



Photo: Jim Hesse

British Columbia Urban Ungulate Conflict Analysis

Summary Report for Municipalities



Ministry of
Environment

Prepared for:
Micheal Badry
Wildlife Conflicts Coordinator
Conservation Officer Service
British Columbia Ministry of Environment
and

Irene Teske
Wildlife Biologist
Kootenay Regional Office
British Columbia Ministry of Environment

Prepared by:
Gayle Hesse B.Sc.
British Columbia Conservation Foundation
200 1383 McGill Road
Kamloops BC
V2K 2E4



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Executive Summary

Deer, moose, elk, and bighorn sheep have a widespread distribution across British Columbia, providing significant public recreational opportunities and aesthetic enjoyment to BC residents. However, excellent habitat in residential areas and protection from hunters and predators has encouraged some ungulate populations to become urban dwellers. Increasing numbers of ungulates (primarily deer) living in urban areas has led to increased conflict with the human residents of those areas.

Conflicts between urban ungulates and municipal residents include damage to gardens and landscaping, high rates of ungulate vehicle collisions, aggressive behaviour towards humans, and potential transmission of disease from ungulates to humans and livestock. Across Canada, there are only a few cities where active urban ungulate management has been implemented.

Urban ungulate populations are challenging to manage for biological, jurisdictional and social reasons. Deer are very adaptable to human altered environments, and thrive in urban areas. The overlapping roles and responsibilities of municipal and provincial governments complicate management decisions. Further, the wide range of public opinion on appropriate management interventions presents a huge challenge, as the diversity of often opposing opinions makes for a controversial management project.

Many communities in the United States (where urban deer management has a longer history than in Canada), are undertaking collaborative, community based, co-management processes, which are usually perceived to be more appropriate, efficient and equitable than traditional authoritative wildlife management approaches. Although these processes may take more time, they can result in greater stakeholder participation and satisfaction with urban wildlife management.

Urban ungulate management strategies should be focused on the reduction of conflicts and management of populations to an acceptable level, not the complete elimination of the problem or herd. A comprehensive and integrated plan that incorporates aspects of many options is required to achieve the project objectives. Short term strategies may provide relief from symptoms, while long term plans address population levels. Provincial and community resources plus property owner cooperation are needed to achieve measurable results.

Management options fall into four categories: conflict reduction, population reduction, fertility control, and administrative options. Conflict reduction options keep ungulates away from susceptible properties, minimize the damage that is sustained if animals do enter property and reduce human/ungulate conflict. Landscape design, careful plant selection, taking preventative measures early before patterns of behaviour are established, and using repellents and scaring devices can reduce, but not eliminate, ungulate damage. Fencing is the only viable option when damage cannot be tolerated.

Population reduction programs are ongoing activities, with an initial reduction phase, when a significant proportion of the population is removed at one time, and a maintenance phase, occurring after ungulate densities are reduced and when fewer individuals are removed. Community specific management decisions have to factor in the number of animals to be removed and at what intervals, the potential for increased reproductive productivity, and possible increased immigration due to less competition for habitat and resources. Capture and relocation of deer has not often been implemented across Canada or the United States due to concerns about animal mortality during capture and post release, however, in localized areas, under special circumstances, it may be appropriate. Sharpshooting, capture and euthanization, and controlled public hunting have all been used successfully in the United States to reduce ungulate populations.

When complaints caused by overabundant ungulates are increasing in numbers and severity, then conflict reduction options such as fencing, repellents, and aversive conditioning will not significantly reduce the numbers of complaints. Population reduction is needed to reduce the damage caused by overabundant ungulates. Once the population numbers are lowered, then damage is easier to manage with conflict reduction techniques. The method of population reduction and how often it needs to be carried out is dependent on the site specific circumstances in each community.

Fertility control options are extremely limited because no fertility control drugs are approved for general use in ungulate populations in Canada. Immunocontraceptive vaccines are the most promising fertility control method and have been approved for experimental research purposes. Ongoing, long-term research reporting on the efficacy of these drugs to reduce populations and maintain them at low enough levels to keep ungulate damage at acceptable levels is just starting to emerge. For the near future, most researchers suggest that populations be lowered using lethal control, and then, when proven practical, population levels can be maintained using fertility control.

Administrative options such as amending municipal bylaws and provincial regulations to permit lethal control options need to be implemented, and public education and formal project monitoring need to be ongoing before, during and after any management interventions.

This report provides an overview of the reasons why ungulates are present in urban environments and summarizes the consequences of overabundance. Examples of urban ungulate management projects in other jurisdictions are provided. The biological, social and administrative challenges of managing urban ungulates, a discussion of why residents' opinions and values about wildlife need to be considered when developing urban wildlife management programs and how residents and communities in other jurisdictions have become involved in urban wildlife management programs are discussed. Management options for urban ungulates are reviewed, including discussions of efficacy, costs, human health and safety, animal humaneness, and project advantages and disadvantages. Finally, there are recommendations for the future as municipalities address urban ungulate management challenges.

Definitions

Biological carrying capacity (BCC)

Biological carrying capacity is defined as the number of ungulates in good physical condition that a parcel of land can support over an extended period of time based on the quality and quantity of forage and the availability of good winter habitat. Reproductive productivity causes populations to exceed BCC, unless the productivity is balanced by mortality. When population numbers approach or exceed BCC, habitat quality decreases with loss of native plant species, the herd physical condition declines, and the likelihood of winter mortality due to poor nutrition or disease increases.

Cultural carrying capacity (CCC)

Cultural carrying capacity is defined as the maximum number of ungulates that can coexist compatibly with local human populations. CCC is a function of the sensitivity of the local human population to the presence of animals, and can be considerably lower than BCC. Sensitivity of humans to ungulates is dependent on local land use practices, local population density, and attitudes and priorities of humans. Excessive numbers of wildlife vehicle collisions, homeowner and gardener complaints, or reports of wildlife aggression indicate that CCC has been exceeded.

Wildlife acceptance capacity (WAC)

Wildlife acceptance capacity is defined as the wildlife species population level that is acceptable to a group; for example, gardeners may have a lower WAC than wildlife enthusiasts.

Rural

For this report, rural refers to land outside municipal boundaries, and urban or suburban refers to all areas within the city or town boundaries, which may include: commercial or industrial districts and properties; residential properties (city lots) and larger properties (1 – 3 hectares); vacant properties; railway yards; school yards; cemeteries; airports; city parks; greenbelts, wetlands, or areas managed for aesthetic or environmental purposes; and land parcels reserved from development due to inaccessibility or inoperability. This report does not discuss ungulate management options for land used for commercial agriculture, even if this land does occur within municipal boundaries.

Urban ungulate

Urban ungulates are hoofed, herbivorous mammals that live primarily in urban ecosystems. The majority of urban ungulate management issues involve deer, but in BC, cervid species such as moose and elk, and bovid species, such as bighorn sheep, are also found in urban areas.

Attractants

The increases in urban ungulate populations (primarily deer) are a predictable consequence of human actions within municipalities. People have established greenways and parks, planted gardens and trees, eliminated natural predators, leashed and controlled dogs, enacted municipal bylaws to prohibit the discharge of firearms and deliberately fed the wildlife. The resultant habitat and protection that people have provided have enabled ungulate populations to not only survive, but thrive.

Excellent habitat

White-tailed deer and moose thrive on edge habitat. Human activities that fragment the natural environment create ideal habitat for these animals. Ravines, creek draws, natural areas, and wooded parks create natural bedding areas and cover, while golf courses, open park land, fertilized lawns and flowering or vegetable gardens provide ample and varied forage opportunities. Bighorn sheep, mule deer and black-tailed deer also find the combination of excellent habitat with abundant refuge areas highly attractive.

Lack of predators

A key factor in deer mortality is predation. Natural predation on adult deer in urban areas is almost non-existent, and the predation behaviour of medium sized predators such as coyotes that would normally prey on fawns in the wild is often significantly different in urban areas. With this key mortality factor reduced, the survival rate and subsequent population growth is greatly increased. Dog licensing bylaws, off leash restrictions and control of stray dogs contribute to the safety and subsequent habituation of urban ungulates. As a prey species, ungulates “know” where they are safe, and use and exploit the safety of urban environments to their advantage.

Wildlife feeding

Purposeful wildlife feeding where feeding stations are set up to attract and feed deer is another contributing factor to increasing deer populations. Healthy, well fed deer, particularly white-tailed deer, have very high reproductive rates, leading to increased populations in urban areas where deer feeding takes place. Deliberate wildlife feeding is very seldom done in urban areas for moose or elk.

Hunting restrictions

In natural environments, wildlife managers use regulated hunting to control ungulate populations and influence sex and age ratios. This management tool is not available for population control in municipalities where weapons discharge and hunting are prohibited.

Consequences of Overabundance

An overpopulation of ungulates can have serious consequences. As an animal population approaches the cultural carrying capacity (CCC) of an area, negative interactions between people and the animals begin to increase. A significant measure of a community's CCC for ungulates is the amount of damage that residents are willing to sustain without calling for animal management programs. Generally, long before the biological carrying capacity (BCC) is reached, the overabundant animals may have worn out their welcome with most residents.

Conflicts between urban ungulates and municipal residents can result in damage to gardens and landscaping, high rates of ungulate vehicle collisions, possible transmission of disease from ungulates to humans and livestock, and in some circumstances, instances of aggressive behaviour towards humans. Additionally, browsing pressure and subsequent decline in habitat quality can lead to a decline in herd health, marked by decreased body weights, lowered reproductive rates, lowered winter survival, increased parasitism, and increased disease prevalence.

Damage to gardens, landscape plantings, and community forests

Overabundant deer populations can negatively impact native plant communities and community forest ecosystems. Deer can eat 2 – 5 kilograms of forage per day and in the most severe instances, a “browse line” is highly visible, beneath which there is little or no new vegetative growth due to over browsing. In urban areas, there are abundant, high quality food sources for ungulates - flower and vegetable gardens, ornamental plantings, fertilized lawns, fruit trees, and sometimes even bird feeders during the winter.

Deer are selective feeders and forage on plants or plant parts with considerable discrimination. However, when deer are overabundant and hungry due to heavy competition for resources, they will eat almost any type of plant. There are primarily three kinds of deer damage: browsing of plant parts; antler rubbing on bark; and trampling of plants. Annuals may be pulled out of the ground. Damage to large trees extends up to about 2 metres, the highest height to which the deer can reach. Smaller trees may be pushed over or the bark may be chewed through.

Ungulate vehicle collisions

Data on animals killed by collisions with vehicles within municipalities is not consistently collected, but in communities with high urban ungulate populations, there are generally high rates of vehicle collisions.

Provincially, deer vehicle collisions comprise about 76% of the total number of wildlife collisions each year and other ungulates species comprise about 12% of the total. In a typical year in BC, about 5 people are killed in wildlife vehicle collisions and a further 382 people are injured. In 2006, ICBC spent about \$34 million CDN on 10,500 animal related collisions. The Ministry of Transportation and Infrastructure

spends over \$600,000 CDN on highway cleanup and carcass removal annually. Additional societal costs are incurred by police, emergency response teams, WorkSafe BC, hospitals, and employers. Wildlife collision costs per vehicle including human injury and fatality costs, have been estimated at as high as \$6,617 (2007) USD for deer, \$17,483 (2007) USD for elk, and \$30,760 (2007) USD for moose. The Ministry of Transportation and Infrastructure records show that there are about 4,900 wildlife carcasses recovered each year, while a further 14,700 animals are hit and killed by vehicles but move away from the roads to die, and therefore are not recovered and included in the official counts.

Disease

When there are high densities of ungulates there are high densities of the organisms that live on them or in them. Diseases can be transmitted from ungulates to humans, from one ungulate species to another, and from livestock to ungulates and back. Anthrax, bovine tuberculosis and chronic wasting disease are serious diseases for ungulates, but are not found in free ranging wild ungulate populations in BC. An infection caused by *Escherichia coli* transfer from deer faeces to humans is unlikely. Although Lyme disease can develop into a severe chronic illness if undetected and untreated, the risk of humans contracting this disease via overabundant deer (and therefore ticks) is only low to moderate.

