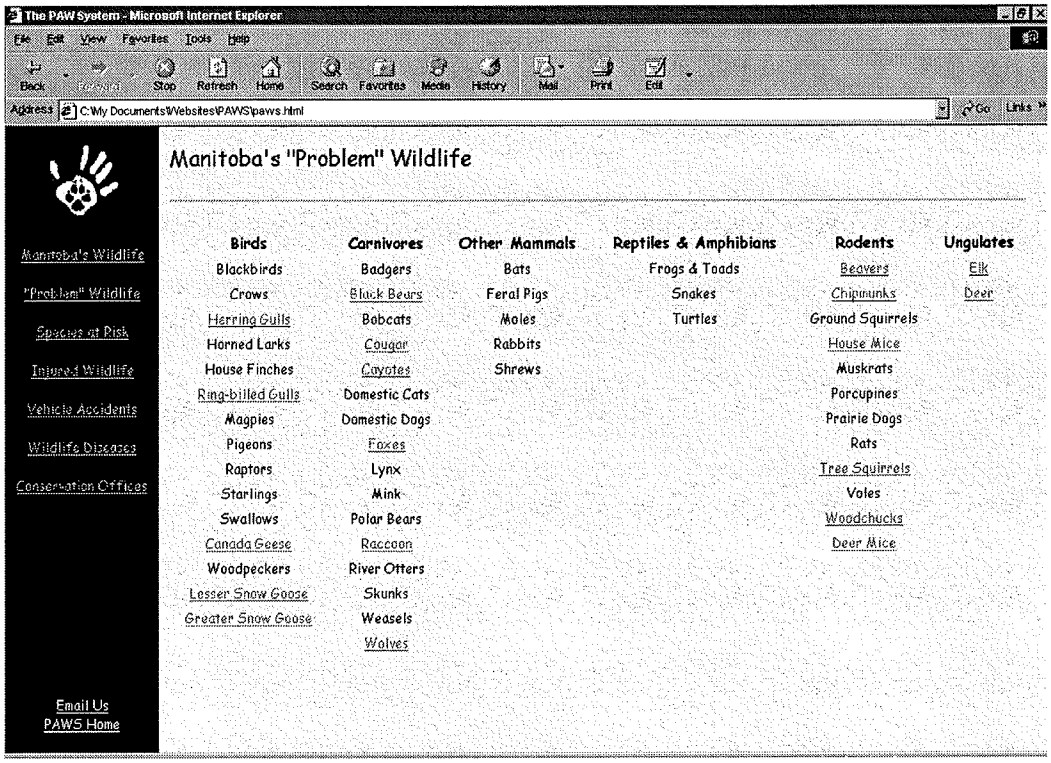
The actual construction of the website system was guided by the need to make the system as user-friendly as possible. There are two standard methods to navigate through webpages. The first is that the user proceeds from start to finish in a linear fashion and using the web browser's "back" button to return back through the webpages. The second navigation method is for the user to be guided through the webpages by the site designer using a series of menus. This way the user can always return directly to their original location in the website. Because the PAW System was to be used by the general public (who may only use the system occasionally) and by wildlife managers (who may access it continually), the decision was made to use the second navigational method in order to provide the use with as much control as possible. The next step in the construction of the website was to "map out" the information to be accessed in order to build a hierarchical layout that would be easy to understand and to use. As the CWS Hinterland Who's Who series included non-problem-wildlife species and as the system was to help the public improve/increase their awareness of the wildlife around them, it seemed prudent to include these additional species on the system. The five levels of the system are as follows:

PAWS Homepage



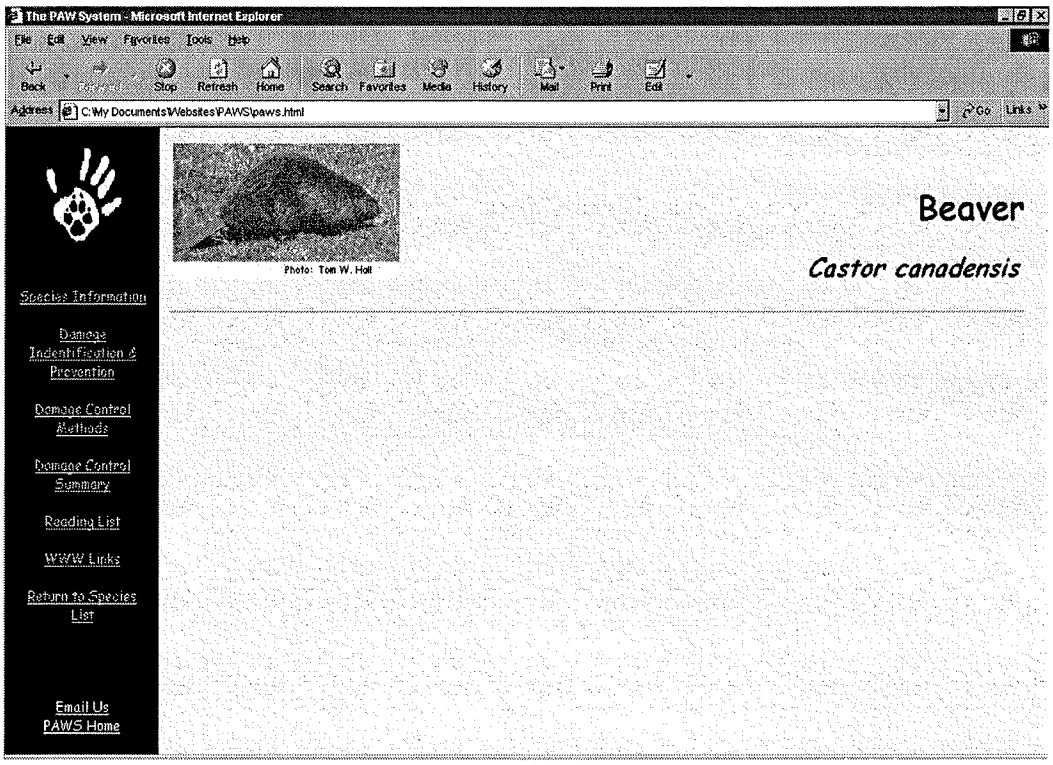
The "PAWS Homepage" is the user's first introduction to the Site. Because of policy requirements within Manitoba Conservation, the decision was made to host the PAWS Site on an external server with a link to the Manitoba Conservation, Wildlife and Ecosystem Protection Branch Website. As a result a copyright and disclaimer were required to inform the public of the source and purpose of the Site. The frame on the left-hand side of the screen is the Navigation Frame and contains the main navigational links available to the user. Because the PAW System uses "frames", it is more effective to use the links in the Navigation Frame than to use the web-browser "Back" button. Users need only follow the links to navigate around the System. Users can *Email Us* to inquire of the Site Administrator while the *PAWS Home* link returns the user to the current screen no matter where they are on the website.

