COLUMBIA MOUNTAINS INSTITUTE
of Applied Ecology

Urban Wildlife: Challenges and Management

April 18–19, 2012
Cranbrook, British Columbia, Canada

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Thanks to our sponsors and volunteers!

This conference was hosted by the Columbia Mountains Institute of Applied Ecology. The CMI is proud to have worked with these agencies, which contributed financial assistance in support of this conference:

The Columbia Mountains Institute gratefully acknowledges the financial support of **Columbia Basin Trust,** a regional corporation created to deliver social, economic, and environmental benefits to the residents of the Columbia Basin. www.cbt.org

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Our presenters and the people who brought posters and displays travelled from various communities in British Columbia, Alberta, Manitoba, and Ontario. We are grateful for your willingness to share your expertise with us, and for the support of your agencies in sending you to our conference.

We appreciate the willingness of **Kathryn Teneese**, Ktunaxa Nation Council, and **Wayne Stetski**, Mayor of Cranbrook, for offering a welcome at the start of the conference.

Special thanks go to our volunteers **Julie Tyrrell, Patrick Stent, and Leigh Anne Isaac** for their help in keeping the event running smoothly.

We are appreciative of the work of our conference organizing committee, and others who contributed expertise as the conference developed. The members of the organizing committee were:

- **Marc-André Beaucher,** Creston Valley Wildlife Management Area
- **Mike Badry,** BC Ministry of Environment
- **Sara Dubois,** BC SPCA
- **Brian Harris,** BC Ministry of Forests, Lands and Natural Resource Operations
- **Gayle Hesse,** BC Conservation Foundation
- **Pedro Lara Almuedo,** FORREX
- **Jackie Morris,** Columbia Mountains Institute of Applied Ecology
- **Donna Thornton,** BC Ministry of Forests, Lands and Natural Resource Operations

Conference description

Wildlife numbers are increasing within many British Columbia municipalities, leading to more interactions with humans and our infrastructure. Interactions can lead to property damage, public safety issues, public health concerns, impacts on biodiversity, and death or suffering of wildlife. This conference addressed management of wildlife— and people —related to wildlife in urban settings.

The conference was attended by 110 people. The event included 22 oral presentations and a demonstration of Chris Jobe's herding dog. A poster and "social" session encouraged informal dialogue among participants and presenters.

Dr. Michael Proctor of Birchdale Ecological Ltd. gave an evening talk that was attended by conference participants and the general public. Dr. Proctor's talk was titled "Co-existing with grizzly bears in the Creston Valley" and he spoke about recovering threatened grizzly populations, re-establishing regional connectivity, and providing adaptive options for climate change.

Dr. Proctor's recent paper in Wildlife Monographs was mentioned at the conference. Here is the citation:

> Proctor, M. F., Paetkau, D., McLellan, B. N., Stenhouse, G. B., Kendall, K. C., Mace, R. D., Kasworm, W. F., Servheen, C., Lausen, C. L., Gibeau, M. L., Wakkinen, W. L., Haroldson, M. A., Mowat, G., Apps, C. D., Ciarniello, L. M., Barclay, R. M. R., Boyce, M. S., Schwartz, C. C. and Strobeck, C. (2012), Population fragmentation and inter-ecosystem movements of grizzly bears in western Canada and the northern United States. Wildlife Monographs, 180: 1–46. doi: 10.1002/wmon.6

At the end of the conference, **Mike Badry** (BC Ministry of Environment) and **Brian Harris** (BC Ministry of Forests, Lands and Natural Resources) prepared a talk that summed up the conference.

The conference was held at the Prestige Rocky Mountain Resort in Cranbrook BC.

The summaries of presentations in this document were provided by the speakers. Apart from small edits to create consistency in layout and style, the text appears as submitted by the speakers.

The information presented in this document has not been peer reviewed.

About the Columbia Mountains Institute of Applied Ecology
www.cmiae.org

The Columbia Mountains Institute of Applied Ecology (CMI) is a non-profit society based in Revelstoke, British Columbia. The CMI is known for hosting balanced, science-driven events that bring together managers, researchers, educators, and natural resource practitioners from across southeastern British Columbia. The CMI's website includes conference summaries from all of our events, and other resources.

Summaries of presentations

1. Biology of mule deer and white-tailed deer: Implications for management of urban deer

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Deer have become a common sight in many communities in British Columbia. In the interior, some communities have urban mule deer, some have urban white-tailed deer, some have both species, and communities west of the Coast Range Mountains have coastal black-tailed deer, a close relative of mule deer. Any one of these species can become "problem" urban deer.

Deer family taxonomy

- Deer in BC belong to the Cervidae family ("deer family"), of which there are 43 species worldwide (including moose and elk).
- Antlers are a distinguishing characteristic of the deer family. Almost all species lose their antlers annually.
- Antlers appeared in the fossil record about 15 million years ago.
- Some older deer species have retained enlarged canines into modern times, instead of, or in addition to, antlers.

Mule deer and white-tailed deer

- Their habitats can overlap, and they feed on similar foods.
- Differences in breeding behavior keep the two species distinct.
- Interbreeding is rare and hybrid fawns seldom survive.
- Coastal black-tailed deer are related to mule deer but behave similarly to white-tailed deer.

White-tailed deer

- An old species; first fossil dates to about 3.5 million years ago

- Evolved in wet, forested habitats
- Prefer heavy cover, often nocturnal
- Home range is commonly at low elevations (often near humans)

Mule deer

- Recent deer species, appeared about 10-12,000 years ago
- Evolved in open habitats after glaciers receded
- Traditional seasonal ranges are high elevation in summer, low elevation in winter (i.e. not normally a year round resident in low elevations

Foraging

- The two deer species eat similar types of vegetation, including most garden plants and landscaping.
- Each adult deer eats about 2 kg of food per day
- The two species spend a similar amount of time foraging (50-60% of the day)

Reproduction

- Deer have a high reproductive potential because a ratio of 1 buck to 20 does is sufficient to ensure breeding (Erickson, et.al. 2003).
- Does can mate several times, with different males, within a 24-hour estrus.
- An inadequate number of bucks can cause does miss being bred on their first estrus, and be bred in second or even third estrus (December-January).
- Adult males and females are segregated through most of year
- Females live in family units of does and fawns from the previous couple of years.

White-tailed deer have a higher reproductive rate than mule deer because first time white-tailed breeders have 1 fawn, then 2-3 fawns annually. Mule deer does have 1 or 2 fawns and rarely breed as yearlings. An Okanagan study found pregnancy rates of 86% for mule deer and 92% for white-tailed deer (Dyer, 1983).

Photo: Gerry Kuzyk

Harvest strategies for deer with application to urban deer management

- Deer populations are driven primarily by the number of adult does.
- Antlerless harvest: Factors that affect fawn survival have less effect on doe survival, thus it would be best to harvest fawns as a substitute for natural mortality.
- Buck harvest: Harvesting only bucks will not normally affect the reproductive potential of the deer herd, even if managed to as few as 5 bucks per 100 does.

Mule deer are more likely than white-tailed deer to interact with humans

- Mule deer may be active all day; white-tails are often nocturnal.
- Mule deer may take up residence in a specific property; white-tails are more likely to move to cover except when feeding. The two species spend equivalent amounts of time feeding.
- Mule deer are more aggressive towards dogs (Lingle, 2001).
- Mule deer does are typically more aggressive when protecting fawns.