Disease	Animals Affected	Transmission concerns	Found in BC?	Risk of Humans Contracting the Disease
Anthrax	cattle, sheep and horses	wildlife to humans	No	Extremely low
Bovine tuberculosis	cattle, bison, deer, elk, and goats	livestock to wildlife to livestock	Not found in free ranging wildlife populations in BC. 3 cattle have tested positive to date (2010).	Extremely low – would require frequent and extended exposure to the bacterium
Chronic Wasting Disease	mule deer, white-tailed deer, elk and moose	ungulate to ungulate	No	Extremely low - No strong evidence that it can be transmitted from animals to humans
Escherichia coli (E. coli) infection	Bacterium naturally occurs in the intestine of all mammals. Does not usually cause disease in the ungulate.	deer to humans	Yes	Low – could only occur where there are extremely high concentrations of deer faeces, such as feeding stations
Lyme disease	Deer do not appear to suffer from Lyme disease, but are the primary host for the tick that carries the bacterium.	ticks via deer to humans	Yes – primarily on Gulf Islands, Vancouver Island, Lower Mainland	Low to moderate

Aggressive ungulate behaviour

In BC, Conservation Officers report that all species of ungulates – moose, elk, mule deer, and bison – have demonstrated aggressive behaviour towards humans in urban settings. Ungulate aggression (or aggressive defense postures) can occur in three general situations: 1) females reacting to a real or perceived threat to young (generally occurs in the spring); 2) males or females annoyed or harassed by dogs; and 3) males during the rut (late fall). Aggression can take the form of assuming alarm postures, snorting, standing on hind legs and flailing with front legs, charging, and charging with contact.

Repeated instances of aggressive behaviour can be the tipping point for determining that ungulate management is required in a community. Residents may be willing to endure a considerable amount of property damage commensurate with the pleasures of wildlife watching, but they are generally unwilling to tolerate aggressive incidents that threaten people.

White-tailed deer and mule deer

Reports indicate that there are 5 to 10 people are killed annually in the USA by aggressive buck deer (not differentiated among deer species).

Despite similarities between mule deer and white-tailed deer, mule deer are considered to be more actively defensive than white-tailed deer. Mule deer may defend their own fawns, other non-related mule deer fawns, and even white-tailed deer fawns, and they may be more likely to actively defend fawns against predators than white-tailed deer, which are more prone to flight as a survival strategy. Because mule deer tend to inhabit more open habitat than white-tailed deer, they may rely more heavily on aggression as a defense against predators, rather than the flight or hiding behaviours common to white-tailed deer. When mule deer tendencies towards fight rather than flight are exercised in encounters with humans in an urban environment, mule deer may exhibit active defensive behaviours towards humans, often perceived and reported as aggression. Nonetheless, whether intended to defend fawns or as unprovoked aggressive attacks, the result of the behaviour is the same. Human safety is threatened, deer are the cause, and lethal control of the threatening animal is often the result.

Incidents of aggression or aggressive defense towards humans by mule deer have been reported in Kimberley, Cranbrook and Princeton. No instances of white-tailed deer or black-tailed deer aggression towards humans were described during interviews for this report.

Moose

A significant cause of moose aggression occurs when moose are in distress due to heavy tick infestations or starvation (generally occurring in late winter). High numbers of aggressive moose incidents, where moose had to be dispatched due to their behaviour and/or poor condition, were noted during years of heavy tick infestation by Conservation Officers from both the Peace and Omineca regions. Cow moose will also aggressively defend against real or perceived threats to their calves.

Elk

Elk habituation and subsequent aggression towards humans has been documented in Canada's National Parks, where there are populations of habituated elk in close proximity to both residents and large numbers of tourists. There are no BC communities which are currently experiencing conflict with aggressive elk in urban settings.

Canadian and USA Overview

There is little published literature regarding the management of urban ungulate populations in Canadian cities or towns. City officials, deer committee members and provincial wildlife managers were interviewed to provide the following information and details of their experiences with urban ungulates. More information on the projects in the following municipalities can be found in the Appendices.

	Species of Concern	Public Involvement?	Concerns	Action taken	Results
Ottawa, Ontario	White-tailed deer	Yes: deer management committee formed	<ul style="list-style-type: none"> • Damage to natural ecosystems • Deer vehicle collisions (dvcs) 	Public awareness campaign to reduce deer vehicle collisions	Deer vehicle collisions reduced by ~25%
Winnipeg, Manitoba Appendix B	White-tailed deer	Unknown. Lots of volunteer assistance with the project	<ul style="list-style-type: none"> • Damage to gardens and plantings • Deer vehicle collisions 	1985: Capture and relocate 283 does	Damage complaints reduced considerably for the next 10-12 years. Action required now.
Magrath, Alberta Appendix A	White-tailed deer	Yes: public meetings held	Damage to gardens and plantings	2003: Controlled hunt right up to municipal limits. Removed 164 antlerless deer.	Damage complaints and dvcs reduced considerably for the next 6 years. Action required soon.
Sidney Island, BC Appendix C	Fallow deer (not native to BC)	Yes: deer management committee formed	Damage to natural ecosystems	2009: Capture and euthanize 848 deer; process for venison	Project successful, but population still above targets
Helena, Montana Appendix D	Mule deer	Yes: deer management committee formed	<ul style="list-style-type: none"> • Aggression towards humans • Damage to gardens and plantings 	2008-09: Capture & euthanize 200 deer; process for venison	Project ongoing in 2010, but population still above targets. Complaints reduced.

Management Challenges

Ungulates in urban environments are challenging to manage for many reasons. Deer, particularly white-tailed deer, are superbly adapted to exploit urban resources and thrive in urban environments. As deer are thriving and populations are expanding, appropriate legislation, policy and procedures need to be in place so responsibility, accountability and authority rest with the correct jurisdiction. Community residents have strongly held and varied opinions about what should happen with “their” deer. This diversity of often opposing opinions can make for a controversial management project. All these factors compound the urban ungulate management challenge.

Deer adaptability

Deer will eat a wide variety of plant material, and in urban environments, there are abundant alternative food resources – shrubs, garden plants, succulent grasses and supplemental feed. The natural arid environment in southern BC cannot compete with the fertilized and watered vegetation of urban areas. White-tailed deer especially have a very high reproductive potential. In areas where resources are abundant, high reproductive rates and survival rates in offspring can increase populations almost exponentially. Deer easily develop a tolerance of urban disturbances including human presence, and the abundance of edge habitat provides a preferred habitat. Deer live longer in urban areas compared to rural areas as natural mortality factors are greatly reduced, but still include predation by dogs and coyotes, collisions with vehicles, malnutrition and disease. Regulated hunting and large predators are generally not found within municipal boundaries. Well-fed, healthy deer reproduce longer with a higher fertility rate, and live longer with little chance of either predation or being hunted. Fawns raised in urban environments learn both aggressive behaviour towards humans and pets as well as fence avoidance and crossing behaviours as part of their survival skill set, in addition to having foraging behaviours that are habituated to urban environments.

Jurisdictional responsibilities

One of the challenges in managing urban ungulates is “whose issue is it anyways?” Who is responsible for conducting population estimates, developing a plan, consulting with the public, or implementing recommended treatments?

Municipalities are contained within hunting management units, but overlaying the management unit are city or regional district bylaws that prohibit firearm discharge or bow and arrow hunting within municipal boundaries. This precludes the use of regulated hunting, which is the primary control method used by the Ministry of Environment to manage ungulate populations.

It is the responsibility of the municipality to determine the attitudes and opinions of their residents towards urban ungulate management. This generally means that a survey of public opinion must be

conducted (Appendix E contains information on resident surveys). If the results indicate that a majority of residents are suffering damage, then the city or the province has two paths forward. The provincial government or municipal government can assume the leadership and subsequent decision making role, or there can be a collaborative process with the formation of an urban ungulate management task force with representation from all stakeholders which has the responsibility to determine appropriate management actions for the community and make recommendations for action to the city and province. The province has the expertise and experience in managing wildlife, but the city has the issue.

Diverse Public Opinion

The goal of provincial wildlife management is shifting from maximizing wildlife populations in order to maximize recreational hunting opportunities, to maximizing wildlife values for society, and society today has many diverse values, attitudes and beliefs that may conflict with traditional wildlife management options. This results in a management challenge rooted in social values, ethical decisions and possibly legal issues rather than strict biological or ecological considerations. Wildlife agencies now have a broader client base than the traditional consumptive users that must be included in the process. The value orientations of these new stakeholders are often not commodity based, and might include aesthetics, recreation or ecological diversity. People who represent a wide variety of views are legitimate stakeholders in the urban wildlife management process and may likely have concerns regarding traditional means of population management.

Wildlife managers generally focus on population and community dynamics biology and ecology. However, in urban environments it is often the individual animal or a small social group of animals that requires attention. A concern for the individual animal versus the whole herd is often what distinguishes groups of stakeholders from one another, and from the wildlife managers.

Public relations concerns

One reason wildlife managers regard urban ungulate management as difficult is due to the perceived resistance of the public to a full range of management options. Additional issues include conflicts between recommended solutions and personal values of a diverse constituency, and public animosity towards regulatory agencies.

Human Dimensions of Urban Ungulate Management

In wildlife management, human dimensions refer to the study and understanding of the human considerations that may be involved in wildlife management decisions. Human dimensions information is important in managing urban wildlife because it helps to anticipate issues, makes management decisions more defensible, provides a scientific basis for action, demonstrates the agency is trying to be responsive to public concerns and is cost effective compared to after the fact results.

Human reactions to wildlife include a broad spectrum of emotions and reactions. Attitudes towards wildlife and specific management alternatives are related to:

- *Personal experience with target species* – the most concerned or affected citizens are the ones who will most accept lethal control
- *Health and safety* – always ranked the highest concern - concerns about human toxicity of repellents, or accidents that might injure humans with capture nets, hunting or darting.
- *Effectiveness of options* – if the management technique will work and how quickly – most suburban residents have little experience with this type of management. Efficacy may be more importance to managers than citizens.
- *Cost of options* – personal costs – taxes – time to learn about management techniques - personal inconvenience when management techniques are implemented
- *Political support* – legality of treatments, liability issues
- *Humaneness and violence* – wildlife managers are concerned with sustainable population, but citizens may be concerned with individual animals

Stakeholders are individuals or groups that have legal standing, political influence, sufficient moral claims connected to the situation, or power to block implementation of a decision. Stakeholder groups will each have their own wildlife acceptance capacity. Some categories of stakeholders include: farmers, ranchers, private landowners; hunters and trappers; wildlife enthusiasts; animal welfare activists; animal rights activists; urban residents; and rural residents.

In many communities where it has been decided that urban ungulate populations are too high, the resultant damage is unacceptable, and active management interventions must be considered, surveys of resident's opinions regarding damage, expenditures and the appropriateness of management actions have been undertaken. Examples of questions that may be included in survey of residents is contained in Appendix E.

Community Involvement in Urban Ungulate Management

Traditional wildlife management is generally administered province wide, through legislatively driven policies, with goals achieved through regulation and enforcement. Due to overlapping management jurisdictions and corresponding complexities in managing wildlife in an urban area, a more community based, collaborative management approach for urban deer issues is being undertaken in many American cities (where most organized urban ungulate (primarily deer) management has taken place).

There are many approaches to problem solving and decision making using public involvement. Each involves differing levels of responsibility and involvement of the wildlife management agency spread across a continuum of approaches ranging from total agency control to broad responsibility and decision

making shared amongst stakeholders. In the USA, communities are sharing decision making, costs and responsibility for deer management with state agencies under a variety of collaborative scenarios. These scenarios differ with respect to who makes the decisions and how the decisions are made, but in all co-management scenarios, there is a significant amount of involvement and representation from residents or elected representatives of the communities. The following management models are provided as examples of how some American communities have handled their management challenges.

Community vote

This approach is characterized by a referendum in the community. The wildlife agency is involved in knowledge creation and information transfer, but a community vote is needed to approve deer management actions. Local decision making rests with elected municipal leaders who use the results of the vote to decide whether or not to implement a proposed deer management proposal.

Environmental Impact Assessment (EIA)

This approach involves public engagement and comment associated with a EIA process to guide decision making. State wildlife managers evaluate proposed deer management actions in light of how those actions are likely to impact the guiding management objectives of the state wildlife agency, and make decisions based on the fulfillment of these objectives.

Agency partnership

In this approach, a deer management committee comprised of provincial government agencies (e.g. wildlife and parks), municipal governments, non-governmental organizations, and area residents are vested with the authority to develop a plan. Residents are informed and offered opportunities to review and comment on draft management plans. There is ongoing communication and cooperation between agencies. Decision making rests with the provincial agencies, with input from the group.

Citizen action

Both public and private stakeholders are involved in the formation of a grassroots citizen group supported by professionals with technical expertise. Wildlife agency staff generally participate, but act primarily as technical advisors. These types of partnerships can vary with respect to decision-making responsibilities. Some function as working groups without direct connections to local decision makers, and some are advisory groups with decision making authority.

Citizen-agency partnership

In this approach, a co-management agreement is formed between the wildlife agency and a local land management authority (municipality, airport, regional district), for the purpose of managing deer populations. The wildlife agency provides technical assistance and support in developing a management plan, designates the areas in question as a special management zone, and authorizes the use of approved alternative management techniques. The municipality or regional district assumes

responsibility for documenting damage, implementing the management actions, and recording results. Wildlife agency managers play an advisory role from problem assessment to evaluation of outcomes.