Wildlife Interaction Webpage



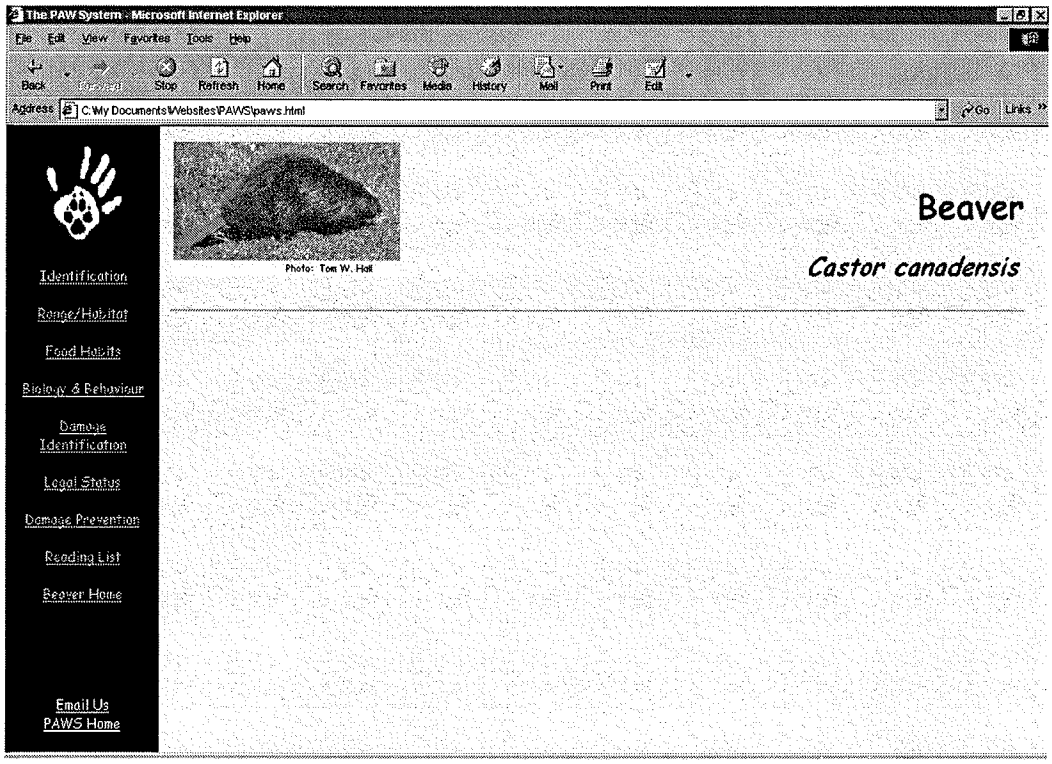
The "Wildlife Interaction Webpage" enables the user to access information about the individual wildlife species found in Manitoba. The page shown above is the *"Problem" Wildlife* species list. Other species lists can be accessed via the *Manitoba's Wildlife* and *Species-at-Risk* links in the Navigation Frame. Other types of information available at this level include what to do in the case of injured or orphaned wildlife (*Injured Wildlife*), wildlife-related vehicle accidents (*Vehicle Accidents*), and diseases that can be transmitted from wildlife to humans or domestic animals (*Wildlife Diseases*). Should the user require more detailed information than is provided here, the *Conservation Offices* link enables them to retrieve the address, phone and fax numbers and email address (where available) of their local Manitoba Conservation Office.

Wildlife Damage Information Webpage



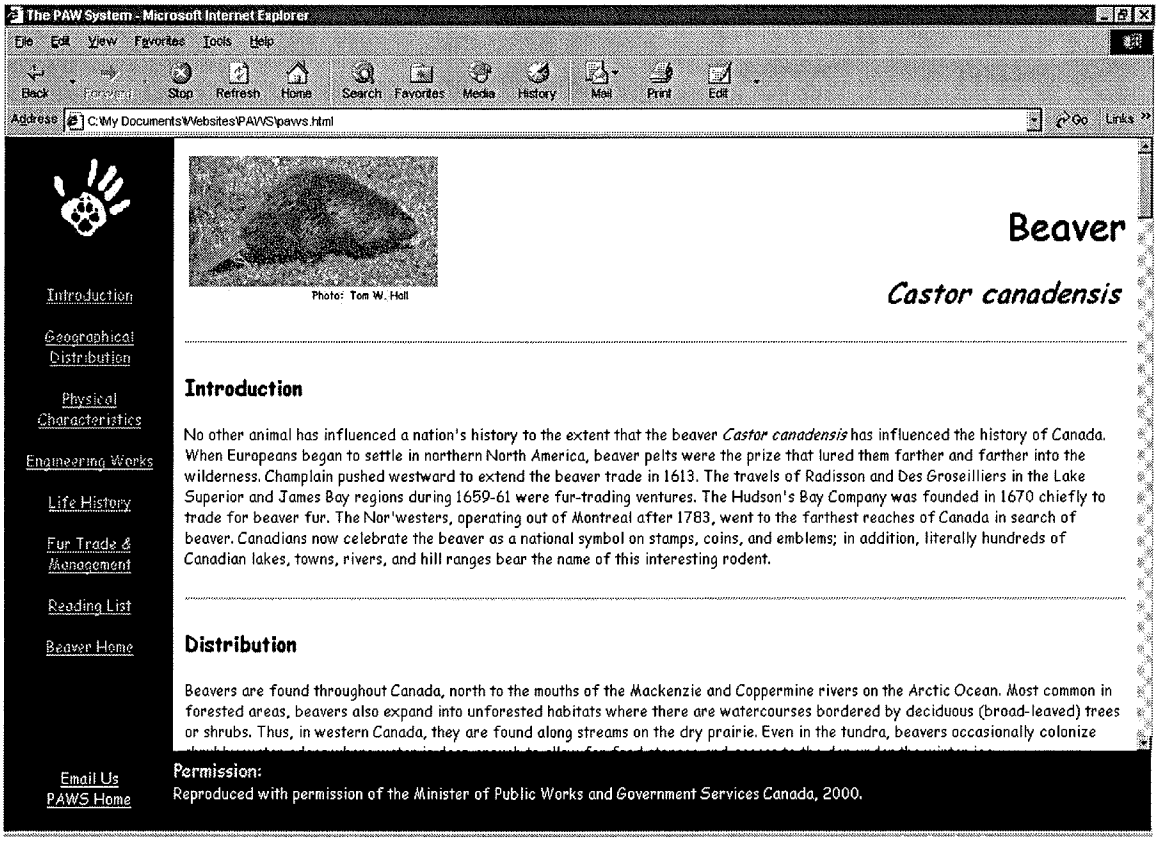
This webpage is an example of the types of wildlife damage information available for individual species. The *Species Information* link contains the Canadian Wildlife Service information while the *Damage Identification and Prevention* link accesses the non-lethal damage control information provided by the University of Nebraska. The screen shown above is a sample of the PAWS Intranet version being provided to Manitoba Conservation. The *Damage Control Methods* and *Damage Control Summary* links contain the lethal control information available only to wildlife managers. These two links are not provided on the general public's Internet version of PAWS. Links to a general reading list and an assortment of related links on the world-wide web are also provided for those users wishing to learn more about individual species. The *Return to Species List* link enables the user to return to the preceding level to select another species or another interaction type.