Different behaviour near Clover traps

- White-tailed deer are more wary than mule deer.
- White-tailed deer are more aggressive when inside the trap.
- White-tailed deer can learn to lift the gate and escape from the trap.

Conclusions regarding urban deer and management

- White-tailed deer prefer low elevation habitat year round thus there is a higher potential for contact with humans.
- Mule deer that are resident year round in urban settings are showing unnatural behaviour.
- Both species can adapt to urban environments—gardens and landscaping are at risk.
- Mule deer are more likely to interact with humans because they may be more active during daylight, more comfortable in open areas, more aggressive towards dogs, and more protective of fawns.
- White-tailed deer are generally more difficult to trap.
- Deer population control should concentrate on adult females.

A monument to urban deer. Brian Harris photo

Further reading

Dyer, O. 1983. Results of 1982 Limited Entry Antlerless Deer Season in the Okanagan. Unpublished report. BC Ministry of Environment, Penticton, BC

deVos, J., Conover, M.R., and Headrick, N.E., editors. 2003. Mule Deer Conservation Issues and Management Strategies. Berryman Institute Press, Utah State University, Logan Utah, USA

Erickson, G.L., Heffelfinger, J.R., and Ellenberger, J. H. 2003. Potential Effects of Hunting and Hunt Structure on Mule Deer Abundance and Demographics. In Mule Deer Conservation: Issues and Management Strategies. Berryman Institute Press, Utah State University, Logan Utah, USA

Lingle, S. 2001: Anti-predator strategies and grouping patterns in white-tailed deer and mule deer. Ethology 107, 295-314.

Wallmo, O.C. 1981. Mule Deer and Black-tailed Deer of North America. University of Nebraska Press. Lincoln Nebraska, USA

For more information about mule deer and white-tailed deer, visit E-Fauna BC at: http://www.geog.ubc.ca/biodiversity/efauna/

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2. *Understanding urban white-tailed deer movement in a Canadian metropolitan centre*

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Dr. M. Campbell, Director and Professor, Natural Resources Institute, University of Manitoba

Urban white-tailed deer (*Odocoileus virginianus*) populations are increasing in many North American metropolitan areas. Over the past three decades, the urban white-tailed deer population within the Greater Winnipeg Area has increased. With adequate shelter, access to water, limited predation, and both natural and human supplemented food sources, urban areas provide suitable conditions for white-tailed deer. Rising numbers of urban white-tailed deer may result in an increase in human–wildlife conflicts. Residents and white-tailed deer residing in close proximity to each other suggest potential conflicts including, among others, deer damage to both natural and managed plantings, disease transmission from deer to domestic pets or humans, and deer-vehicle collisions.

Managing wildlife in urban areas is complex, given the presence of many stakeholders with a diverse range of perspectives. It is increasingly apparent that wildlife managers must consider not only the biological and ecological aspects of an urban wildlife population, but also associated social dynamics.

Building on research this investigator has already carried out on white-tailed deer in urban and suburban areas, the current research project involves the collaring of a number of Greater Winnipeg Area urban deer using Wild Cell GSM collars. The collars will track two full-year cycles of deer movement. Spatial analysis of deer movements is being conducted relative to roads, deer use of right-of-way transmission line corridors, their habitat preferences, as well as other spatial-temporal aspects of habitat use, such as the importance of riparian areas, adjacent agricultural lands, and seasonal variations.

Coupled with the analysis of how deer use urban space, this study investigates, with the use of store-on-board and iridium GPS collars, white-tailed deer movement in the rural, less developed spaces of Riding Mountain National Park. Such investigation opens this study to a comparative analysis of home range size, habitat choices, and seasonal movement patterns between deer residing in the developed urban matrix of the Greater Winnipeg Area compared to the collared deer residing in the relatively undeveloped landscapes in and around Riding Mountain National Park.

Preliminary data, based on the first year of movement of collared deer in the Greater Winnipeg Area and Riding Mountain National Park, has been mapped using ArcGIS 9.3. Initial analysis suggests that collared urban deer have a significantly smaller home range size during fall and winter in comparison to the collared Riding Mountain National Park deer.

Also apparent from this initial analysis is that collared deer in the Greater Winnipeg Area are spending considerable amount of time residing in close proximity to a select number of residential properties. The collared deer appear to be traveling across busy roadways multiple times a day to visit these residential properties. These properties seem to attract urban deer and therefore influence their movement patterns. Such movement across roadways to visit these select few properties may increase human–deer conflict in the city, most notably, increasing the occurrence of deer-vehicle collisions and damage to localized residential plantings. Based on this preliminary information, in combination with the results gathered from the Greater Winnipeg Area human dimensions quantitative survey (McCance, 2009), the current study suggests the need to better understand aspects of the social dynamics surrounding the Greater Winnipeg Area urban deer population.

Using a qualitative, critical case study approach, this research investigates why deer are drawn to return to these residential properties and whether social action may be affecting urban deer movement patterns. It is important to understand how patterns of deer movement may be affected by a small number of residential properties. Qualitative investigation at the sites to which deer are drawn multiple times a day may provide insights into the human behaviors that potentially play a role in influencing urban deer movement and may be useful in designing management approaches that effectively address these social behaviors.

Reference

McCance, Erin, 2009. Resident opinions concerning urban deer management in the Greater Winnipeg Area, Manitoba, Canada. M.Env thesis, University of Manitoba (Canada), 2009, 200 pages; AAT MR53067 Order this thesis from: http://proquest.umi.com/pqdlink?did=1919661251&Fmt=7&clientI%20d=79356&RQT=309&VName=PQD

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3. Challenges to coexistence with urban coyotes: A spatial-temporal analysis of diet and human–coyote interactions in Calgary, Alberta

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Urban coyotes (*Canis latrans*) have been studied in few Canadian cities, despite management concerns, including the apparent increase in negative human–coyote incidents. Our study was designed to develop a baseline understanding on the feeding ecology of urban coyotes, particularly spatial and seasonal effects on diet, and the magnitude, severity, seasonality and spatial distribution of human–coyote incidents in Calgary, Alberta.

Bi-weekly surveys of seven study sites within Calgary were conducted between August 2006 and September 2007. We analyzed 484 scats, identifying bones, fur, and other items in each scat. Top prey items consumed by coyotes according to scat samples were small mammals (84.71%), herbaceous plants (44.63%), crabapples (33.88%), native berries (16.94%), and anthropogenic food sources (14.05%). Small mammals primarily included voles and mice (Family Cricetidae) and ground squirrels (*Urocitellus richardsonii*). Deer (*Odocoileus virginianus* and *O. hemionus*) were also present in some scats (8.06%), as were several bird species (13.43%). Domestic animals including cats (*Felis catus*) and dogs (*Canis familiaris*) were found in 6 scats (1.24% of all scats sampled). Figure 1 illustrates the percent frequency of occurrence of these main prey items in the coyote scats analyzed.

Importantly, given our methods, prey items could have been either hunted or scavenged by coyotes. Statistically significant differences in coyote diet were expressed both spatially and seasonally. In general, larger green spaces had a lower percentage of scats containing anthropogenic content or domestic animals. For full results and discussion please see Lukasik and Alexander (2012).