Community Association

The wildlife agency interacts with a local community or homeowners' association. The agency provides information and expertise, and perhaps assistance with management interventions. The association assumes substantial management responsibilities, which may include problem assessment, and evaluation and implementation of management interventions.

Management Model Comparisons Regarding Decision Making Authority (adapted for Canada)

Model	Decisions on firearms use	Decisions on lethal control use	Decisions on preferred deer management option
Community Vote	Municipal Councilors	Provincial Wildlife Agency	Citizens, through a vote
Environmental Impact Assessment (EIA)	Provincial Wildlife Agency	Provincial Wildlife Agency	EIA process through Provincial Wildlife Agency
Agency partnership	Provincial Wildlife Agency	Provincial Wildlife Agency	Provincial Wildlife Agency with input from deer management committees
Citizen action	Municipal Councilors	Provincial Wildlife Agency	Municipal Councilors with input from deer management committees
Citizen-agency partnership	Municipal Councilors or Regional District representatives	Provincial Wildlife Agency	Municipal Councilors or Regional District reps with input from deer management committees
Community Association	Community Association and residents	Provincial Wildlife Agency	Community Association, through a vote of the executive

In general, community based, co-management processes are usually perceived to be more appropriate, efficient and equitable than traditional wildlife management approaches delivered by provincial agencies. Although these processes may take time, they may result in greater stakeholder investment in and satisfaction with deer management. The community scale is appropriate because deer impacts may vary by neighbourhood and successes or failures are readily apparent at the local level.

Successful urban deer management committees need to have: relevant stakeholder representation; an external trained facilitator; accurate and complete biological data; a survey of community attitudes; and technical support from wildlife management agencies. Responsibilities of a committee usually include:

- setting goals and objectives
- reviewing pertinent biology
- examining and selecting biologically feasible and socially acceptable management techniques

- identifying funding and staff sources
- coordinating dissemination of information and results to the community and media
- evaluating results
- revising goals and objectives as needed as part of an adaptive management program

To fulfill these responsibilities, an urban deer management committee will need to address the following questions:

- Who has the authority over a group of animals?
- Why are we doing this and what is it that we want to achieve?
- Where do we want to go?
- Can we get there?
- How do we get there?
- Will we know when we have arrived?
- What are the disadvantages and what are the benefits to be gained?
- Will the benefits exceed the penalties?

An urban deer management committee will need to consider the following types of information to develop their plans:

- factors contributing to the over abundant population
- population estimates
- population annual rate of increase and projected growth with and without any intervention
- documentation of property, agricultural, or natural resource damage, as well as human health and safety concerns
- legal ramifications or jurisdictional issues – city ordinances, provincial and federal laws
- identified or suspected ecological, economic, sociological and political consequences

The difficult part for urban deer management committees are decisions whether to:

- avoid the problem altogether – proactive management of new property development
- get at the root cause – analyse the factors that have contributed to the situation
- attack the symptoms – reactive strategy to the issue – applied as a triage approach – applied in the most problematic areas
 - clean up the mess – deer vehicle collision mitigation
 - cull the herd
 - translocate (move the animals)
 - fence the animals out
 - use behaviour modification – aversion or frightening methods
 - apply fertility control [no drugs approved in Canada to date (2009)]
- do nothing – live and let die

Urban ungulate management strategies should be focused on the reduction of conflicts and management of populations to an acceptable level, not the complete elimination of the issue or herd. It is critical to define ungulate management goals and measureable response variables prior to the project implementation so that outcomes can be evaluated objectively. In order to monitor a project outcome, baseline data is needed – roadkill numbers, vegetative damage reports, number of homeowner complaints - to determine accurately the effects of management actions and evaluate effectiveness. It is important to understand the criteria by which a successful, collaborative, community-based deer management project can be measured. Some criteria used by stakeholders in communities in the USA to assess both the success of the collaborative decision making processes and the community-based deer management programs that were implemented in their communities are summarized in the table below. Although some of these criteria are specific to an archery program in a Lyme disease prevalent area, most can be used to measure success for any generalized urban ungulate management project.

Criteria that can be used by stakeholders to judge the success of community based, collaborative decision making processes and the resulting deer management plans

Process	Environmental outcome	Socioeconomic outcome	Impact outcome	Management performance
<ul style="list-style-type: none"> • Peaceful, collaborative process • Public input into decisions • Assimilation of all interests in the decision • Diverse representation on committee • Fair stakeholder involvement • Divisive controversy avoided • Decision is a compromise 	<ul style="list-style-type: none"> • Decreased tick population • Improved deer herd health • Improved forest regeneration • Decreased predator population • Decreased deer population • Vegetation is protected • Decrease in roadside deer carcasses 	<ul style="list-style-type: none"> • Increased hunting opportunities • Positive public reaction to the program • Good communication between public and elected officials • Decrease in controversy about the issue 	Decrease in: <ul style="list-style-type: none"> • Vehicle collisions • Lyme disease • Property damage • Shrub damage • Crop damage • Aggressive deer encounters • Complaints from the public • Increase in human health 	<ul style="list-style-type: none"> • No complaints about the hunting program • Wildlife agency says deer population is under control • Increase in deer harvest • Safe and effective hunting program • Genuine attempt to implement non-lethal options • Successful implementation of an adaptive management plan • Plan based on scientific fact • Balance between safety and the environment

Community support for any deer management action requires an effective public education program that will ensure that actions and programs are coordinated to:

- define clear and achievable objectives
- attend to the key components (audience, message content, message channel, perception of source) of the persuasion process
- regularly evaluate the program effectiveness by systematically documenting success and failure
- adjust the program in response to the evaluative information

Management Options at a Glance

Conflict Reduction Options

Hazing and frightening techniques
Repellents
Landscaping alternatives
Fencing
Ungulate vehicle collision mitigation

Population Reduction Options

Capture and relocate
Capture and euthanize
Controlled public hunting
Sharpshooting

Fertility Control Options

Immunocontraception

Administrative Options

Status Quo
Monitoring
Amend Municipal Bylaws
Amend Provincial statutes and regulations
Public Education

The complexities of urban ungulate management mean that there are no easy answers or quick fix solutions. No single technique or strategy will work on its own because management options are not mutually exclusive. A comprehensive and integrated plan that incorporates aspects of many options is required to achieve the project objectives. Short term strategies may provide relief from symptoms, while long term plans address population levels. Provincial and community resources plus property owner cooperation are needed to resolve these issues.

A summary table of population reduction options is found on pages 30 and 31.

Appendix F contains websites and links with more information on management options.

Definition. Frightening techniques to reduce damage by ungulates include the use of auditory, visual or other sensory clues to frighten animals from specific areas. Hazing is the undertaking of deliberate and active measures to keep ungulates from becoming habituated to human presence and activities.

Discussion. Ungulates, like many animals, are afraid of new and unfamiliar things. Many devices have been suggested and used to exploit this fear in order to frighten deer away from both agricultural crops and urban plantings. Visual frightening devices, auditory devices or other low tech suggestions such as wind chimes and radios can be used. The presence of dogs in an area can provide a deterrent for ungulates, if the dog is the right size and temperament, and is outside during the hours of highest animal activity.

Once animal movements and behaviour become established they are difficult to break, so actions must be taken early when damage is first detected. Animals can quickly become habituated to these sights and sounds, so a combination of techniques is most effective and moving the locations of the devices frequently is also beneficial.

An observation of ungulate behaviour in urban environment is that the vast majority of interactions with humans are benign. In order to restore more normal or natural fear reactions in ungulates, the vast majority of interactions should be stressful or negative. To implement hazing in urban areas would mean the involvement of police officers, city employees and bylaw enforcement officers, and may involve a considerable amount of staff time and resources. The deliberate hazing of ungulates to reduce their habituation to humans is a complex undertaking, and any activities must be undertaken under defined protocols which set out humane and ethical actions.

Efficacy

- Low to moderate (if RCMP are involved it could be more costly)
- Animals can quickly become habituated to frightening devices

Cost

- Low to moderate
- Frightening device costs incurred by property owner
- Hazing costs incurred by municipality

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- May be helpful for residential property owners

Disadvantages

- Animals become quickly habituated o frightening devices
- Not effective in areas experiencing heavy browsing pressure
- Results are unpredictable
- Site shifting may occur as animals move to other areas without these devices or activities

Conflict Reduction Options

Repellents

Definition. Area repellents are behaviour modifying substances that create a chemical barrier that animals will not cross, or products that permeate an area to be protected from ungulate browsing with an odour that causes animals to avoid the area. Contact repellents are behaviour modifying substances that are topically applied or attached directly to a plant in order to reduce their palatability or to induce pain or fear in the animal.

Discussion. Repellents are designed to persuade ungulates to eat something other than the treated or protected food source, so they function best when alternate food sources are readily available and when they are used on plants of general low palatability and preference. Repellents have four modes of action: fear, conditioned aversion, pain and taste and can be classified as odour based or taste based. Odour based repellents generally out-perform taste based repellents. Repellents can be spread throughout an area or applied to the plant. Repellents will rarely stop antler rubbing and will not eliminate browsing. If browsing cannot be tolerated at all, then fencing or barriers are the only option.

Efficacy

- Low to moderate
- Animals can quickly become habituated
- Topical repellents generally perform better than area repellents
- Fear inducing repellents performed better than the other types of repellents
- The most effective repellents emitted sulfurous odours
- Repellents containing decaying animal proteins, such as egg or slaughterhouse waste appeared to be the most effective

Cost

- Low to moderate
- Incurred by property owner and/or municipality

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- May be helpful for residential property owners or communities

Disadvantages

- Not effective in areas experiencing heavy deer pressure
- Require frequent applications to continually protect new growing shoots
- Repeated applications are time consuming and effective
- Results are unpredictable
- Site shifting may occur as animals move to untreated areas

Conflict Reduction Options

Landscaping alternatives

Definition. Altering urban landscaping practices and plant selection in favour of less palatable plants in an effort to reduce ungulate browsing.

Discussion. Ungulate preferences for specific plants depends upon several factors: the animals' nutritional needs; its previous feeding experiences; plant palatability; time of year; and the availability of wild forage. When deer populations are low and food is abundant, deer select their most preferred food. When deer population increase and food becomes scarce, there are few plants that deer will not eat. A large deer population creates competition for food, causing deer to eat many plants that they normally would avoid. Planting less desirable plants around homes and in gardens may reduce the likelihood of damage, but in areas of high deer densities, almost all plants are at risk. Certain plants can be more or less palatable to deer depending on time of year, individual plant health and overall deer pressure, however fertilized and watered plantings are generally very attractive to deer and it is difficult to prevent browsing unless physical or chemical barriers are imposed.

Efficacy

- Low to moderate
- If browsing pressures is heavy, likely not effective
- If browsing pressure is low to moderate, there may be some relief from browsing

Cost

- Moderate
- Incurred by property owner

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- May be helpful for residential property owners or communities

Disadvantages

- Site shifting may occur as animals move to other areas with easier access
- Only really effective in areas where there is low to moderate browsing pressure
- If deer are motivated, they will eat almost anything
- Can be quite labour intensive, and may not prove to be effective

Conflict Reduction Options

Fencing

Definition. Fences exclude (or contain) animals by providing a physical barrier, a psychological barrier (through aversive conditioning) or a combination of both.

Discussion. Some fences, such as a woven-wire fence, provide a physical barrier through which the animal cannot pass over, through or under, and others such as electric fencing, provides a minimal physical barrier but acts as a psychological barrier through the delivery of a negative stimulus (shock) upon contact. Fences are best employed as part of an integrated ungulate management program. For home or municipal gardens where no incursions are tolerated, a fence must be of good quality, high (taking into account snowpack), specifically designed for the area, and installed with care and precision in order to be effective. There are several variables to consider when determining appropriate fence structures. These include the desired level and duration of protection, ability of the animal to penetrate various designs, animal motivation to penetrate, behavioural characteristics of the animal, and economics.

Physical capabilities. Ungulates, particularly deer, are adept at jumping barriers and can also manoeuvre through or under poorly constructed fences. Deer have been recorded passing through openings as narrow as 19 cm. Fences to exclude deer may need to be as high as 2.4 meters.

Motivating factors. Food, predators, seasonal movement, separation from family or social group may all contribute to an animal's ability to penetrate a fence. When food is abundant and competition minimal, animals will be less motivated to penetrate a barrier.

Behaviour. Individual animals that have learned how to penetrate a fence can educate others by their behaviour, and conversely, learned behaviour may be beneficial in educating others to respect an electric fence.

Economics. The cost of a fence relative to the potential savings must be weighed. A less expensive fence may require more maintenance and may not last as long as a more expensive fence. Although all fences require maintenance, inexpensive fences like the baited electric fence require additional maintenance in the continued application of attractants or repellents.

Efficacy

- Moderate to high
- Fences need to be well maintained and gate access monitored

Cost. Permanent fences are expensive; seasonal fences are moderately expensive

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- Lots of options available
- Can effectively prevent ungulate damage
- Long term solution if permanent fencing is used
- One of the few effective options for landowners
- Existing fences can usually be retrofitted with either high-tensile electric wires or several strands of barbed wire.