Species Introduction Webpage



Once the user has chosen what type of information they are interested in accessing, in this case the *Species Information* link, the Navigation Frame once again provides the user with a selection of links to more easily retrieve specific information. The information at this level of the database is an individual file and the navigation links enable the user to access information at specific points in the file (see "Species Data Webpage" below). The purpose for maintaining this information in a single file is multi-fold: 1) provide relevant information in a single location; 2) preserve the integrity of the original source document when it is printed out by a user; 3) facilitate the updating of information as necessary. When printed out, these species documents are rarely more than five pages in length. For the wildlife manager advising a stakeholder without Internet access, the document contains all the relevant information, including the source, in a size that can be mailed or faxed with ease.

Species Data Webpage



The "Species Data Webpage" provides the user with the ability to either view the entire document sequentially using the scroll bars on the right side of the screen or to jump to specific points in the file by using the links in the Navigation Frame. Along the bottom of the above sample screen, is the reprint permission statement so that the online user, who may or may not print out the information, is apprised of the source of the material and can assess the veracity of the information displayed. The permission statement is also affixed to the end of the document so that when it is printed, the hardcopy also contains the correct source citation.. To return to the preceding database level ("Species Introduction") the user need only use the Species Home link, (in the above example, *Beaver Home)*. From there the user can return to the species lists (*Return to Species List*) from where they can once

again access any of the links on the "Wildlife Interaction Webpage". As mentioned earlier, a user can automatically return to the "PAWS Homepage" from anywhere on the Site by using the *PAWS Home* link.

4.2.4 Implementation

Implementation of the PAW System required a different sort of investigation and planning. Because the site contains information to be used by the general public, if the system were to be included on Manitoba Conservation's website, it would need to go through the department's policy and information sections to ensure that the information conforms to departmental standards. Upon consultation with the Wildlife and Ecosystem Protection Branch, it was decided that this course of action would result in a considerable delay in implementation and the potential removal of information deemed essential for use by wildlife managers because the site contains information from other external agencies and was designed by an outside party. In the end, the Internet version of the PAW System is to be implemented on-line via a privately-owned web domain and Manitoba Conservation will receive a compact disc copy of the Intranet version of the PAW System. Because the two systems are mirror-images of each other, additions/deletions and modifications made to one will result in similar amendments to the other. Modifications to the management material contained on the Intranet PAW System will be provided upon request from the Wildlife and Ecosystem Protection Branch of Manitoba Conservation.