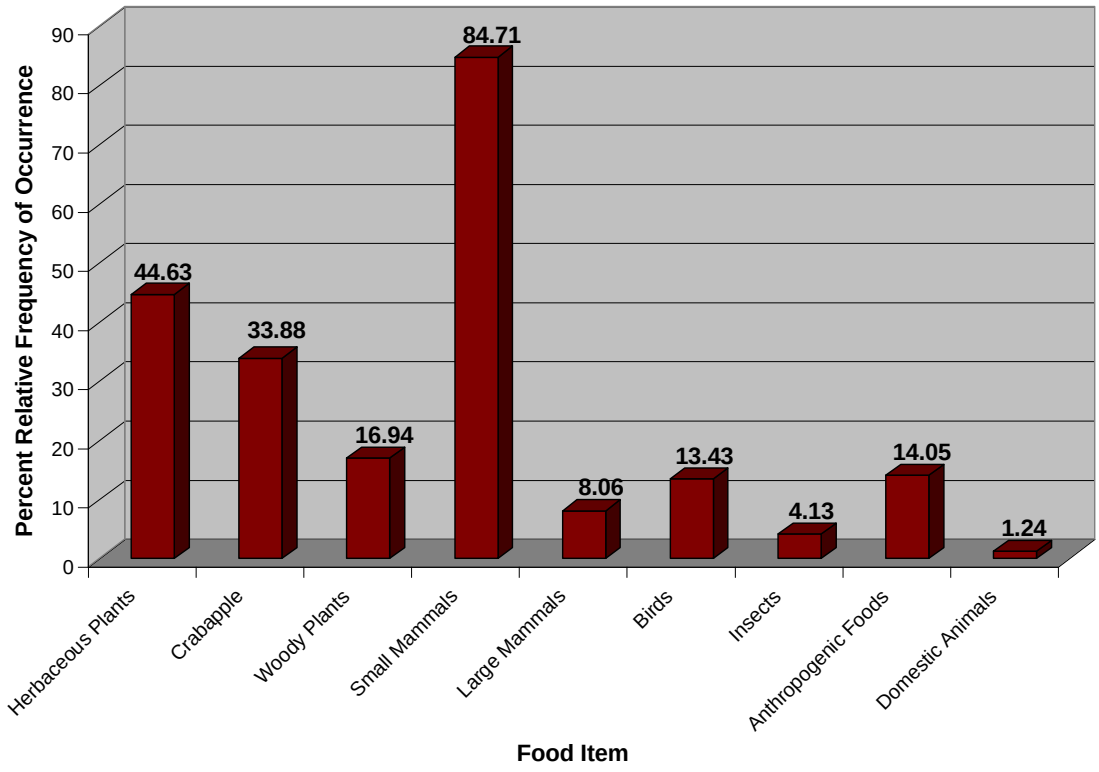

Figure 1. Percent relative frequency of occurrence of main food types in coyote scats analyzed *(Source: Lukasik and Alexander, 2012)*

Human–coyote incidents were identified through citizen reports collected by the city of Calgary between 2005 and 2008. Reports were categorized into five levels from sightings (Level 1) to conflict (Levels 4 and 5). Only incidents where coyotes exhibited aggressive behaviour or came into contact with humans or domestic animals were considered conflicts. Most incidents reported were sightings of coyotes (89%); only 5% of reports were considered conflicts. Seasonal differences and spatial patterns of reported incidents were found. Sites with higher anthropogenic food content found in scats tended to correlate with areas of higher reported conflict. Highest conflict was reported in the spring and summer and may be associated with pup-rearing. For full results and discussion, please refer to Lukasik and Alexander (2011).

Coyotes in Calgary consume predominantly natural prey items, and human–coyote conflicts remain unusual. However, the presence of anthropogenic food items in 14% of scats may represent the potential for a heightened risk of food conditioning, an increased potential for habituation of coyotes to humans, which in turn may increase the risk of human–coyote conflict. Based upon the spatial distribution of scats found containing anthropogenic content and reported conflicts, we believe food conditioning may be present in some areas of the city.

Coyote in a crabapple tree. © M. Morrison (Source: Lukasik and Alexander 2012

To improve coexistence, we recommend stricter enforcement of garbage bylaws, management of attractants, which may include management of fruit trees, responsible husbandry practices with domestic pets (e.g., leash animals when in areas frequented by coyotes, do not allow cats to roam free), improved monitoring of coyote behaviour and human–coyote interactions, and targeted educational campaigns to neighbourhoods where coyotes are frequently observed.

Though the City of Calgary has indicated an interest in science-based management policy towards coyotes, limited implementation of recommendations has been observed to date. We suggest proactive measures may be required by educational groups and citizen groups in the city to ensure proper action is taken to reduce the potential for human–coyote conflict. Engaging citizens to take part in reporting coyote sightings online may foster needed discussion of coyotes within communities,

and allow an engaged public to become aware of the importance of urban coyotes, promoting human–coyote coexistence. To this end, an online mapping tool and educational resource has been developed for the Calgary area (Living with Coyotes: www.rockies.ca/coyotes). Other regions may find it valuable to modify this tool for their area and species of concern.

Based upon our results, we believe human–coyote coexistence in urban settings is possible. It is important to education and engage the public about coyotes to reduce the incidence of food-conditioning, habituation, and potential risks to pets and small children. When anthropogenic food sources are removed, coyotes can provide benefits to humans, for instance by controlling rodent populations.

References

Lukasik, V.M. and Alexander, S.M. (2011). Human–coyote interactions in Calgary, Alberta. Human Dimensions of Wildlife. 16(2): 114-127. Doi: 10.1080/10871209.2011.544014

Lukasik, V.M. and Alexander, S.M. (2012). Spatial and temporal variation of coyote (*Canis latrans*) diet in Calgary, Alberta. Cities and the Environment (CATE). 4(1): Article 8. Available at: http://digitalcommons.lmu.edu/cate/vol4/iss1/8

Recommended Reading

Alexander, S.M. and Quinn, M.S. (2011) Coyote (*Canis latrans*) interactions with humans and pets reported in the Canadian print media (1995–2010). Human Dimensions of Wildlife. 16(5): 345-359. Doi: 10.1080/10871209.2011.599050

Alexander, S.M. and Quinn, M.S. (2012) Portrayal of interactions between humans and coyotes (*Canis latrans*): Content analysis of Canadian print media (1998-2010). Cities and the Environment (CATE). 4(1): Article 9. Available at: http://digitalcommons.lmu.edu/cate/vol4/iss1/9

Fortin-McCuaig, M. (2012). Spatial and seasonal differences in the diets of urban and rural coyotes (*Canis latrans*) in the Calgary, AB vicinity. MSc. Thesis. Department of Geography, University of Calgary.

Watts, A.G. and Alexander, S.M. (2012). Community variation of gastrointestinal parasites found in urban and rural coyotes (*Canis latrans*) of Calgary, Alberta. Cities

and the Environment 4(1): Article 11. Available at: http://digitalcommons.lmu.edu/cate/vol4/iss1/11

An online mapping tool and educational resource has been developed for the Calgary area:

Living with Coyotes: www.rockies.ca/coyotes

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4. Challenges of Managing Stormwater Wetlands for Black Terns: A Case Study

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Within a watershed, wetlands provide important ecosystem services including flood protection, water storage, groundwater recharge, and water filtration (The City of Calgary 2009). They also provide important habitat to a wide diversity of flora and fauna. As a result, wetlands are among the most important ecosystems on earth (Mitsch and Gosselink 2000). Today, it is estimated that 90% of the pre-settlement wetlands in Calgary, Alberta have been lost to development (The City of Calgary 2011). Some activities related to urban development in Calgary that can negatively impact wetlands include: dredging, draining and/or filling wetland areas for conversion to agricultural, industrial or residential lands, waste disposal, stormwater pollution and water contamination, and nutrient loading (Wetlands Alberta 2009).