Disadvantages

- Can be expensive
- Addresses only site specific problems
- Environmental, personal and aesthetic considerations restrict use
- Electric fencing may suffer from seasonal problems associated with poor grounding due to heavy snows and dry soil conditions
- Electric fencing not suitable for areas of frequent human contact
- Site shifting may occur as animals move to other areas with easier access

Conflict Reduction Options

Ungulate vehicle collision prevention

Definition

Ungulate vehicle collision reduction is the implementation of techniques to address factors responsible for ungulate vehicle collisions caused by overabundant populations in urban areas.

	Efficacy	Cost to implement	Responsible agency	Comments and constraints
Deer whistles	Ineffective	Minimal	General public	Independent research does not support use
In-vehicle technologies	Unknown	Expensive	General public	Expensive to purchase, no independent research
Roadway lighting	Limited	Moderate	Municipalities, province	May be effective in specialized circumstances
Speed limit reduction	Effective	Minimal	Municipalities, province	Difficult to implement and enforce
De-icing alternatives	Limited	Moderate	Municipalities, province	Compounds include Calcium, Magnesium, or Potassium chloride, or Potassium acetate. Logistically difficult to implement.
Wildlife warning signs	Limited	Minimal	Municipalities, province	Need to reflect seasonal risk and use non-traditional designs
Wildlife reflectors	Ineffective	Moderate	Province	Independent research does not support use
Repellents	Unproven	Moderate	Province	Logistically complex to implement
Public education	Effective in focused markets	Moderate	Municipalities, province, ICBC, wildlife organizations	Due diligence to the public requires notification of areas where wildlife hazards exist
Right of way brushing	Effective	Moderate	Municipalities, provinces	Needs to be carried out in midseason to prevent resprouting
Exclusionary fencing	Effective	Expensive	Provinces	Expensive, restricts natural travel patterns unless implemented with crossings
Wildlife crossings	Effective	Expensive	Provinces	Expensive, needs to be implemented with fencing to direct animal movement
Roadway planning and design	Effective	Moderate	Municipalities and provinces	Can be incorporated into already existing processes

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages. Techniques ranked as effective can reduce collisions

Disadvantages. Jurisdictional issues between MOE, MOTI and municipalities may restrict action

Population Reduction Options

Capture and relocate

Definition. The capture, transport and release of free-ranging, wild animals, primarily for conservation or ecological reasons, in (to) a location different from which they came, but where the species may presently occur or historically have occurred naturally.

Discussion. Ungulates are trapped, netted and/or remotely immobilized with tranquilizers and then relocated. Ungulates may be captured by a variety of techniques including stationary drop nets, rocket nets, net guns, remote immobilization using drugs, corral or Clover traps. Some capture techniques involve pre-baiting to attract and condition the animal to the capture site, and then baiting the trap or net site to facilitate capture. After capture, the animal is generally restrained and blindfolded, and sometimes chemically immobilized. Subsequently, the animal may be subject to a variety of procedures: marking, tagging, collaring, collection of biological data or samples, preparation for transport or even euthanasia. Time from reaching the trap until the deer is restrained ranges from 5 seconds to 30 minutes, and after that, tagging, collaring or other procedures can be completed quickly (often less than 5 minutes).

Alternately, animals can be injected by tranquilizer darts, via remote delivery. It takes about 4 to 6 minutes for the tranquilizer to become effective during which time the animal may continue to feed and move. Wildlife professionals have no control over where an animal might move, and may require permission of land owners to come onto private land and retrieve a darted animal. When the animal succumbs to the tranquilizer, it is tracked and captured.

For transport, the animal may or may not be crated and then trucked, trailered or barged to the release site. During transport, deer should not be overcrowded (<5 individuals transported together) and should be kept in the dark. Antlers should be removed from bucks or they should be transported separately.

Efficacy. Effective at lowering populations, and may be useful in localized situations

Cost

- Expensive due to staff time (generally >60% of project costs) required for capture and transport
- Costs vary from \$352 USD /deer in 2000 to \$800 USD/deer in 2002
- Winnipeg MB project reported costs of \$300 CDN/deer in 1985 - volunteer time not included. Details of this project are included in Appendix B.

Human health and safety concerns. The risk of accidental encounters with capture equipment and treatment drugs is minimal. There is a small risk of human injury during capture activities. Animals

treated with immobilizing drugs cannot be consumed by humans so animals must be ear tagged prior to release in areas where there may be hunting.

Humaneness

- High mortality after release negates the perceived “humaneness” of this action.
- Animals can suffer extreme stress during capture and relocation, capture related injuries and mortality, capture myopathy causing debilitation and death, and incur high incidental mortality rates following release.

Advantages

- Perceived by the public as a humane option, therefore has some public relations value
- May instill wariness in remaining animals, possibly reducing aggressive incidents
- May be of value for small social groups in localized situations under special circumstances
- May be of value when the population is below carrying capacity at the release site

Disadvantages

- Not as humane as the public might think; not necessarily a non-lethal management option
- High ungulate mortality rates, both during capture and following release, may occur
- Ungulates may be injured during the capture or transport process
- Ungulates subject to capture and relocations are susceptible to capture myopathy; a significant mortality factor
- Expensive
- Requires substantial financial and logistical commitments of trained personnel and equipment to ensure human and animal safety
- Disrupts resident populations and may increase disease spread, initiate or exacerbate other land use conflicts, or disturb existing predator-prey balance
- Ungulates habituated to urban environments may seek out comparable residential locations from which they came
- Few skilled contractors available, requires significant investment of Ministry staff time

Population Reduction Options

Capture and euthanize

Definition. The capture and subsequent euthanization of ungulates, using a penetrating bolt gun or firearm.

Discussion. Ungulates are trapped, netted or tranquilized and then killed. For capture and euthanize projects, ungulates may be captured by a variety of techniques including stationary drop net, rocket nets, net guns, Clover traps or remote immobilization drugs.

Some capture techniques involve pre-baiting to attract and condition the animal to the capture site, and then baiting the trap or net site to facilitate capture. Netting will capture multiple deer at a time and Clover traps capture individual deer, or occasionally a doe and fawn together. After capture, the animal is restrained and killed either by a penetrating captive bolt gun or other firearm shot to the brain, or may be shot without initial restraint. Time from reaching the trap until the deer is restrained and euthanized ranges from 5 seconds to 30 minutes.

Efficacy. Effective at lowering populations

Cost

- Expensive due to staff time required for capture and animal transport, but less than capture and relocate
- Helena, Montana project reported \$250 USD/deer in 2009, using a Clover trap and bolt gun. Details of this project are contained in Appendix D.

Human health and safety concerns. The risk of accidental encounters with capture equipment and treatment drugs is minimal. There is a small risk of human injury during capture activities.

Humaneness. The use of a drop net to capture animals prior to killing is viewed as less humane than the use of a Clover trap because of the time interval between netting and euthanization when the animal may struggle. In a Clover trap, deer remain fairly calm with minimal stress until the last few seconds when humans are sighted. Capture and euthanize is considered less humane than sharpshooting due to the capture component.

Advantages

- May instill wariness in remaining animals, possibly reducing aggressive incidents
- Meat can be donated to charities
- Use of a bolt gun may be permitted in areas where no firearms discharge is permitted
- Suitable for areas where sharpshooting is not feasible.

Disadvantages

- Controversial and expensive due to the trapping component
- May shift damage to areas where hunting is not permitted or where damage was previously low due to low ungulate densities
- Ungulates may become educated to the bait and net technique; less so with a Clover trap where only one animal at a time is captured

Population Reduction Options

Controlled public hunting

Definition. Controlled public hunting describes the application of legal and regulated hunting in combination with more stringent controls or restrictions. Controlled hunting may limit hunters to a modified season which is usually more restrictive in terms of hunter density, methods of take, and size of huntable area and may also provide incentives for antlerless harvest and hunter participation.

Discussion. The goals and objectives of urban ungulate management are very different from traditional ungulate management. Urban ungulate management reflects an increased focus on individual animals or small social groups versus population management or herd dynamics. Goals in urban hunting may be to maximize antlerless deer removal as the most effective way to reduce populations rather than provide opportunities for large bucks which may be the emphasis in traditional hunting. Target population densities in urban areas may be different from conventional management standards in more natural environments. Success may be measured in terms of reduction in landowner complaints or reduced numbers of ungulate vehicle collisions rather than simply the maintenance of healthy and self sustaining ungulate populations.

In areas where local laws permit and the physical layout is appropriate, many jurisdictions have concluded that controlled public hunting in urban areas is effective, economical, efficient and acceptable.

Traditional public hunting, as prescribed in the provincial hunting regulations, may not have sufficient controls to mitigate the public safety concerns about hunting in urban environments. Controlled hunts can address both residents' safety concerns and the achievement of management goals. Hunters wishing to participate in controlled urban hunts may be expected to: pass shooting proficiency tests; undergo extra safety training; attend pre-hunt seminars; agree to pre-hunt interviews; meet mandatory check-in and check-out requirements; meet residency requirements; have a specified number of years of hunting experience; and be required to register any specialized equipment.

Designing management strategies for urban hunts may include a variety of options or incentives such as: inviting each homeowner in the treatment zone to participate; providing an opportunity to earn a bonus additional either sex tag (includes a buck harvest) by the prior harvest of 2 (or 3) antlerless deer; offering a 2 deer either sex bag limit; higher or unlimited bag limits; providing an opportunity to harvest additional antlerless deer if the meat is donated to a food bank; providing for special opportunities to youth or disabled people; or the opportunity to enter a lottery if only a designated number of hunters is allowed.

Changes to the hunt design itself may include: designated hunting areas or hunting lanes; extending the season; restrictions for weekdays or weekends; hunting in short intense bursts (2 days) followed by periods of inactivity (5 days); restricted hunting hours; high hunter densities; use of crossbows outside of archery seasons; use of archery only; use of elevated blinds only; allowing hunting from elevated stands; allowing hunting over bait; or restricting locations where field dressing occurs.

Efficacy. Hunting is an effective way to reduce ungulate population numbers, where hunter participation is adequate and access to land can be assured.

Cost

- Hunting is considered cost effective because hunters provide much of the labour for ungulate removal with little public expenditure.
- Difficult to estimate costs due to volunteer component
- Estimates range from \$20 CDN (2004) /deer (Magrath AB – see Appendix A for details) to \$200 USD (1995) /deer.

Human health and safety concerns. There may be some perceived safety concerns regarding firearm discharge and the potential for human injury. Required hunter training and proficiency skill tests may help to relieve these safety concerns.

Humaneness. Hunting could be considered as the least humane of all the lethal control options because of the potential for wounding. Some people will consider any killing of an animal as inhumane.

Advantages

- Efficient if using firearms, slightly less if using archery equipment
- Specifications can be restricted or liberalized to influence effect on ungulate populations, address public concerns or control seasonal requirements
- Hunting can increase animal wariness and decrease habituation, possibly leading to less damage
- Opportunity for meat to be donated to a food bank or utilized by hunters

Disadvantages

- Controversial, with strong public concerns over safety
- Limited hunter access to private lands restricts efficacy
- By its very nature hunting increases animal wariness making future removal difficult
- May shift damage to areas where hunting is not permitted or where damage was previously low due to low ungulate densities
- Some lost recreational opportunities for non hunters if recreational areas are closed due to hunting

Definition. The systematic culling of ungulates by trained and authorized personnel at multiple pre-approved and prepared bait sites during the day or night. Suppressed small calibre rifles are preferred but crossbows with a minimum peak draw of 50 pounds can be used where firearms discharge is not permitted. Protocols specify under what conditions a shot can be taken, ensuring no misplaced shots and that animals are dispatched with a single well placed shot to the head or spine.

Discussion. Shooting takes place from stopped vehicles, elevated locations, tree stands, or ground blinds, and during the day or at night. Shots are taken only when there is a known earthen backstop, either through topography or the shooters' relative elevation. Shots are taken only when there are no humans in the zone. Shots are not taken unless clear brain or spine shots can be achieved. Deer are shot on a first opportunity basis with antlerless deer being the first priority. Deer are not removed in the bush, at random locations or while moving.

Sharpshooting has been successfully used to address small scale deer overabundance problems in a variety of urban situations in the USA. Significant numbers of deer can be effectively and discreetly removed in one night. A variety of techniques can be used to maximize safety, humaneness, discretion, and efficiency. Sharpshooting can be employed in areas where there is insufficient undeveloped land for controlled hunting. Projects can be implemented with little disturbance to local residents if sound suppressed firearms are used. Properly designed sharpshooting projects can be efficient, safe for humans and effective.