With the implementation of the PAW System, the general public will be able to log onto the website to access information that will enable them to either solve their own problems with wildlife and/or prevent them from occurring again in the future. For Manitoba Conservation, the system will provide all staff working with wildlife with resources to do so

at a minimal cost. Wildlife managers will be able to access the information on the Intranet system to solve problem-wildlife management issues. In addition, as not everyone has or uses the Internet, Manitoba Conservation's staff will be able to easily download (to paper) the pertinent information and forward it to the individual or agency requesting the information. Requests requiring further assistance or email requests, can be forwarded directly to the appropriate staff member

Chapter Five Conclusions and Recommendations

5.1 Summary

Interactions between people and wildlife in the urban, suburban and rural environment continue to increase. As the surveys of rural and urban Manitobans revealed, many of these encounters are positive and are eagerly sought out. Some of these human-wildlife interactions are problematic due to the amount and severity of the damage that can be the result. After investigating wildlife management agencies in Manitoba, it was determined that a conservative estimate of the cost of problem-wildlife to Manitobans is in excess of $ 16 million per year. And regardless of how, and how often, the public is affected by problem-wildlife, wildlife will continue to adapt to man-made (or man-modified) environments as human development increasingly encroaches on wildlife habitat. It is essential for problem-wildlife managers and agencies to evolve and adapt to the needs of the profession. In particular, public awareness and education about wildlife and wildlife management demand that managers embrace new technologies and techniques. Improved inter-agency communication and information-sharing is essential to effectively and efficiently manage the province's problem-wildlife. At present, the public is frequently frustrated in their attempts to get advice or assistance despite the array of private and public services available. The PAW System is available to anyone who has access to the technology (i.e., access to the internet) and is designed to assist Manitobans to take control of certain problem-wildlife situations. Stakeholder interest and involvement in wildlife management issues is a growing trend, particularly in North America's increasingly urbanized population.

5.2. Conclusions

1. Wildlife is important to Manitobans.

Manitobans' perceptions of wildlife are changing from primarily consumptive to primarily non-consumptive as the population becomes more urbanized. This shift is evidenced by the increases in memberships in wildlife-related organizations, participation rates, expenditures (e.g., field glass and identification guides) and the leisure time devoted to non-consumptive wildlife activities such as bird watching.

2. Perceptions of what is a "problem" varies between individuals.

Survey respondents were found to enjoy having wildlife on their property and most were willing to tolerate a certain amount of wildlife-related damage. In general, people associate negative or positive values to wildlife. Personal values toward wildlife are the result of many different variables such as people's past encounters, personal philosophies toward wildlife, attractiveness of the animal and the behaviour of the animal. As a result, appreciation for a particular wildlife species varies from one neighbour to another.

3. Confusion exists among wildlife managers and the general public regarding problem-wildlife management.

It can be a challenge for both wildlife managers and the general public, to identify which wildlife agency or organization is responsible for which species and when. Because many of the wildlife species in the province are not listed in the *Wildlife Act*, some agencies are unwilling to assume responsibility for managing these

species. In addition, wildlife regularly occur in areas where government jurisdictions overlap. It can be a complex process to establish who is responsible for managing a particular species and under which circumstances. There are a variety of organizations that people can contact when seeking information to solve their wildlife problems. However, most of these organizations do not have the answers, resources or authority to provide much help. Many are even unable to refer inquiries to the correct agency. Therefore it can often be an exercise in frustration for an individual seeking assistance or advice.

4. **There is a lack of Manitoba-specific problem-wildlife management information.**

Except for a few references in the U.S. literature, there is only one published paper devoted to problem-wildlife and its management in Manitoba. The U.S. articles dealt with agricultural compensation programs across North America, while the lone Manitoba publication focussed on human-wildlife conflicts in Winnipeg and was published in 1978. When wildlife agencies and organizations were contacted for information on the costs inccurred by their problem-wildlife activities, nearly half of all those contacted were unable to provide the requested information. Though it is admirable that most of these organizations consider problems with wildlife to be "just a part of doing business", such information is vital in order to fully and accurately assess the extent of the problem-wildlife situation in Manitoba and to adequately prepare for the future.

5.3 Recommendations

Although each level of government has a role in managing wildlife, provincial government is usually held responsible for the wildlife concerns in Manitoba. In order to maximize the use of public education as a management tool, it will be necessary to design a system for disseminating the most information to the most people. The following recommendations are offered to assist the provincial government in their efforts to manage problem-wildlife.