There are various municipal and provincial mechanisms in place to protect remaining wetlands within the city. The Calgary Wetland Conservation Plan, which was implemented in 2004, made Calgary one of the first municipalities in Canada to adopt a wetland protection policy that provided procedures for the protection of priority urban wetlands. The plan includes a "no net loss" policy for Environmental Reserve Wetlands (naturally occurring wetlands with a Stewart and Kantrud classification of Class III to VI) (The City of Calgary 2004). The City of Calgary implements the no net loss policy by balancing approved wetland disturbances or losses with mitigation through wetland restoration, enhancement or creation. In addition to this protection, Alberta's *Water Act* has mechanisms in place to protect all waterbodies, or requires compensation for their loss.

Wetland ecosystems are some of the most complex ecosystems in the world, due to the biogeochemical processes and rich biodiversity that they support (Mitsch and Gosselink 2000). Due to this complexity, it is difficult to restore wetlands to pre-disturbance conditions or create new wetland habitat with naturally functioning wetland characteristics. The majority of wetlands within Calgary receive stormwater inputs, which challenges environmental managers to balance stormwater treatment with ecological function. The Bridlewood Creek Wetland, located in southwest Calgary, is an example of such a wetland.

The Bridlewood Creek Wetland is a stormwater wetland serving an important purpose in the City of Calgary's stormwater drainage system. Rainwater and snowmelt entering Calgary's drainage system transport sediment and debris into our rivers. The Bridlewood Creek Wetland is an integral part of this stormwater collection system as it is designed to slow water flow during large storm events and also clean stormwater by allowing it to settle prior to its release into the watershed.

This wetland requires periodic maintenance to improve its efficiency in treating stormwater, and this maintenance directly affects the habitat and associated flora and fauna using the site. The purpose of this paper is to discuss this wetland in detail; specifically, how the City of Calgary is managing the wetland for both stormwater treatment and a breeding population of Black Terns.

Stormwater wetlands in Calgary

Stormwater wetlands are designed to treat stormwater by removing suspended sediments and nutrients, particularly nitrogen and phosphorus (Mitsch and Gosselink 2000), prior to stormwater discharge to the Bow River. There are two types of stormwater wetlands in Calgary: 1) Engineered natural, and 2) Constructed.

Engineered natural wetlands are naturally occurring wetlands that are designed to receive stormwater inputs. Constructed wetlands are wetlands created specifically for stormwater treatment (The City of Calgary 2004).

Wetlands receiving stormwater require regular monitoring and maintenance. Monitoring of water quality is necessary to ensure that discharges to the Bow River meet Alberta Environment's standards. The removal of sediment is required to ensure that wetlands continue to maintain their capacity to retain and treat stormwater along with their ecological function and viability. Generally, stormwater wetlands in Calgary require dredging every 5-10 years.

Bridlewood Creek Wetland

The Bridlewood Creek Wetland is an engineered natural wetland that was engineered to receive urban stormwater input in the late 1990s; it thus has characteristics of both a stormwater wetland and a natural wetland. It is located in southwest Calgary, just northwest of the Highway 22X and James McKevitt Road intersection. The wetland is part of the upper drainage sub-basin of the Pine Creek watershed. Water from the wetland drains south below Highway 22X, eventually draining into Pine Creek and then into the Bow River.

The Bridlewood Creek Wetland was historically Bridlewood Creek, a small tributary stream within the Pine Creek watershed. Access roads that were constructed in the early 1970s caused the initial impoundment and a wetland developed. In the late 1990s, the new Bridlewood Creek subdivision was being developed and the wetland was modified and enlarged to act as a stormwater wetland and as an urban natural habitat preserve. A survey completed in 1996-97 indicated an abundance of terrestrial and aquatic vegetation with moderate to high wildlife habitat value (Westhoff Engineering Resources, Inc. 1997).

Stormwater from the Bridlewood Creek subdivision is directed into the Bridlewood Creek Wetland. This six hectare wetland is composed of 3 areas which facilitate the flow and treatment of stormwater:

- Cell 1, the initial inflow area (~0.67 ha);
- Cell 2, the middle and largest area (~2.80 ha); and
- Cell 3, the outflow spillway structure (~1.05 ha).

This wetland is characterized by open water and emergent vegetation zones, which are immediately surrounded by upland tall shrub and aspen forest vegetation communities. The emergent vegetation zone is dominated by cattail, rushes, and sedges and the upland tall shrub community is predominantly comprised of willows.

Bridlewood Creek Wetland is a highly productive wetland, supporting an abundance of primary and secondary production. This is likely the result of a longer than average growth season, as ice on this wetland comes off earlier than other wetlands in the area (Goudey 2012, pers. Comm.). The abundance of emergent vegetation and the mix of open water cells scattered throughout the wetland support a variety of wildlife species. Of particular interest is the North American Black Tern (*Chlidonias niger surinamensis)*, a listed species which has bred in the wetland for a number of years.

Black Terns and Bridlewood

The Black Tern was first recorded in the Bridlewood Creek Wetland in 2009; however, Black Terns likely occupied the wetland prior to 2009. They have been observed using the wetland for both foraging and nesting purposes. This species occupies most of its former range, breeding throughout central and southern Canada and the northern United States (Naugle 2004; Zimmerman et al. 2002). The largest concentration of breeding terns in Canada occurs in the prairie pothole region of the Prairie Provinces (Naugle 2004). Although it is listed as globally "secure", the Black Tern is considered a species of concern in a number of locations throughout its breeding range due to population declines and local extirpations as a result of habitat loss and alteration (Naugle 2004). Black Terns are listed as "sensitive" in Alberta.

Breeding in loose colonies, Black Terns nest amongst emergent vegetation, building nests of dead plant material on top of floating vegetation, abandoned nests of other bird species (e.g., American coot), or muskrat houses (Bezener 2000; Naugle 2004). They prefer semi-permanent wetlands with nearly equal proportions of emergent vegetation and open water that provide abundant nesting substrates (Zimmerman et al. 2002). Black Tern nest success is typically dependent upon stable water levels during the breeding season, as eggs may be lost to wave action. Faber (1996) reported that only four of 21 nests hatched with a minimum water depth of <30.5 cm, indicating that wetland depth is also an important factor affecting nest success.

Black Tern populations exhibit considerable annual fluctuations as a result of water conditions (Naugle 2004). Therefore, they typically exhibit low site fidelity, although some terns may return to a nest site in consecutive years if suitable water and vegetation conditions remain (Zimmerman et al. 2002). Primarily insectivorous,

Black Terns capture insects at or near the water's surface (Naugle 2004). Small fish are an important part of their diet in some habitats.

Based on the habitat preferences of the Black Tern, the Bridlewood Creek Wetland provides ideal breeding and foraging habitat for this species. The wetland provides suitable nesting substrates in the form of floating cattail rootstalks, appropriate vegetation density which provides cover while giving access to adults for aerial defence, suitable water depths (~0.5-1.5 metres) and stable water levels, and an abundance of suitable food sources (invertebrates and small fish, including overwintering populations of brook stickleback and fathead minnows).