Efficacy. Sharpshooting is an effective localized tool

Cost

- Time required for implementation and monitoring adds to project costs
- Reported costs range from \$150 - \$400 USD/deer in 2009

Human health and safety concerns. There may be some perceived safety concerns regarding firearm discharge and the potential for human injury. Human safety is ensured by only shooting when there is a known earthen backstop created through the shooters' relative elevation or topography and a clear line of vision.

Humaneness. Sharpshooting can be considered more humane than hunting because of the strict protocols regarding shot placement and timing which should result in much less wounding or escape. Some people will consider any killing of an animal as inhumane.

Advantages

- Very structured option – can be implemented under strict protocols
- Opportunity for uniformed staff, such as Parks Officers or Conservation Officers, to implement the project, therefore may be perceived as safer by the public
- Can use tools not normally authorized in hunts such as bait or spotlights to improve efficiency
- Quick, effective and efficient
- Specifications can be restricted or liberalized to influence effect on ungulate populations or address public concerns
- Opportunity for meat to be donated to a food bank
- Little disturbance to local residents if sound suppressed firearms are used

Disadvantages

- Strong public concerns over safety
- Controversial
- In areas where hunting could occur, sharpshooting could be a source of conflict if hunters felt their access to the resource was denied
- May shift damage to areas where sharpshooting is not permitted or where damage was previously low due to low ungulate densities
- Some lost recreational opportunities for the general public if recreational areas are closed due to sharpshooting

Fertility Control Options

Immunocontraception

Definition. The use of a contraceptive drug, vaccine, or sterilization to reduce the fertility rate of a population so that it is less than or equal to its mortality rate.

Note. *There are no fertility control drugs currently approved by Health Canada to date (2010) for routine operational use in ungulates.*

Discussion. It is important to distinguish between applying fertility control methods to ungulates in captive studies, versus small enclosed herds, versus achieving fertility control in the routine management of free-ranging ungulate populations. Achieving fertility control in captive deer or in small scale field experiments may or may not be an accurate predictor of the success of fertility control at the population level in a free-ranging deer herd. Fertility drugs have not been tested long enough at the population level to accurately predict long term results.

Maintaining large free-ranging populations with contraception may be accomplished with a long lasting contraceptive, and reducing the overall population numbers can be difficult but potentially achievable

over time. The long term population effect of a PZP vaccine used in Gaithersburg, Maryland, and Fire Island National Seashore, New York, has demonstrated 27% and 58% population density declines over 5 and 9 years respectively, but results are very dependent on factors such as vaccine efficacy, accessibility of deer, and site-specific birth, death and immigration/emigration rates.

One of the main constraints with using fertility control drugs is that project goals to significantly reduce population growth and total population numbers may be achievable, but the length of time required for such strategies to achieve adequate control is likely to be considerable. In the meantime, if no other management options are taken to reduce the population density, ungulate-caused damage continues at the same level. *Consequently, many researchers conclude that reducing the size of a deer population to an acceptable level is more effectively achieved through culling first, and then maintaining the population at the desired level through contraception.*

Immunocontraception. This has been the most widely researched fertility control treatment method for long lived mammals. It relies on the administration of a vaccine that prevents conception by causing the immune system to initiate antibody production against proteins and hormones essential for conception. Immunocontraception has been used to successfully control reproduction in ungulates. There are three main formulations of immunocontraceptives:

1. *GonaCon™ vaccine* - developed by United States Department of Agriculture (USDA), Animal Plant Health Inspection Services (APHIS), Wildlife Services Program, National Wildlife Research Centre. The USA product label requires annual injections.
2. *PZP vaccine* - developed by the University of California, Davis, California; the Science and Conservation Center, Billings, Montana; and the Humane Society of the United States. Research reports that one injection maintains contraception rates of 80% over 5-7 years.
3. *SpayVac™ PZP vaccine* - developed by TerraMar Environmental Research Ltd., Sidney, BC; ImmunoVaccine Technologies Inc., Halifax, NS; and Dalhousie University, Halifax, NS. Research reports that one injection maintains contraception rates of 80% over 5-7 years.

Efficacy. Immunocontraception has achieved fertility control in a variety of species, under a variety of conditions. Achieving fertility control in a free ranging population has also been achieved but is very logistically complex and dependent upon many variables. Although promising, it is very preliminary to assume that this method will be effective for all urban deer conflict situations.

Cost

- The treatment is expensive due to staff time required for capture and animal handling.
- In 2004, capture and single shot vaccination project costs were reported as \$350 USD/deer
- Cost of the immunocontraceptive drug itself is inexpensive (\$24-50/dose/deer)

Human health and safety concerns. The major concerns are accidental exposure to the vaccine via a lost or poorly aimed dart, and consumption of meat from a treated animal. Human health and safety

concerns are minimized due to regulatory approvals necessary prior to use and strict protocols for field use. Generally, animals are ear tagged post injection marking them as unfit for human consumption.

Humaneness. Fertility control is perceived by the public as more humane and morally acceptable than lethal population control methods, because fertility control works by decreasing birth rates rather than by increasing mortality rates.

Advantages

- Ungulate birth rate is reduced
- Popular concept, favoured by public, perceived as humane
- Is a rapidly advancing technology, which may prove useful in the future

Disadvantages

- Fertility control drugs are currently not approved by Health Canada, and therefore not available for routine managed application. Site specific approval is required for experimental use. In the USA, GonaCon™ is registered for operational use in white-tailed deer under the Environmental Protection Agency. *SpayVac™* and the *PZP vaccine* remain unregistered in Canada and the USA.
- The USA label for GonaCon™ states reapplication is required annually if sterility is desired for > 1 year; ear tagging no longer required, but dose must be hand-injected so the deer capture component cost still exists
- Some fertility control drugs require an initial treatment and a booster treatment thereafter
- Time and effort required to treat sufficient individuals to achieve the desired population control significantly reduces the cost efficiency of the treatment
- Does not address the problems/damage caused by the population at its existing level
- Relies on natural mortality causes (disease, predation, vehicle collisions, and emigration) which can be reduced in an sheltered, urban population, to achieve a reduction in the original population
- Under the best circumstances, there would be a time lag of several years (if ever) before population numbers and impacts would be reduced to any noticeable level
- Successful control is contingent on repeated treatments of large proportion (70-90% of females)
- Although long term research results are beginning to be published, and preliminary results appear promising, most methods are still unproven at the population level
- The state of fertility control technology lags far behind public expectations for this technique to be a reasonable alternative to lethal control

Summary of Population Reduction and Fertility Control Options

Method	General Public Safety	Animal Humaneness	Efficacy	Relative Cost	Social Factors	Legal Issues
Trap and relocate Ungulates are baited, trapped and moved outside the city	Possibility of people or pets encountering traps, nets or unused/lost darts containing chemicals	High stress resulting from capture and relocation High mortality after release (BC experience with elk and Manitoba experience with WTD does not show high mortality after release)	Population and damage will be reduced Animal wariness may increase with each subsequent trapping effort	Expensive due to high cost of animal capture, transport, possible collaring and subsequent tracking Reported costs range from \$352 USD/deer (2000) to \$800 USD/deer (2002)	Generally favoured by the public Not controversial	Non-government staff require a permit to handle/possess/transport wildlife Government staff require approvals from Region or Branch for relocation projects
Trap and euthanize Ungulates are baited, trapped and dispatched with bolt guns by COs, police or contractors	Possibility of people or pets encountering traps, nets or unused/lost darts containing chemicals	High stress resulting from capture Stress duration is short, with a goal of painless and quick death	Population and damage will be reduced Animal wariness may increase with each subsequent trapping effort	Expensive due to high cost of animal capture. \$250 USD/deer (2009 Helena, MT) Moderate labour costs if COs or police are used, expensive if contracted out	Generally not favoured by the public Controversial	Non-government staff require a permit to handle/possess/transport wildlife Government staff require approvals from Region or Branch for trap and euthanize projects
Sharpshooting Ungulates are baited, and shot by COs, police, or contractors	Possibility of collateral human injury during the process, however strict shooting protocols would be in place	Possibility of poor shot placement and subsequent animal injury and suffering, however strict shooting protocols are in place	Population and damage will be reduced	Moderate if COs or police are used, expensive if contracted out Reported costs range from \$150 - \$400 USD/deer (2009)	Generally not favoured by the public Controversial	Need for change to city bylaws to allow discharge of weapons

Method	General Public Safety	Animal Humaneness	Efficacy	Relative Cost	Social Factors	Legal Issues
<p>Controlled public hunting</p> <p>Ungulates are shot by recreational bow hunters or rifle hunters that have received enhanced training</p>	<p>Possibility of collateral human injury during the process</p>	<p>Possibility of poor shot placement and subsequent animal injury and suffering</p>	<p>With good hunter success, population and damage will be reduced</p>	<p>Inexpensive, perhaps some small revenue accrues due to license purchase</p> <p>Reported costs range from \$20 CDN/deer (2004) to \$200 USD/deer (1995)</p>	<p>Generally not favoured by the public</p> <p>Controversial</p>	<p>Need for enhanced monitoring of hunters</p> <p>Need for change to city bylaws to allow discharge of weapons and hunting. Need for change to hunting regulations</p>
<p>Fertility control</p> <p>Ungulates are baited, trapped, ear tagged, and contraceptives administered by dart or hand injection</p>	<p>Animals must be tagged to prevent human consumption or repeat treatments</p> <p>Possibility of people or pets encountering traps, nets or unused/lost darts containing chemicals</p>	<p>High stress resulting from capture, tagging, or injections; minor stress from darting</p>	<p>Proven effective at reducing fertility in individuals</p> <p>Very slow to achieve population reduction in free ranging populations, therefore damage is ongoing</p>	<p>Expensive due to high cost of animal capture and possible annual treatment</p> <p>Capture/single shot vaccination project costs reported as \$350 USD/deer (2004)</p> <p>Drug cost is inexpensive (\$24-\$50/dose/deer)</p>	<p>Generally favoured by the public</p> <p>Somewhat controversial</p>	<p><i>No drugs licensed for operational use in Canada</i>; permits required for scientific trials</p> <p>GonaCon™ registered in USA for WTD; state approval must be obtained prior to treatment</p>

Administrative Options

Status Quo

Efficacy. Damage still continues unless other management options undertaken

Cost. No additional costs incurred by the municipality, but costs likely to be incurred by residents

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- Generally gradual escalations of damage and costs

Disadvantages

- Both ungulate numbers and negative impacts increase

Administrative Options

Monitoring

Definition. The establishment of management goals and measureable responses prior to project implementation so that outcomes can be evaluated objectively

Discussion. In order to monitor a project outcome, baseline data is needed as well as project monitoring during and after management options are implemented. Population data, standardized reporting of complaints and vehicle collisions, documentation (age, sex, health) of any animal removed, and vegetative browse damage assessments in open areas and enclosed plots can all help to determine the effects of management actions and evaluate effectiveness.

Efficacy. Properly monitored projects provide useful results and allow for adaptive management practices as projects proceed.

Cost. Minor administrative/operational costs are incurred to implement ongoing project monitoring.

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- Monitoring will provide information to measure project outcomes

Disadvantages

- None

Administrative Options

Amend Municipal Bylaws

Definition. Municipalities can implement bylaws that complement and enhance more active ungulate population interventions. Three examples of bylaws to manage urban ungulate populations are:

1. *Ban ungulate feeding*
2. *Regulate land use or types of landscaping plants*
3. *Regulate weapon possession, weapon use and hunting*

Ban ungulate feeding. Many people enjoy feeding ungulates (usually deer) particularly in the winter when conditions may be harsh for animals. However, feeding contributes to artificially high population levels. Supplemental feeding can enhance deer reproductive rates, enhance winter survival, contribute to the collapse of home range size, encourage deer to congregate, and increase the habituation of animals to humans. Education and regulation may help to reduce the number of people who feed ungulates, but wildlife feeding bylaws may be difficult to enforce. A concerted effort is required from the community, law enforcement, and wildlife agencies to discourage this practice, which is not recommended by wildlife agencies.

Regulate land use or types of landscaping plants. Urban landscapes contribute to habitat fragmentation and reduced connectivity for wildlife movement. By requiring ecologically informed land use and development practices through municipal bylaws, ungulate habitat and connectivity corridors may be improved, thus reducing ungulate pressure in both newly developed and previously developed areas. Multifunctional green corridors may allow urban landscapes to be porous to ungulates, rather than attracting them and then habituating them to stay in urban areas. Greenways must be wide enough and complex in vegetative structure in order to retain ungulates within their boundaries. Alternate vegetation selection and management with respect to ungulate palatability may reduce ungulate preference for cultivated plantings and encourage them to move on in search of more natural forage opportunities.