1. Provide relevant information for use by wildlife managers and the general public.

a) *Develop a comprehensive listing of wildlife-related agencies and organizations.*

The public's greatest problem-wildlife management complaint is that they were unable to find an agency that could assist them with their problem when they needed it. As these agencies do exist, the problem is that wildlife agencies themselves do not know who to contact in many cases . The listing should include: organization name, areas of responsibility and contact information and should be updated on an annual basis. The listing should be provided to all agencies, organizations and groups that are contacted by the public seeking information.

b) *Maintain and expand the PAWS electronic database.*

The PAW System was designed for use by the general public and the

wildlife managers at Manitoba Conservation. The information provided includes basic species data, damage identification, legal status, prevention techniques and contact information for Manitoba's wildlife management agencies and organizations. The database is user-friendly, expandable and easily update-able. As such, it is a valuable resource for educating the general public and as a source of up-to-date management information for wildlife professionals.

c) *Develop a toll-free information phone line.*

Not all residents have access to the Internet or many feel more comfortable with the information they are receiving when they consult with a live person. A toll-free, 24-hour phone number should be set up to provide in-person information during business hours and automated contact information after-hours so that the public can access the appropriate agencies in a timely fashion. The information that should be available through this service would include the listing of Manitoba wildlife agencies, organizations and groups, and basic wildlife and problem-wildlife information would be available to the phone operator via their connection to the electronic database on the Branch intranet system. More complex or legally-sensitive issues could be forwarded to the appropriate staff member.

2. Improve communication and the sharing of information between wildlife agencies.

Effective communication is the cornerstone of any successful partnership. Constant communication is necessary to share information and to ensure coordination. A network of wildlife managers needs to be developed to: (a) facilitate the resolution of human-wildlife conflicts; (b) improve the operational efficacy of individual wildlife management agencies and organizations in the face of fiscal-restraint and reduced staffing; (c) enable wildlife managers to report, record and share information to better anticipate and mitigate damage due to wildlife.

3. Conduct Manitoba-specific problem-wildlife research

The lack of Manitoba-specific problem-wildlife information makes it exceedingly difficult for the wildlife manager to effectively address the issue of problem-wildlife. Funding, staffing and other resources cannot be made available if current, accurate data is not available. Such information also facilitates inter-agency partnerships as it identifies management areas that need the cooperation of more than one agency. Areas that require further research include the cost of problem-wildlife, public perceptions of wildlife and problem-wildlife, stakeholder involvement in wildlife management and the value of wildlife education.

Personal Communication

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Burns, V. (1998) Executive Director, Winnipeg Humane Society.

Bukowsky, R. (1998) Senior Environmental Specialist, Manitoba Hydro.

Carmichael, R. (1997-98) Chief, Game and Fur, Wildlife & Ecosystem Protection Branch, Manitoba Conservation.

Curtis, T. (1998) Maintenance Engineer, Manitoba Transportation & Government Services

Dack, T. (1998) Manager, Animal Services Branch, City of Winnipeg.

Derhak, T. (1998) Deputy Fire Chief, Winnipeg Fire Department.

Dixon, D. (1998) Apiculture Section, Soils & Crop Branch, Manitoba Agriculture & Food.

Elliott, W. (1997-98) President/CEO, Fort Whyte Nature Education Centre.

Frolick, M. (1997-98) Lab Technician, Veterinary Services, Manitoba Agriculture.

Glover, G. (1998) Veterinarian, Assiniboine Park Zoo, City of Winnipeg.

Graham, G. (1996-98) Legislative Specialist, Wildlife & Ecosystem Protection Branch, Manitoba Conservation.

Gosselin, J. (1997-98) President, The SWAT Team Pest Services.

Gottfried, J. (1998) Construction Engineer, Manitoba Highways and Transportation.

Hemmings, C. (1997-98) City Naturalist, Parks and Recreation, City of Winnipeg.

Horne, D. (1998) Senior Administrator, Manitoba Health.

Hornshaw, S. (1996) Professor of Anthropology, University of Winnipeg.

Jones, R. (1996-2002) Prairie Habitat Specialist, Wildlife & Ecosystem Protection Branch, Manitoba Conservation.