Dredging project

Although the Bridlewood Creek Wetland was modified over 10 years ago to receive stormwater flows, new construction within its catchment area since that time resulted in a sediment buildup of thousands of cubic metres by 2010. Surveys showed that the outlet culvert was 80% non-functioning, resulting in aquatic debris buildup and water level increases. Cell 1 was no longer retaining most of the sediment; instead it was flushing into the main part of the wetland (Cell 2), resulting in sediment accumulation, increased vegetation cover, and anoxic conditions. The wetland was about 30-40 cm deeper than its originally designed depth of two metres. In order to ensure that the Bridlewood Creek Wetland was operating as intended, the City of Calgary Water Services planned to remove sediment build-up from the bottom of the wetland.

A biophysical impact assessment was completed in 2010 prior to the planned dredging project to determine the biophysical and ecological characteristics of the wetland, assess potential impacts to these characteristics, and develop mitigation options to preserve sensitive areas and/or species. As expected, breeding Black Terns were identified within the wetland, and were found to be nesting in a cattail vegetation community along the eastern edge of Cell 2. The wetland characteristics and recommended mitigations identified in the biophysical impact assessment were used to develop a dredging work plan.

Cells 2 and 3 were dredged from south to north in winter 2011. To begin the dredging process, water was removed from the wetland in phases, starting in early January 2011. Sediment removal began in mid-January, 2011, and required the use of heavy equipment. Frozen sediment was removed by excavators to specified depths to achieve a water depth between 1.0 and 1.5 m, and was then transported away from the site in a dump truck. The cattail community along the eastern edge of Cell 2 was not

dredged, as this area was identified as essential nesting habitat for Black Terns. Most of the vegetation in Cell 3 was removed, and the berm slopes were modified to increase the functionality of this cell. Upon completion of the work, water levels were left to return naturally. Areas of disturbed vegetation were reclaimed by seeding and planting native grass, forb and shrub species.

Black Tern mitigations

A number of mitigations were put in place as part of the dredging project to promote the return of foraging and nesting Black Terns. Dredging activities did not take place during bird nesting and fish spawning periods. The wetland was contoured with slopes and benches that would facilitate the establishment of vegetation communities and provide wildlife habitat. The cattail vegetation community along the eastern edge of Cell 2, which was determined to support nesting Black Terns, was not dredged and will be permanently protected (regardless of the presence or absence of terns from year to year) to accommodate fluctuating Black Tern populations.

Future monitoring and management

Monitoring was conducted in the summer of 2011 to assess the wetlands' post-dredge condition. Results revealed the return of Black Terns to the wetland, as well as a healthy re-colonization of micro-organisms, invertebrates, and other wildlife species, likely the result of a large annual inflow of stormwater containing organic material (Goudey 2012, pers. Comm.).

The City of Calgary will conduct long-term monitoring of the Bridlewood Creek Wetland. The monitoring objectives are to assess whether the mitigation measures used in the dredging were effective for preserving the Black Tern habitat and to assess the effectiveness of erosion, sediment control, and restoration measures. Monitoring specific to Black Terns will be conducted by a qualified biologist to check for the presence of Black Terns and to observe all wildlife use. If Black Terns are observed, subsequent site visits will focus on Black Tern behaviour to determine if the site is used for nesting and/or feeding. Additionally, as part of the City of Calgary's Biodiversity Strategy, the general health of the wetland (e.g., species diversity) will likely be monitored in the future.

It is important to note that a regional management approach will be taken by managing other wetlands on the landscape, as recommended by Naugle (2004) and Zimmerman et al. (2002), rather than focusing management objectives solely on the

Bridlewood Creek Wetland. This may include habitat mitigations for Black Terns in nearby wetlands, such as those located approximately 800 metres south.

An update since the conference….

Recent 2012 monitoring has revealed the return of breeding Black Terns to the wetland. Three nesting pairs have been confirmed thus far. The terns have been observed feeding on both fish and invertebrates. Site visits will continue throughout the season to estimate nest success. Aside from Black Terns, a variety of waterbird species have been identified during site visits such as the Red-Necked Grebe, Pie-Billed Grebe, and Sora.

Nesting Black Terns, spring of 2012. Kelly Day photo.

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5. Bats in buildings: Roost conservation and enhancement

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From myths to misconceptions, bats are often feared, loathed, and persecuted. This attitude, among other factors, provides conservation challenges, particularly for bats living in buildings. Half the bat species in British Columbia are red or blue-listed and an additional species, the little brown myotis (*Myotis lucifugus*) has recently been assessed as Endangered federally by COSEWIC as a result of White-Nose Syndrome. White-Nose Syndrome is a devastating disease that is decimating bat populations in eastern North America. Killing over 6 million bats since its discovery in 2006, this disease is moving west and bat populations in British Columbia may soon be at risk.

Bats rely on a number of habitat elements including wildlife trees for summer roosts, caves for summer roosts and hibernacula, and wetlands for foraging. With a reduction of these natural features on the landscape, bats have adapted to use anthropogenic structures such as buildings and bridges that meet their thermoregulation and security needs. Habitat conservation and enhancement for bats, including the use of anthropogenic roost structures, is a critical element of supporting bat populations particularly in light of White-Nose Syndrome.

Funded by the Columbia Basin Trust, the Kootenay Community Bat Project was run from 2004 to 2006, and is being re-initiated in 2012, to promote education and awareness of bats, identify bat roost sites (particularly on private land), and assist landowners with roost conservation planning. Through media and other publicity, we encourage residents to report roost sites on their property so that we can identify the bat species present, discuss bat conservation, and address landowner concerns.

Colony of approximately 1000 Yuma myotis *inhabiting an attic.*

One of the first steps during a landowner visit is to identify their issues. In many cases, landowners are willing to have bats occupy structures on their property, primarily because they are aware of the benefits of bats in consuming nocturnal insects or they are interested in conserving wildlife. For other landowners, the bats are problematic. We discuss their concerns including guano, noise, smell, or perceived health issues; and consider whether or not these concerns can be addressed while leaving the bats where they are. Mitigation techniques may include using plastic under bat colonies to protect buildings from the guano or urine, insulating an attic to prevent noise, sealing small crevices to prevent entry of bats into living quarters, or cleaning buildings once a year to reduce guano build-up and smell. When landowners want to remove the bats, we provide information on bat eviction techniques including timing the eviction in fall or winter when bats are likely not using the roost site, and establishing an alternative roost site on their property, usually in the form of a bat-house.

Shifting attitudes towards bats is another goal of landowner visits. When possible, we temporarily take a bat from an attic or other building structure to show the landowner. We explain the differences between bats and rodents, demonstrate identification techniques, and display bat echolocation calls using a bat detector. We dispel myths about bats and emphasize conservation issues. Often there is a detectable shift in attitude during our visit.

Currently there are few resources available for landowners dealing with bat issues in buildings. Because bats are protected under the *Wildlife Act* of BC, they cannot legally be exterminated. The Ministry of Environment does not always have a bat expert on staff (although currently Aaron Reid is serving that role for the Kootenays) nor do they have a website to provide detailed information. The Kootenay Community Bat Project provides information and resources to landowners including information on bat-houses and bat exclusions, local sources of bat-houses, and site visits by biologists when possible. We have contacted pest control companies to provide them with this information for their customers and to encourage them to sell well-designed bat-houses.