Regulate weapon possession, weapon use and hunting. Communities commonly have local bylaws that regulate, within municipal limits: the discharge of weapons; the possession of weapons commonly used in hunting (firearms and archery equipment); and/or hunting activities. These types of ordinances

were frequently written when resident populations of deer in urban areas were almost non-existent, and may not reflect the present needs of a community. Where necessary and appropriate, existing bylaws could be revised to include:

- provisions authorizing the use or possession of particular types of weapons needed under special circumstances
- restrictions on the types of equipment allowed
- restrictions on the techniques that may be used
- provisions authorizing specific individuals to use specific type of weapons during ungulate control activities.

Efficacy. Damage still continues across the municipality unless other management options undertaken. A *Ban Ungulate Feeding* bylaw may have limited efficacy without corresponding efforts at public education, but may contribute to reducing ungulate congregation in localized areas.

Cost. Little direct or additional costs to the municipality would be incurred, except a potential increase in bylaw enforcement requirements.

Human health and safety concerns. *Ban Ungulate Feeding* bylaws won't change incidents of wildlife aggression or ungulate collision rates. *Regulate weapon possession, weapon use and hunting* bylaws increases the theoretical potential of increased human harm due to increased firearm use.

Humaneness. *Regulate weapon possession, weapon use and hunting* bylaws could theoretically increase animal suffering if lethal population control options were poorly monitored.

Advantages

- Revising bylaws has minimal cost to municipality
- *Ban Ungulate Feeding* bylaws likely would reduce animal habituation

Disadvantages

- Despite bylaw changes, damage likely to continue across the municipality
- Bylaw enforcement may be problematic
- *Regulate Land Use* bylaws may impose additional burdens on developers or property owners
- *Ban Ungulate Feeding* and/or *Regulate Land Use* bylaws may shift damage as property owners implement changes or wildlife feeding patterns stop or change
- *Regulate weapon possession, weapon use and hunting* bylaws likely to be controversial
- *Ban Ungulate Feeding* bylaw may be unpopular with residents, and raises the possibility of increased animal mortality if supplemental feed is required for survival during winter.

Definition. Changes to provincial hunting regulations or related provincial wildlife management legislation, regulations, policies or procedures would likely focus on providing opportunities for herd reduction in urban areas through lethal control.

Discussion. The Ministry of Environment has both authority and responsibility to manage ungulate populations. Regulated hunting is the primary management tool, through manipulation of herd age and sex ratios. Although municipalities are contained within hunting management units, bylaws restricting weapons discharge mean hunting cannot be implemented without regulatory changes from all jurisdictions.

Since traditional hunting methods may be inappropriate for urban areas, and hunters may be more reluctant to hunt in urban areas, creativity and incentives may be necessary to design a successful urban hunt. Some of the options suggested include: longer seasons; Sunday hunting; restrictions to weekday hunts only; the use of bait; increased bag limits; quota hunts; earn 1 bonus buck tag by harvesting 3 antlerless deer; allowing for culling as opposed to hunting; inclusion of either sex seasons; inclusion of archery seasons – with or without crossbows; ability to harvest bonus deer if meat donated to the food bank; and lowered tag costs for antlerless hunts. Additional factors to consider would be required special training, proficiency tests, and residency requirements for urban hunters.

In small localized urban areas, management strategies and subsequent regulations can be adjusted to account for size of harvest, sex composition through bag limits, antlerless permits, season type, season timing, season length, number of permits, land access policies and other considerations.

Efficacy. Regulatory changes to liberalize hunting regulations and implement some herd reduction options will result in decreased damage.

Cost. Low increase in administrative and enforcement costs, offset by small revenues from tag sales.

Human health and safety concerns. There have been no human safety incidents reported in any urban deer hunts that have occurred in US cities.

Humaneness. Regulatory changes to liberalize hunting regulations in order to implement herd reduction options will be considered a controversial and inhumane way to manage deer overabundance.

Advantages

- Regulatory changes to liberalize hunting regulations in order to implement herd reduction options offer an efficient and expedient way to control overabundant ungulates.

Disadvantages

- Regulatory changes to liberalize hunting regulations in order to implement herd reduction options are likely to be very controversial.

Administrative Options

Public Education

Definition. Public education imparts two kinds of information – information about the process (the ongoing activities, timing, funding, who is involved) and knowledge about the issue (unbiased and accurate information about urban ungulate biology, ecology, behaviour, management and potential interventions).

Discussion. Public education covers many aspects of urban ungulate management and should be carried out by all agencies involved in managing the issue. Public education can change human attitudes or behaviours and complement other active management interventions by:

- Increasing tolerance of ungulates and ungulate problems through informational programs that explain why ungulate/human interactions are increasing and what can be done about them
- Creating realistic expectations about ungulate management or achievable results for population levels through communication programs explaining key concepts (biological carrying capacity, limits on population controls, predator-prey relationships)
- Increasing appreciation for wildlife through youth stewardship education programs
- Increasing desirable human activity associated with urban ungulates through information programs on feed/do not feed and appropriate backyard plantings
- Reducing undesirable human activity associated with ungulates through wildlife collision signage
- Improving public understanding of other stakeholder's concerns through informational meetings

Efficacy. Damage still continues unless other management options undertaken.

Cost. Staff time to prepare and disseminate materials

Human health and safety concerns. No concerns

Humaneness. No concerns

Advantages

- Keeping the public informed of the process, the issues and the management options to be undertaken can contribute to the success of a project.

Disadvantages

- None

Conclusion

Some BC communities are experiencing increased conflict with habituated urban ungulate populations. Addressing urban ungulate conflicts must involve all stakeholders: the public; concerned wildlife organizations; provincial, regional and municipal governments. Collaborative, community-based processes will likely provide the most open and transparent way to arrive at community-specific solutions. An urban deer management committee with representation from all stakeholder groups provides the opportunity for public education, establishment of biological baseline data, goal setting, discussion and selection of management options, and evaluation of results.

Solutions to urban ungulate conflicts must involve components of all management options: educating stakeholders thereby increasing their participation in management decisions; establishing measureable management objectives; modifying deer behaviour; modifying human behaviour; reducing herd size; and amending provincial and municipal regulations to facilitate management interventions. No single technique will be universally appropriate. Complexities of deer management and limitations on available interventions make quick-fix solutions unlikely. Because both the positive and negative values associated with ungulates are so high, setting management goals and determining treatment options can be very difficult.

Those responsible for urban ungulate management decisions may have to strike a balance between the aesthetic and sentimental value of urban deer and the unwelcome interactions and costly property damage they cause. The conflicting or overlapping jurisdictional responsibilities between provincial and municipal governments and the limited financial resources of all agencies compound the operational difficulties. Additionally, an unfortunate reality is that addressing the social conflicts caused by management interventions may be more difficult than managing the biological aspects of population reduction.

There is no one best method to address the issue of overabundant urban ungulates. The situation in each community will dictate what management interventions can be implemented. A management program that integrates many components of ungulate management will be most successful. An

integrated program will require action by all stakeholders, including all levels of government, the general public, and wildlife organizations.

What is clear is that if the complaints caused by ungulate damage are increasing in numbers and severity, then conflict reduction options such as fencing, repellents, and aversive conditioning will not significantly reduce the numbers of complaints. A reduction in the population is needed to reduce the damage caused by overabundant ungulates. Once the population numbers are lowered, then damage is easier to manage with conflict reduction techniques. Population reduction methods are not generally going to be popular with the majority of the public, but are the only way to have a measureable impact on damage levels in the community. The method of population reduction and how often it needs to be carried out is dependent on the site specific circumstances in each community.

In communities where ungulate management challenges exist, preparation and planning for future management decisions must begin. Actions that can be undertaken by communities include:

Public opinion surveys

The results of public opinion surveys can provide valuable information to guide urban ungulate management committees in their decisions. Surveys can be distributed in tax notices or utility bills, through email, or using more formal survey processes. Appendix E contains examples of survey questions that can be adapted for use in specific communities.

It may not be helpful to query residents about which management options they prefer unless the public is well educated about the various options first. In general, most people will prefer non-lethal methods over lethal methods (contraception or trap and relocate over sharpshooting and trap and euthanize) without fully understanding cost comparisons or operational constraints (fertility control is not operationally available and trap and relocate may cause stress and mortality for relocated animals). A survey may be most appropriate to identify how much damage is occurring, how much damage people are willing to tolerate, and if the animals are posing a physical hazard to humans or other animals (pets). Thus, the survey can provide support for a reason to act, but may not be the most appropriate way to determine interventions for a community. It can also be used to monitor damage or conflict after the implementation of any management options.

Community capacity

To increase the capacity of the community to contribute to an ungulate management task force, people or organizations who would be interested and able to participate should be identified.

Cultivate relationships with the media

An ungulate management program can be won or lost in the media, so media involvement is crucial. Invite the media to every meeting, and if they don't come, send them a summary. Take them along on population counts, damage estimates, and when an animal has to be dispatched because it has stomped

a dog or frightened a child. Urban ungulate management cannot be a closed process - it needs to be as open as possible. This is perhaps counter intuitive and difficult to accomplish as public employees, and it is where a community based ungulate management task force can play an important role.

Gather data

Communities should identify the sources of data on ungulate human interactions and set up systems to gather the data consistently at every point of data collection. Baseline data will be needed to support management decisions before any ungulate management program can be implemented.

Data Sources

- Provincial: Highways maintenance contractors, Ministry of Transportation and Infrastructure, Conservation Officers
- Municipal: public works crews, bylaw officials, parks department, receptionist at the municipal office
- Federal: RCMP, Parks Canada
- NGO: BC Wildlife Federation clubs, trappers, guides or other similar organizations
- Private: independent biologists or wildlife experts

Data Required

- Numbers of deer killed in deer vehicle collisions on city streets or on adjacent highways.
- Numbers of complaints received (and costs): deer damage to gardens, properties, vehicles
- Number of complaints received: deer aggression
- Numbers of deer attended by Conservation Officers for other reasons – caught in fences, trapped in yards etc and the outcomes
- Population estimates and other parameters, including population health
- Any associated increase in cougars or coyotes in urban areas

Background

In the summer of 2003, residents in Magrath became disturbed at what they felt were unusually high numbers of white-tailed deer living in and around their community. This resulted in 83 residents signing and delivering a petition to the local MLA in the fall of 2003.

The overall population of white-tailed deer adjacent to the town had increased over the last 10 years, from approximately 60 deer up to almost 300 (500% increase) and there was a shift in habitat use by deer, as all deer were observed within ~2 miles of town. The deer were moving in closer to the community to take advantage of the permanent food sources (gardens, ornamentals and irrigated fields), the lack of predators and safety from hunters.

A series of meetings with local agencies and the general public were held. During the meetings, attendees were provided survey forms to indicate their opinions regarding a quota hunt. Survey forms were also mailed out to all landowners within the proposed hunt boundary. The outcome from the meetings and surveys indicated almost unanimous support for a quota hunt. Support from community residents, landowners and the local government (town and county) for a hunt was very strong.

A limited entry, special quota hunt was held in January 2003, and about 100 hunters harvested 164 antlerless white-tailed deer. Public complaints decreased and remaining deer were more wary.

In 2009, there again appears to be an increase in deer related complaints and deer vehicle collisions

Quota Hunt Project Specifics

In Alberta, quota hunts are used to target a very specific population of animals, in a very specific geographic location that cannot be dealt with effectively during the regular season. A series of four 3-day hunts (Thurs., Fri. & Sat.) with 25 hunters participating in each was approved. All hunters were licensed to harvest 2 antlerless white-tail deer within a specific area. Hunters were required to apply in person, have a valid Wildlife Information Number (WIN) and signed permission for access from at least one landowner in the hunt area. Licenses were issued on a first come, first served basis, which increased the likelihood local hunters would be licensed and hunter success maximized. All other hunting regulations applied as per the regular hunting season.

The limited entry, special quota hunt was held in a small geographic area around Magrath. Approximately 100 hunters harvested 164 antlerless white-tailed deer. Aerial surveys carried out shortly after the hunt indicated that while white-tailed deer numbers in the Magrath area remained high, but there was a reduction in the number of deer that were utilizing habitat in close proximity to Magrath. Residents of the community also report that the deer in and around town are more wary of people.

Additional points contributing to the success of this project:

- A reduction in deer numbers was fully supported by local governments
- Good historical population numbers were available
- Areas right adjacent to Magrath would not be first choice for hunters in the regular season, but for a quota hunt it was an additional opportunity to hunt, at a time of year when no other hunting opportunities were present
- Private landowners in the hunt area were largely in favour, and allowed access
- It was possible to have more visible enforcement presence because the hunt was not held during the regular season
- All hunters were required to attend a briefing session every morning
- Perhaps one-third to one-half of the Magrath deer population was removed

Background

In 1985, Manitoba Conservation embarked on a 3-year project to capture and relocate ~200 white-tailed deer (WTD) away from the Greater Winnipeg Area (GWA). Since this relocation, the GWA has again experienced a large urban WTD population growth and Manitoba Conservation has noted a significant increase in the number of complaint calls involving human-deer conflict over the last 20 years. The number of complaints peaked in 2000 to 2003 at ~50 calls/year, but has dropped off since then to ~20 calls/year. Complaints generally involve damage to home or commercial gardens and deer vehicle collisions, with few calls involving aggressive deer.