Joubert, L (1997-98) Operations Manager, Operations Branch, Manitoba Conservation.

Knapp, B. (1998) Practice Manager, Assiniboine Animal Hospital.

Koonz, W. (1998-2001) Biologist, Wildlife & Ecosystem Protection Branch, Manitoba Conservation

Kubis, S. (1998) Biologist, Canadian Wildlife Service, Environment Canada.

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Appendix - Survey Instrument

Dear Homeowner:

I am a graduate student at the Natural Resources Institute at the University of Manitoba and I am conducting research on people and wildlife for my Master's thesis. The following is a short survey (it takes about 15 minutes to complete) the results of which are essential for my research and I would very much like to include your experiences and opinions. All responses will, of course, be kept in strictest confidence. I have included a stamped return envelope for your convenience.

Thank you for your help and I look forward to receiving your completed survey.

Tracy Maconachie
Masters of Natural Resource Management (MNRM) Candidate

Natural Resources Institute, University of Manitoba
70 Dysart Road, Winnipeg, Manitoba R3T 2N2

If you are interested in the results of this survey, I'd be happy to provide you with a summary. I can mail or fax you a copy or if you have e-mail, I can e-mail you a copy.

Name: _____

Address: _____

_____

_____

Fax: _____

E-mail: _____

If you require more space, please write it on a separate sheet of paper with the corresponding question number.

1. Would you say that you live in an urban environment or a rural environment?

2. a) Do you own or rent / lease your property?

   b) Do you have a cottage or vacation property? In what part of the province?

3. Do you support any nature or wildlife-related organizations? Which one(s)?

4. Are you involved in any nature or wildlife-related activities? Please check all that apply.

   O hunting O hiking O nature photography
   O fishing O camping O bird-watching
   O canoe-tripping O bird-feeding
   O other:

   Do you participate in these activities:

   O only in summer O only in winter O all year-round

5. What species of wildlife have you noticed living on or around your property?

6. a) What kinds of interactions with wildlife do you regularly experience?

   b) Do you consider any of these interactions to be a "nuisance" or a "problem"?

7. Have you ever had a vehicular accident / encounter related to wildlife? What species of wildlife was involved? What happened specifically?

Was the vehicle damaged? Was anyone in the vehicle injured? Was the animal injured or killed?

8. Have you ever had to seek compensation for damage to your home or property caused by wildlife?

9. Who would you contact for advice or assistance with:
   a) an animal causing problems or damage to your home / property?
   b) an animal killed after an accident with a vehicle?
   c) an injured animal?

10. a) When you hear the phrase "problem wildlife" what species of wildlife comes to mind?
    b) What species of wildlife do *you* consider to be "nuisances" or "problem wildlife"?

11. a) To your knowledge, what organizations are involved with wildlife-related activities in the province?
    b) What organizations are involved in responding to problems involving wildlife in the province?

12. a) In a non-emergency situation, how would you go about contacting one of these organizations ? After-hours or on weekends?
    b) In case of an emergency? After-hours or on weekends?

13. Have you ever had to contact a wildlife organization regarding a problem or injured animal?
    a) What kind of situation was it specifically?

b) Whom did you contact? _____

c) Were they able to assist you with the situation? _____

_____

d) Were you satisfied with the advice / assistance you received? What would have improved theassistance you received? What, if anything, would you do to improve the system?

_____

_____

And finally, just a few personal questions to help with my statistical analysis - if you feel this information is too personal, please feel free to decline to answer.

14. Do you, or have you ever, owned a pet? _____

15. a) How long have you lived at your current address? _____

b) Where did you live before? For how long? _____

_____

c) If you have a cottage, how long have you had your vacation property? _____

d) Did you have a place before that? Where was it located? _____

_____

16. In terms of age, are you (please check one category):

O under 18 years of age?
O between 18 and 25 years of age?
O between 25 and 35 years of age?
O between 35 and 45 years of age?
O between 45 and 65 years of age?
O over 65 years of age?
O prefer not to answer

17. What is your current occupation? _____

18. Last question, how would you classify your annual household income? Please check one.

O less than $20,000
O between $20,000 and $40,000
O between $40,000 and $60,000
O between $60,000 and $80,000
O over $80,000
O prefer not to answer

Thank you for your time and cooperation!