Bat houses (left) supporting a colony of little brown myotis (right)

From 2004 to 2006, we conducted approximately 385 site visits to actual and suspected bat roosts, and identified 289 roost sites, including 161 maternity roosts, 132 day roosts, 36 night roosts, and 24 unknown roosts. Seven bat species were seen or detected including Townsend's big-eared (*Corynorhinus townsendii*), California myotis (*M. californicus*), little brown myotis (*Myotis lucifugus*), Yuma myotis (*M. yumanensis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasiurus noctivigans*) and long-legged myotis (*M. volans*). Inventory in 2012 will focus on all bat species but emphasis will be placed on identifying little brown myotis through acoustic monitoring and DNA analysis of wing punches or guano samples, given that this species is most susceptible to White Nose Syndrome.

We are currently researching successful bat-house design and site location for the Kootenays. Typically large, multi-chambered bat-houses that are stained black and south-facing are likely to be most successful for southern Canada (Tuttle et al. 2004). Nursery bat boxes and rocket boxes appear to be most suitable designs for our region. We are encouraging land owners to install several bat houses on their property, register them, and monitor and report on success. We will prepare a summary of that information in the fall of 2012.

Another focus of the Kootenay Community Bat Project in 2012 is citizen-science monitoring of bat populations. We are encouraging residents with bats to conduct emergence counts four times during the summer as part of the Annual Bat Count. These long-term data, particularly for little brown myotis, will provide estimates of bat populations. Since White-Nose Syndrome is usually detected in hibernacula for bats and these sites are generally not known in BC, long-term population data may indicate the arrival of White-Nose Syndrome in the province before physical evidence is apparent.

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We are extremely grateful to the Columbia Basin Trust for funding this project. We also wish to thank Dr. Cori Lausen, Aaron Reid, and Thomas Hill for sharing their bat knowledge and skills with us. This project would not be possible without the countless landowners and other volunteers who have participated over the years.

For more information on the Kootenay Community Bat Project, see www.kootenaybats.com.

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6. *Silencing the dinner bell: How do we reduce the feeding of urban wildlife?*

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(The following information was taken from Sara's PowerPoint presentation notes. Her research project will be published as part of her PhD thesis.)

Urban wildlife issues are animal welfare issues, and thus of interest to animal welfare research and the British Columbia Society for the Prevention of Cruelty to Animals.

There are different understandings and definitions of "animal welfare" and term is used in different ways. Animal welfare is a scientific concept, which relates to the measurement of quality of life of animals including three components:

- Promotion of health (physical and psychological well-being),
- Prevention of suffering, and
- Allowing animals to live in ways suited to their natural adaptations.

Scientific study of animal welfare has been taking place since the 1980s. There are graduate programs currently at three Canadian universities (UBC since 1997), and more than a dozen programs between USA, UK, Brazil, plus introductory courses in many veterinary schools.

Journals featuring welfare research include: Animal Welfare; Applied Animal Behaviour Science; Anthrozoös; Journal of Dairy Science; Veterinary Record; Zoo Biology; Public Understanding of Science; and Wildlife Research.

The dilemma of what is the appropriate use of, or care of, animals is a moral dilemma. It has been noted that we can't apply science to moral decision—is it right or wrong to feed wildlife? The science of animal welfare is just one field to guide the

ethical debate of how we ought to treat animals. Other fields might be religion or justice. Animal welfare science conducts research (facts) to inform social debate (values).

It is often suggested that conservation and animal welfare are incompatible because one operates at the population level and the other at level of individuals—one is concerned about preserving ecological systems and biodiversity, while the other is concerned about quality of life.

However, both are multidisciplinary sciences that determine facts and identify value-based beliefs in response to societal concerns, and make policy recommendations. They have a shared goal to reduce harm to wildlife and have a shared problem—human population and global industrialization. With an increasing human population and industrialization of developing countries, ecosystems, populations, and individuals are being harmed.

When we begin talking about urban wildlife issues, they are certainly not all conservation issues. They include wildlife management and animal welfare issues.

Types of wildlife feeding: Intentional versus unintentional

Unintentional feeding

- Examples are garbage, landfills, compost, gardens, fruit trees, and pet food.
- Management to date includes garbage bylaws, transfer stations, Bear Aware programs, provincial Dangerous Wildlife Protection Order for attractants, municipal bylaws for "feeding an animal in a way that attracts wildlife".

Intentional feeding

- Tourism: fish, sharks, stingrays, dolphins, monkeys, mountain sheep.
    - Make wildlife predictably and reliably viewable to visitors, but food-conditioned wildlife suffer nutritionally, become dependent on unreliable food sources, and are susceptible to predators and vehicle collisions. Feeding can lead to: aggressive behavior toward people, increased habituation, food-seeking aggression, and social stress.
- Recreation: for examples, ducks on ponds, squirrels and chipmunks in picnic areas.
    - This is a social activity that is generally discouraged but allowed in certain parks; same potential problems for wildlife and people as tourism feeding.

- Residents feeding birds
    - This is the most widespread and popular form of human–wildlife interaction worldwide. Originated as a humane response to plight of hungry birds during "hard winters" in northern hemisphere in early 20th century.
    - Pros of feeding birds: Improved survival of wintering birds, enhancement of certain threatened populations, and an increase in general environmental awareness among people who feed birds, enables citizen science.
    - Cons of feeding birds: Spread of disease, nutritional imbalances, enhancement of introduced or unpopular bird species (and mammals), increased aggression, creation of "ecological traps", possible dependency.
    - Residents feeding other wildlife: This is widespread but has an unknown impact; it is one of greatest contributors to "nuisance wildlife" issues and poor animal welfare.

Motivations for feeding wildlife

- Pleasure associated with close contact, providing food
- Closer approach for observing or photographing wildlife
- A feeling of greater connectedness with nature
- Want to show other people that wildlife trust them
- Can be an educational activity
- Various ethical reasons – a way of counteracting the negative human impacts such as habitat destruction
- "Protection" and "attachment" – there is perceived benefit and assistance.

A blurred distinction between wild and domestic animals may be another underlying motive for individuals to feed wildlife

Case study: Bear feeding in Christina Lake

In August 2010, 20+ docile black bears were discovered during an RCMP raid of private property. Bears were being fed dog food daily in spring through fall. Community and government officials knew about this activity for over a decade, but there were no incidents. Then it became a media circus and there was a public outcry and debate over what to do.

I conducted a two-phase phone survey of local residents in February 2011 (n = 159) and December 2011 (n =123). Residents were asked about sightings and interactions, attitudes towards bears, bear feeding and penalties, and potential management actions in fall 2010 and spring 2011.

Results of bear feeding survey:

February 2011 (before summer activity)

- Positive/neutral attitudes towards bears
- High tolerance for food-habituated bears
- High support for "giving second chance"
- Most disapproved of activity, supported penalty

December 2011 (after summer activity)

- Negative towards bears and more management activity
- Tolerance of food-habituated bears is at a maximum
- Increased support for penalty
- Mixed approval for management
- "Unfair", should have dealt with sooner

How to reduce feeding and conflict?

Traditional conservation tools to resolve urban wildlife conflicts are targeted at wildlife (e.g., culling, translocation, and aversive conditioning), but often have

limited short-term success. Some lack social tolerance with stakeholders or disregard animal welfare. There is growing recognition that long-term solutions should include altering human behaviors though public education and enforcement.