There are no city bylaws in place preventing deer feeding. The Conservation Officers can ticket individuals for feeding deer, but the provincial legislation is weak, and it has to be demonstrated that the feeding is proving to be a safety concern for humans.

The number of deer vehicle collisions is increasing. In 2005, 2006, and 2007, there were 325, 433, and 424, respectively. An aerial survey conducted in 2006 by Manitoba Conservation estimated that there were approximately 1800 white-tailed deer within the city limits, and about half were concentrated in one geographic area of the city. This is a resident white-tailed deer population, with little movement out of the city during the spring and summer.

There are polarized views in the general public regarding deer management options. Three years ago it was identified there was a need for a strategy and Provincial MLAs organized two public meetings which 200 people attended. The City of Winnipeg has worked with Manitoba Conservation to prepare a draft management document to establish management options. This document is still under review and not available for general distribution at this time. The three main recommendations are: maintain the status quo; continued public education; and herd reduction.

In 2009, a public opinion survey of deer management options in Winnipeg was carried out for Manitoba Conservation and the Manitoba Wildlife Federation. Conclusions and recommendations from this survey of 1182 residents were:

Conclusions

1. Greater Winnipeg Area (GWA) residents want an urban deer management plan
2. GWA residents substantially prefer non-lethal methods of management
3. GWA residents residing in high deer density areas, and GWA residents who have experienced direct human-deer conflict, show the highest support for lethal methods of action
4. Male and female GWA residents show significant statistical differences in relation to their acceptance of lethal methods of action, and the use of firearms within city limits

5. GWA residents believe residents and government together should create an urban deer management strategy

Recommendations

1. Establish a public education initiative
2. Integrate human dimensions work into the process of creating a management plan and continue human dimensions research
3. Create a management plan that is systematically revisited, adaptive and multidimensional
4. Prohibit deer feeding within the city limits
5. Increase road safety signage and barrier fencing/modifications on high collision prone roadways
6. Selectively cull injured deer to address residents concerns regarding deer well being
7. Create a city task force to address long term deer management planning

Capture and Relocate Project Specifics

Beginning in 1985, there was a 3 year project to trap white-tailed deer in Winnipeg and move them 60 miles south east. The target was to capture and relocate 300 does out of a population of +/- 1000.

Project highlights included:

- 283 white-tailed deer were removed over a three year period. Not all were does
- Four or five bait sites were established, and a drop net was used to capture the deer
- 10 to 12 deer could be caught at once, and all deer were chemically immobilized
- 6 or 8 deer could be transported in a stock trailer at one time. The deer generally remained immobile during transport.
- There was 3.5% mortality (10 deer) during the capture/transport phase of the project
- All deer were ear tagged for future recognition purposes, and ~20 deer were collared
- There was some supplemental feeding at the release site
- Less than 5 deer were recaptured back in Winnipeg
- Several deer moved long distances from the release site (>100 miles)
- Several were seen right at the release site in the years following the release
- There was no formal measurement of mortality post release, but there were lots of reported sightings of the tagged deer in the years following the relocation
- There was lots of volunteer labour involved in capture, transport and release
- Difficult to estimate costs due to high amounts of volunteer help, but may have been around \$300/deer
- Winnipeg deer population after the project followed the wildlife agency expectations. There was an increase in deer numbers, but not a huge reproductive rebound. It bought them 15 years, until 08/09, when the situation again requires active management

The following is an anecdotal account of the capture and euthanize method employed by the Sallas Forest Strata Corporation.

Background

European fallow deer *Dama dama* (a species not native to BC), were introduced to Sidney Island near Victoria BC early in the last century, and have multiplied to an extent that they are severely damaging and disrupting the island's natural ecological systems. Various methods have been utilized in an attempt to manage the population, including recreational hunting, commercial guided hunting, and the live capture and shipment of large numbers of fallow deer for sale to deer farmers.

Over the past 28 years, more than 11,000 fallow deer have been removed from the island. From 1994-2004, an average of 506 deer/year were removed, with the largest numbers taken by live capture for transfer to deer farms and in commercial, guided hunting. Both of these activities were terminated in 2002, because of the collapse of the deer farming industry and the restriction of hunting opportunities due to residential development. This level of removal was insufficient to slow population growth. Parks Canada and other experts have suggested a reduction of the deer population by 70% or more must happen before ecosystem recovery can take place. The current deer population is estimated at ~2700 individuals, with an average density of 3 deer/ha, well above a sustainable density and several times the fallow deer density on other Gulf Islands.

The 82 private owners of most of the island lands, organized as the Sallas Forest Strata Corporation, have decided to launch a renewed, long-term effort to reduce and control the deer population to protect the forest environment from further degradation and to help restore the ecosystem. Because of the current size of the deer population, the Strata Corporation has decided that both recreational hunting and live capturing and processing of deer on the island for production of venison products will be most effective method of population control.

The Strata Corporation identified the following key objectives for their project:

- that deer are handled as humanely as possible, with minimum stress and threat of injury
- that reasonable efforts be made that deer removed are utilized for human consumption
- that sustainable recreational hunting opportunities are provided for property owners
- that the plan and its implementation must be efficient in its demands on financial and managerial resources

In 2008, a new opportunity was presented by the development of a mobile abattoir, licensed to process red meat in BC. The Strata Corporation therefore constructed a new, high-quality deer barn and

capturing facilities and contracted with the operator of the abattoir, Gate to Plate Food Services Inc., to bring it to Sidney Island. In March, September and October 2009, 898 fallow deer were captured and dispatched, and the feasibility of capturing and processing large numbers of deer on the island was demonstrated.

Capture and Euthanize Project Specifics

There is a large natural meadow which has been fenced, and this is the initial staging area for the operation. There are 4 gates in the fence. The gates are left open most of the year, and the deer freely move in and out. Some weeks in advance of the operation, the area is baited with alfalfa, near the gates and throughout the meadow area. During the night, when the deer are the quietest, the gates are closed. Hundreds of deer may be contained in this meadow at a time.

The deer do not herd easily, but 2 or 3 men, moving very quietly and gently, “work” the herd along the fence towards an open gate and an interim paddock area. The deer are kept here for up to 8 or 10 days. They are provided with shade, food and water. They are generally very calm as long as there is very little presence of humans or dogs.

When sufficient numbers of deer are captured, the abattoir is brought in, and the deer are moved through a series of increasing narrow spaces, always maintaining a gentle and soft approach to the herding process. Because fallow deer very retain large racks, which can damage other deer during the herding process, bucks are removed by sharpshooting at this stage. The deer are not alarmed by the shots, but may become nervous when carcasses are removed, and there is more movement in the paddock. Does and fawns ultimately end up in a small, absolutely dark shed, where they are in very close quarters, but in this very dark area, they are very passive and immobile. One MoE or Parks Canada staff member moves quietly among the deer, and dispatches 4-6 animals with a bolt gun. This is the number of carcasses that the abattoir can process efficiently without undue handling delays.

In March 2009, 348 deer were captured and dispatched. Only about half the deer delivered to the abattoir were deemed suitable for human consumption, because of their poor, emaciated condition, bordering on starvation. Nevertheless, this phase of the project succeeded in demonstrating the feasibility of capturing and processing large numbers of deer on the island. The next phase took place in September and early October 2009 and removed 550 deer. This time of year resulted in a conspicuous improvement in the condition of the deer harvested, and a much larger proportion was utilized to produce venison. The Strata Corporation independently found a market for the venison, resulting in revenues sufficient to cover the abattoir cost and the immediate costs of the operation.

348 deer were removed March 2009, 550 deer were removed in fall 2009, 380 taken by hunters in winter 2008/2009, resulted in 1280 deer in total being removed from fall 2008 to fall 2009.

Background

Beginning in 1996, the City of Helena experienced an increase in the numbers of urban deer and associated deer-human conflicts. These issues resulted in public safety concerns, property and landscaping damage, and concern for deer welfare. Resident tolerance for deer decreased as deer populations and subsequent damage increased. There was increasing public frustration and constant public pressure. A tipping point seemed to be reached when deer began to interfere with the free movement of the public. One particular example was mentioned: a boy delivering newspapers was trapped under a vehicle by an aggressive mule deer. Also, small dogs had been attacked and stomped by both does defending fawns, and bucks during the rut.

Helena Urban Deer (White-tailed and Mule deer) Reports 2003-2006

Year	Dead or Injured	Other Complaints	Total	Vehicle Collisions
2003	86	17	103	16
2004	77	22	99	30
2005	127	55	182	31
2006	193	48	241	30
2007	216	43	293	34
2008	246	85	363	32

Montana Fish, Wildlife & Parks Urban Deer (White-tailed and Mule deer) Reports 2003-2006

Year	Dead or Injured	Other Complaints	Total
2004	58	15	73
2005	73	76	149
2006	96	66	162

The Helena City Commission created an Urban Wildlife Task Force in 2006, which was then charged with evaluating the condition of the urban deer herd and recommending deer management actions. The Task Force met 29 times, held 2 public meetings, and compiled the *“City of Helena Urban Deer Management Plan – Findings and Recommendations of the Helena Urban Wildlife Task Force”* after one year of operation. The Deer Management Plan summarized all processes, technical information and administrative actions that the Task Force used to develop management recommendations to present to the City Commission. The Task Force:

- Researched other jurisdictions that were developing deer management plans
- Researched state and municipal legislation and ordinances that impact urban deer management
- Researched current response practices of agencies involved in urban deer complaints
- Compiled historical state and municipal agency summaries of urban deer complaints
- Conducted a telephone survey of citizen’s opinions of urban deer and deer management (approximate cost \$7,000 USD)

- Conducted a deer inventory study (approximate cost \$6,000 USD)
- Researched historical population levels of deer in and around Helena
- Hosted 2 Town Hall meetings and solicited public input from citizens
- Developed a master communication plan for knowledge transfer to the public, Helena officials, and to identify and track future activities and deadlines

Following a 9 month information gathering process, the Task Force began to consider 5 key questions.

1. Are the health and/or safety risks to people and urban deer significant?
2. Are urban deer management actions necessary, or not?
3. Has Helena reached its social carrying capacity for deer, or not?
4. Should Helena reduce its deer population, or not?
5. Should Helena establish a permanent Urban Wildlife Advisory Committee?

The Task Force identified the following options as suitable for immediate or future use.

1. Maintain current management actions
2. Public education and outreach
3. Landscaping/repellents/barriers
4. Zoning/ordinances/laws
5. Capture and transfer
6. Capture and euthanize
7. Fertility/sterilization
8. Professional wildlife removal
9. Certified urban hunting
10. Deer tracking and aversive conditioning

Additionally, the Task Force recommended that an adaptive management strategy be applied to evaluate the effectiveness of all management options and to consider future inclusion, exclusion or transition of all appropriate management options.

Helena City Commission decided to implement a capture and euthanize project in Sept-Oct 2008.

Capture and Euthanize Project Specifics

The pilot project was implemented by the Helena Police Department. Phase 1 was conducted Sept 15 to Oct 30, 2008, and Phase 2 was conducted Feb 3 to Mar 31, 2009. Six traps were employed in Phase 1 and 12 traps in Phase 2.

Traps were located almost exclusively on private lands, in residential yards. Landowners signed a release form authorizing officers to be on their property, and advising them that their lawn may incur some damage from the trap or the deer. Generally, the response was that the deer cause more damage than a trap or net ever could. Neighbours within eyesight of the proposed trapping locations were consulted, and if there were any objections then that proposed location was not used.

Baited Clover traps were used to capture the animals. The traps consist of a rectangular pipe frame covered with heavy netting, with a sliding mesh or netting door at one end. A trip line runs through the bait and up to a snap trap or trip mechanism. When the deer makes contact with the trip line, the snap trap releases the door rope and the door closes, trapping the deer inside. If a trap failed to catch a deer it was moved to another location where a landowner had requested a trap. Clover traps are designed to capture only one animal at a time. Infrequently, a doe and fawn were captured together. The traps were checked about one hour prior to sunrise. If an animal was found in the trap, the frame and net were collapsed down onto the animal to restrict its movements, and then the animal was dispatched on site using a bolt gun. Bolt guns are used in the food processing industry, and the mechanism fires a steel bolt directly into the brain of the animal, causing instant brain death. The time the officers reached the trap until the animal was dispatched was timed at 18 seconds.

The carcasses were removed to a Fish, Wildlife & Parks facility to be cleaned, dressed and stored. When carcasses accumulated, they were taken to a local butcher, processed into deer burger, and the meat donated to the Helena Food Share for distribution to needy families. The butcher processed the meat at a reduced price. Helena Food Share paid for the processing through its regular donations.