Public education programs are often volunteer-run, grant-funded, and are not always sustainable. Wildlife regulations and bylaws are commonly passed to alter human behavior and reduce human–wildlife conflicts—but do we know if they are successful?

BC municipal bylaw assessments

In February and March 2012, I used websites and phone contacts to research all bylaws pertaining to wildlife feeding in 78 BC municipalities. I assessed types of bylaws, enforcement, complaints, and wildlife feeding issues that were not covered by bylaws.

Results of bylaw assessments:

37 out of 78 (47%) of municipalities had no bylaws.

- They had minor concerns: raccoons, squirrels, gulls, crows, pigeons
- No new bylaws were under consideration
- Awareness of feeding of dangerous wildlife covered by province

13 out of 78 (17%) had bylaws that only addressed garbage.

- Such as use of wildlife-resistant containers, no attractants in compost
- Concerns ranged from low (birds) to high priority (bears)
- Few had fines
- Feeding of any dangerous wildlife covered by the province.

18 out of 78 (23%) had bylaws that addressed feeding only

- Unintentional (bird feeders) – 1 municipality prohibits bird feeding between April and October
- Intentional – 3 municipalities restricted feeding in park/public areas only, others address specific species: “Deer” (5), “Birds” (2), “Pigeons” (1), “Fur-bearers” (1); “Wildlife” (1), Combination of species (4)

10 out of 78 (13%) had both garbage and feeding bylaws

- Unintentional – Wildlife-resistant containers, no attractants in compost

- Unintentional (bird feeders) – 4 municipalities had bylaws pertaining to making feeders inaccessible to other wildlife, plus 1 municipality prohibits bird feeding between April to October
- Intentional – Feeding of specific species prohibited: "Mammals" (3), "Any not domestic" (1), "Deer" (1), "Wildlife" (1)

Overall, I saw an inconsistency to species; there was not a high priority for enforcement; few fines were given out; an educational approach was often taken first; and there were repeat offenders feeding specific wildlife. Some feeding bylaws were very new and there were no enforcement statistics yet.

Communication strategies

There is a need to decide when it is acceptable or not acceptable to feed wildlife. Is okay on vacation? At parks? Always?

Strategies can appeal to:

- Moralistic values, for example, you are not helping wildlife, you are hurting wildlife: "We know you care about wildlife, but nature provides plenty of food"
- Fear appeals, such as warning of fines and risk of personal injury, disease to family and pets
- Social norm, such as"# park visitors did the right thing last year" or consider the effects of effects of their behavior on others: "People come here with kids and pets, please don't put them at risk"
- Clarify the blurred distinction between pets and wild animals: "let wildlife be wild", "this is an unnatural situation", "this is not Disney movie".

Strategies to silence the dinner bell

- Combine proactive education and proactive enforcement
- Make bylaws be consistent – apply to all wildlife, bird feeder management.
- Unfortunately, there is not always a direct link between attitudes, intents, and knowledge and actual change in behaviours, so we need to research direct measurements for changes in human behaviours
- Use animal welfare science and "humane" messaging

Reducing feeding of urban wildlife may only happen if we keep our visual appetite for wildlife in check, and find alternatives to satisfy our desire to interact with wildlife—for example, viewing wildlife cams.

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7. *The process of solving urban wildlife conflicts at the community level*

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British Columbia's urban wildlife conflict imperative

Urban wildlife conflict is rapidly becoming an issue that is socially dividing communities in BC. Municipal governments are scrambling to address public concerns through local urban wildlife committees and provincial ministries are attempting to offer guidance. Communities that adopt ad hoc approaches to solving urban wildlife problems will likely experience higher rates of failures than communities that adopt formal structured problem solving methods. This document will explain why.

My objective for this paper is to take the lessons learned from the discipline of professional problem solving and provide communities with a new way of approaching the solving of community-specific urban wildlife problems. At the end of the document readers will find a checklist to evaluate whether their community's current urban wildlife conflict resolution process is likely to succeed, and whether their liability has been addressed through due diligence.

The Ministry of Environment's *British Columbia Urban Ungulate Conflict Analysis Summary for Municipalities* (2010) summarizes the current state of urban wildlife conflict management in different jurisdictions throughout North America, describes the legal context for urban wildlife management in BC, and recommends management options for communities to consider. However, these guidelines fail to demonstrate an integral way of solving conflicts at the community-level using a formal and structured approach to solving these types of problems.

What can we learn from problem solving experts?

Most individuals and organizations fail to effectively solve problems because the majority of people have never been formally trained in the science of problem solving and most do not think of problem solving as a discipline unto itself. In structured problem solving, failure to solve a problem simply means that the problem recurs and the consequences associated with that problem impact stakeholders again and again. In the education system we are taught "problem solving" which typically involves

answering a specific question. If X=Y+2 where X = 10 what is Y equal to? Answering questions like this are often misrepresented as learning how to "solve problems". Students, at any level, are not typically taught a universal method for solving problems as a stand-alone subject. As a result, many professionals and organizations claim to be good at solving problems yet experience the recurrence of the same problems.

Formally trained problem solvers can identify the pitfalls that most untrained problem solvers commonly fall into and they can explain why those pitfalls typically cause untrained individuals to fail at solving problems. Trained problem solvers know how to apply a universal systematic method for solving any kind of problem. Expert problem solvers can dispel common myths that exist including the most common one in which people believe there is a single cause—a single "root cause"—to every problem and once a solution is found for "the root cause" the problem goes away. Even the Ministry of Environment's *Urban Ungulate Conflict Analysis Summary* (2010) report perpetuates this myth by recommending communities "get at the root cause". In fact, there is no such a thing a single root cause to any problem and relying on paradigms such as this typically leads to failure for problem solvers.

I believe that solutions to urban wildlife conflicts will best be developed at the community level and that solutions that are deemed effective for one community may not necessarily be effective for another. Populated cities and communities are not acceptable habitats for the province's largest wildlife. In order to maintain public support for the conservation of wildlife and stewardship of wildlife habitats in the undeveloped areas of the province, human–wildlife conflicts in the more densely populated "human habitats" must be minimized. Communities using unstructured or *ad hoc* approaches to solving wildlife problems will struggle with the same issues over the long term.

A few definitions

A problem is simply defined as a "deviation from a goal".

Effective Problem Solving or Structured Problem Solving (also known as Root Cause Analysis) is a structured process used to understand the causes of past events for the purpose of preventing recurrence.

Cause is the answer to a "why" question.

- Why did "A" happen? Answer: because of "B" and "C".
- "B" and "C" are causes of "A".

An effective solution is an action designed prevent recurrence of a defined problem by affecting a known cause of the problem.

Effective problem solving defined

The steps of effective problem solving include 4 steps:

Step 1 – Define the problem

- Create a short statement stating exactly what the problem is.
- Define when and where that problem has occurred.
- Include descriptions and costs associated with the significance or consequences of the problem to the stakeholders.

Step 2 – Identify the causes that worked together to create the problem

- Visually show how multiple causes relate to one another (i.e., "A" was caused by "B" and "C". "B" was caused by "D" and "E"…so on and so on).
- Provide "evidence" to support each cause.

Step 3 – Identify & Evaluate Solutions

- Identify all potential actions that might be taken to control each of the known causes of the problem.
- Determine which of those solution ideas will be effective solutions.