Helena Police Department made a concerted effort for the process to be open and transparent. Notices were placed in the paper advising that the project was ongoing, and local media, both newspaper and TV, were invited to travel with and attend trap sites with the officers. Officials felt strongly that the donation of meat to Helena Food Share, and the inclusion of the media in the process were helpful in gaining the public support for this project.

- Note: During Phase 1 when 50 deer were captured and euthanized, an additional 40 deer were either killed by collisions with vehicles, removed by FWP for aggressive behaviour towards people or dogs, impaled on fences or from other unknown causes.
- Note: During Phase 2, Helena Food Share received 4,499 lbs of meat from 150 deer at a cost of \$5,962. This included skinning, butchering, processing into burger and adding suet.

The cost expended out of the Urban Wildlife Project Fund budget for both Phase 1 and 2 was \$36,885. Additionally, during Phase 1, approximately \$13,000 was expended out of Police Department salary funds for research and set up time, and regular officer operational time on the project.

Total cost to remove 200 deer was approximately \$49,885. This works out to \$249.33 USD /deer.

There are many reasons why a survey of public opinion may be conducted. A survey may be held prior to any management option implementation to provide a benchmark level of damage, and then the same survey may be conducted at intervals after treatment to determine the effectiveness of the interventions at reducing damage levels. Alternately, a survey may be held to assess the views of the public about the acceptability of management options to be undertaken or the amount of funding or effort that they wish expended upon ungulate management.

A survey containing questions on management options without ensuring that the public is well educated about the advantages and disadvantages of each management option may not be an accurate reflection of the community's preferences. It is recommended that public education be carried out prior to soliciting public opinions on management techniques, or that such surveys be conducted both before and after an extensive public education program. Information on the community deer situation and unbiased and clear science-based information on management options can be included with the survey, but a one-shot effort at education may not be sufficient.

This appendix contains a variety of survey questions that may be drawn upon for inclusion in a survey. The reason for the survey will dictate which of these questions should be included.

In order to obtain statistically valid information from a survey, there are survey protocols that must be observed. For example: the selection of the target population; recording the number of surveys sent out; and contacting some of the non-respondents in order to ensure that they do not represent one particular opinion group are all requirements of a well designed survey. This appendix was not intended as a final reference for survey techniques, and agencies conducting a survey should ensure that they research and understand basic survey protocols.

Residents Survey

Methodology

- **Please have an adult resident of this household whose birthday is closest to the time of this survey complete the survey questions. This helps to minimize gender and age bias in the survey sample population.**
- **Please answer all questions using events that have happened within the past (???) years (e.g. *three year period July 2007 to July 2010; or one year period July 2009 to July 2010*)**
- **Please return this survey to (address/location) , by (date)**
- **Along with the survey, municipalities may wish to include a summary fact sheet with information such as estimated deer population, annual number of deer complaints and/or deer vehicle collisions, explanations of possible management options, and any other pertinent information.**

Resident Concerns

- **How concerned are you about the deer population in this community?**
 - *not concerned at all*
 - *not very concerned*
 - *neutral*
 - *slightly concerned*
 - *very concerned*
 - *don't know*
- **What are your main concerns regarding the deer herd in this community?**
 - *deer/vehicle collisions*
 - *deer aggression towards humans*
 - *deer damage to vegetables, flowers, trees, shrubs or other landscape plantings*
 - *deer aggression towards pets*
 - *human health risks from deer*
 - *other _____*
 - *overall health and well being of the deer herd*
 - *no concerns*
 - *over population of the deer herd*
 - *don't know*
- **Have you or a member of your immediate family seen deer sign on your property? (e.g. pellets, tree rubbing, browsing, or the deer themselves)**
 - *yes*
 - *no*
 - *don't Know*

Deer Aggression

- **How concerned are you about deer aggression in this community?**
 - *not concerned at all*
 - *not very concerned*
 - *neutral*
 - *slightly concerned*
 - *very concerned*
 - *don't know*
- **Have you or a member of your immediate family been threatened by a deer?**
 - *yes*
 - *no*
 - If yes, was it a buck or a doe?**
 - *buck*
 - *doe*
 - *don't know*
 - If yes, at what time of year did this incident occur?**
 - *spring*
 - *summer*
 - *fall*
 - *winter*
 - If yes, were you walking a dog at the time? Was the dog on a leash?**
 - *yes*
 - *dog on leash*
 - *dog off leash*
 - *no*

- **Other than the incident described in the question above, has your pet been threatened by a deer?**
 - *yes*
 - *no*
 - If yes, was it a buck or a doe?**
 - *buck*
 - *doe*
 - *don't know*
 - If yes, at what time of year did this occur?**
 - *spring*
 - *summer*
 - *fall*
 - *winter*

Deer Damage

- **What amount of property damage caused by deer have you experienced?**
 - *no damage*
 - *minimal damage*
 - *moderate damage*
 - *severe damage*
- **What types of plants have been damaged by deer on your property?**
 - *shrubs/trees*
 - *flowers*
 - *vegetables*
 - *other* _____
 - *none*
- **Have you tried to protect your property from deer damage?**
 - *yes*
 - *no*
- **What method have you used to protect property from deer damage?**
 - *fence*
 - *repellent*
 - *netting or screening*
 - *scaring*
 - *other* _____
- **How much money (approximately) have you spent in the past 5 years to deal with deer damage in your yard? (replacing deer damaged plants, installing fencing, repellents, frightening devices etc)**
 - _____

Deer Feeding

- **Do you or your immediate family feed deer?**
 - *yes*
 - *no*
- **Do you personally know anyone else who feeds deer?**
 - *yes*
 - *no*

Deer Vehicle Collisions

- **Have you observed deer involved in a deer vehicle collision in this community? (seen a dead or injured deer on a municipal street or witnessed a collision on a municipal street)**
 - *yes*
 - *no*
- **How concerned are you about having a deer-vehicle collision?**
 - *not concerned at all*
 - *not very concerned*
 - *neutral*
 - *slightly concerned*
 - *very concerned*
 - *don't know*
- **Have you or a member of you immediate family had a deer vehicle collision?**
 - *yes*
 - *no*

Deer Management Options

- **Would you support the municipality forming a committee to investigate management options for urban deer in your community?**
 - *yes*
 - *no*
 - *don't know*
- **In the future, what would you like to happen to the number of deer in your community?**
 - *slight increase (about 10%)*
 - *moderate increase (about 30-40%)*
 - *slight decrease (about 10%)*
 - *moderate decrease (about 30-40%)*
 - *stay the same*
 - *don't know*

- There are many criteria to be considered when managing an urban deer population and deciding upon appropriate management options. Circle the response (extremely important, moderately important, slightly important, not important at all, or don't know) that best describes how important it is to you personally that the management consideration be taken into account when developing a management plan for urban deer in your community.

Management Consideration

Be operationally feasible	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Be effective	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Offer a quick solution	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Offer a sustainable solution	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Minimize costs to society	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Make any harvested deer available for human consumption, either privately or thorough a food bank	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Minimize animal suffering	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Minimize health and safety to humans	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>
Maintain a healthy deer population	<i>Extremely important</i>	<i>Moderately important</i>	<i>Slightly important</i>	<i>Not important at all</i>	<i>Don't know</i>

- There are a number of management options that can be used to manage urban deer populations. Circle the response (very acceptable, moderately acceptable, slightly acceptable, not at all acceptable, or don't know) that that best describes how personally acceptable you think each management option is for use in your community.

Management

Option

Use of hazing/frightening techniques	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Use of repellents	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Regulate types of plants and trees	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Use of fencing	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Ungulate vehicle collision techniques	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Capture and relocate deer	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Capture and euthanize deer	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Controlled public hunting	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Sharpshooting	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Maintain the status quo	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>
Carry out public education about deer	<i>Very acceptable</i>	<i>Moderately acceptable</i>	<i>Slightly acceptable</i>	<i>Not at all acceptable</i>	<i>Don't know</i>

- **Please pick only one management option that you would most prefer as a short term option to manage the urban deer population and reduce damage in your community.**
 - *Hazing/frightening techniques*
 - *Repellents*
 - *Landscaping alternatives*
 - *Fencing*
 - *Ungulate vehicle collision mitigation*
 - *Capture and relocate*
 - *Capture and euthanize*
 - *Controlled public hunting*
 - *Sharpshooting*
 - *Status Quo*
 - *Public Education*
- **Please pick only one management option that you would most prefer as a long term option to manage the urban deer population and reduce damage in your community.**
 - *Controlled public hunting*
 - *Hazing/frightening techniques*
 - *Capture and euthanize*
 - *Repellents*
 - *Landscaping alternatives*
 - *Public Education*
 - *Fencing*
 - *Ungulate vehicle collision mitigation*
 - *Sharpshooting*
 - *Capture and relocate*
 - *Status Quo*
- **Please pick only one management option that you would least prefer to manage the urban deer population and reduce damage in your community.**
 - *Fencing*
 - *Controlled public hunting*
 - *Status Quo*
 - *Hazing/frightening techniques*
 - *Capture and euthanize*
 - *Landscaping alternatives*
 - *Public Education*
 - *Sharpshooting*
 - *Ungulate vehicle collision mitigation*
 - *Capture and relocate*
 - *Repellents*
- **Please pick only one management option that you believe would be the most effective option to manage the urban deer population and reduce damage in your community.**
 - *Ungulate vehicle collision mitigation*
 - *Sharpshooting*
 - *Controlled public hunting*
 - *Status Quo*
 - *Capture and euthanize*
 - *Public Education*
 - *Hazing/frightening techniques*
 - *Fencing*
 - *Landscaping alternatives*
 - *Capture and relocate*
 - *Repellents*

Respondent Demographics

- **Gender of respondent**
 - *male*
 - *female*
- **Age of respondent**
 - *18-20 years*
 - *20-40 years*
 - *40-60 years*
 - *60+ years*

○ **How long have you lived in this community?**

○ *less than 1 year*

○ *1-3 years*

○ *3 to 5 years*

○ *5-10 years*

○ *over 10 years*

○ **Do you have any other comments on the deer population or deer population management in your community?** _____

○ **Can we contact you for more information or to participate in an urban deer management committee? If so, please provide your contact information (name, address, phone number, email address).** _____

Blogs

Deer Impacts BlogSpot. This blog monitors deer conflicts and impacts around the world. There are many news stories highlighting community efforts to manage their deer populations, and discussion threads on many urban deer management topics. The blog is maintained by Tom Rooney, a biology professor at Wright State University, Ohio, who has been studying the effects of deer on forests since 1995.

<http://deerimpacts.blogspot.com/search/label/municipal%20deer>

Websites

Cooperative Extension System. eXtension provides objective and research-based information and learning opportunities that help people improve their lives. eXtension is an educational partnership of 74 universities in the United States. One component is the Deer Damage Management website.

http://www.extension.org/pages/Deer_Damage_Management .

Internet Center for Wildlife Damage Management. This is a non-profit, grant funded site that provides research-based information on how to responsibly handle wildlife damage problems.

Prevention and Control of Wildlife Damage. Editors, Scott E. Hygnstrom, Robert M. Timm, Gary E. Larson. 1994. University of Nebraska-Lincoln. 2 vols. This details identification, control and management of over 90 species of wildlife, written by authorities in their respective wildlife areas.

http://icwdm.org/handbook/mammals/mam_d25.pdf

Manitoba Conservation. Living with White-Tailed Deer: A Homeowner's Guide.

http://www.manitoba.ca/conservation/wildlife/problem_wildlife/pdf/wtddeer_en.pdf

University of Nebraska – Lincoln Extension. Institute of Agricultural and Natural Resources. Managing Deer Damage in Nebraska. Scott E. Hygnstrom, Bruce D. Trindle, and Kurt C. VerCauteren.

<http://www.ianrpubs.unl.edu/epublic/live/g1822/build/g1822.pdf>

Washington Department of Fish and Wildlife. Living with Wildlife: Deer.

<http://wdfw.wa.gov/wlm/living/deer.htm#tips>

Books

Solving Deer Problems: How to Keep them out of the Garden, Avoid them on the Road, and Deal with them Anywhere. 2003. Peter Loewer. The Lyons Press, Guilford, Connecticut, USA.

Living with Wildlife. 2004. Russell Link. Washington Department of Fish and Wildlife. Attn: Book Sales. 16018 Mill Creek Blvd. Mill Creek, WA 98012

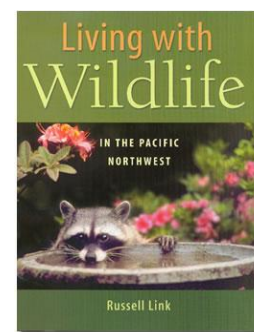
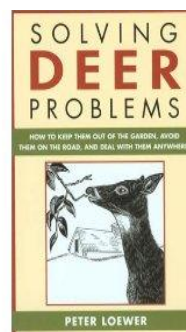




Photo: Irene Teske



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