Step 4 – Implement the best solutions

- Implement the best effective solutions.
- Monitor the effectiveness of all the solutions that are implemented.

A bit more detail and discussion on effective problem solving

Step 1 – Define the problem

A problem definition must be a short concise statement that all stakeholders agree to. The problem definition statement must be completed before the rest of the process can move forward.

> Example of a problem statement: "Deer are residing inside city limits year-round."

Recognizing problems and triggering the need for a formal problem solving process are best accomplished when an organization has clear measurable goals related to events and situations that are important to the well-being of the organization. For example, a community's Official Community Plan (OCP) might set a goal or have targets related to aspects of urban wildlife management. These goals would then be used to define an urban wildlife problem and trigger the need for a formal process to solve that problem whenever an event occurs outside the goal posts of the desired conditions.

Example OCP urban wildlife management goals:

- "Maintain urban wildlife complaints below 10 per year."
- "Maintain expenditures on urban wildlife damage to less than $5,000 per year."
- "Maintain urban deer population below 20 resident animals."

In problem solving, these measurable goals are called *thresholds*. OCP thresholds would be the most effective way for a municipality to define a problem and determine the process used to solve it. Thresholds need to be set at levels that ensure a city government only dedicates resources to events where the cost of solving the problem will be less than the cost of the impacts associated with a that problem. Thresholds and OCP goals would help prevent misunderstandings over what is a problem worth solving through a formal process, and what is not. It is a common mistake for people to argue over what the problem is because often people misunderstand the differences between the actual problem, the significance of that problem and the causes of that problem. Goals and thresholds that formally define what a real problem is and follow an effective problem solving method will help reduce this confusion.

Threshold levels can change over time by either raising or lowering the threshold limit. A common mistake is for organizations to manage wide-ranging interests by setting threshold levels too low and thus committing to a formal problem solving process for every little situation. Zero-tolerance type limits usually create the need for numerous formal problem solving sessions. Threshold levels should initially be set to ensure the most important and costly problems are being dealt with using a formal structured approach.

As soon as an OCP threshold is exceeded a municipality, by definition, has a defined problem for its community. Defining the problem and getting on with a formal problem solving process is then very efficient to initiate because time is not wasted arguing over "what the problem is". Problems can be quickly recognized and defined

using threshold criteria and OCP goals. For example, Table 1 shows how OCP goals, problem thresholds and problem statements work together.

Table 1. The relationship showing how formal goals, problem threshold limits, and problem statements relate to one another in effective problem solving.

OCP Goals	Threshold Limit	Actual event or situation	The Event or Situation Triggers a Community Problem?	Formal Problem Statement
Minimize formal public wildlife complaints	≤ 10 complaints per year	11 formal complaints received by June 1st	Yes	11 urban wildlife complaints received
Minimize unplanned expenditures on wildlife damage to public property	≤ $5000 per fiscal year	Expenditures on wildlife damage total $6000 by start of the 3rd quarter	Yes	$6000 expended on wildlife damage to public property
Maintain resident deer population at socially tolerable levels	≤ 20 resident animals	Mid-year deer survey determines 12 deer residing permanently within city limits	No	Not applicable

In addition to the problem statement, a properly defined problem must characterize when and where the problem has occurred and includes statements describing the significance or consequences of the defined problem. The cost of the problem as well as what the problem might cost should it recur must be explicitly stated in the problem definition.

Quantification of the actual and potential costs are absolutely critical in formal problem solving because in Step 3 ("Identifying and Evaluating Solutions") a cost-benefit evaluation of proposed solutions will help decision makers determine if a given solution is going to be an effective one or not. More often than not inexperienced problem solvers discount potential effective solutions before any objective evaluation can take place simply by jumping to the conclusion: "Oh we can't do that because it will be too expensive". "Too expensive" is a judgment and the

only way in which the cost effectiveness of any solution idea can be judged is through a comparison against the cost of the problem and the capacity to pay for it.

In urban wildlife management a potential risk from any recurring wildlife conflict related problem is that of a human fatality or serious injury. By including the cost of a potential fatality in the problem definition, problem solvers who exercise due diligence will show how many so called "too expensive" solutions are actually very cost effective solutions. Discounting a solution opportunity based only on absolute cost is not an indication of a good attitude towards organizational due diligence. In urban wildlife management, exclusion fencing often seems to be the solution idea discounted at the outset of a process because of its absolute cost. The Ministry's *Urban Ungulate Conflict Analysis* report (2010) perpetuates the pitfall of judging solutions by their cost (i.e., "expensive option") in absence of a comparison against the total cost of a defined problem, the risks associated with its recurrence, and the options available to a community to amortize the cost over an acceptable period of time.

Step 2 – Identify the causes that combined to create the problem

Once a problem is defined, the next step is simply to ask the question "Why did this problem happen?" The answers will yield the causes of the problem. In turn, if one then asks "why" of each one of those causes, the answers will provide more causes of the problem. Following this iterative process leads to a logical understanding of the problem. Identifying as many causes of the problem as time and resources permits will give problem solvers more opportunities to generate ideas for solutions.

In order for solutions to work they must act on known causes of a problem. Solutions DO NOT fix problems directly. They work indirectly to prevent recurrence of a defined problem by acting on known causes of the problem. Evidence (i.e., factual data) is used to support each cause so that problem solvers know that every cause identified in the problem analysis is in fact a real cause of the problem. Evidence prevents causes that are based on speculation or opinion from being considered as the real causes of the problem. The danger in accepting causes that are not factual is that solutions get developed and implemented to control causes which are not the actual causes of the problem. Solutions that do not control known causes of a problem will not prevent a problem from recurring.

Step 3 – Identify and evaluate solutions

Once the causes of a defined problem are identified, the next step is to identify and evaluate ideas for solutions. Possible solutions might address individual causes of the problem. "Out of the box" thinking is facilitated by brainstorming possible solutions in an environment that initially considers all possibilities without judgment. After this step is completed all the ideas for solutions are evaluated to determine which are effective. Effective solutions meet the following criteria.

An effective solution:

1. Prevents recurrence of the problem by controlling a known cause of that problem.
2. Is an action that is within the control of the problem owner.
3. Is an action that meets the problem owner's goals and objectives – i.e., it is an action that is legal, practical, feasible, cost-effective, socially and environmentally acceptable, and timely.

Solutions which are implemented and do not meet all three criteria have a high probability of failing. The more ineffective solutions that a problem owner relies on to solve a defined problem the greater the risk exists that the problem will strike again. The quantity and quality of solutions that a problem solving team is capable of generating increases dramatically when the steps of effective problem solving are followed sequentially.

Step 4 – Implement the best solutions

When followed properly, effective problem solving typically puts decision makers in the position of choosing the "best" solutions from a suite of equally valid options. Having numerous options for solutions to choose from is a very desirable position to be in for city governments charged with having to balance the social, political, economic, and environmental aspects of urban wildlife management. *Ad hoc* problem solving processes typically provide managers and decision-makers with very few options from which to choose. In situations where committees have very few recommendations for solutions, decision-makers might feel pressured to implement a solution they are not fully comfortable with because there are "no other viable options". In turn, decision-makers with inadequate options to recommend may decide to do nothing, and the risk of problem recurrence has not been reduced at all.

When approving or adopting recommended solutions generated from a formal problem solving process, decision makers should be thinking along the lines of implementing a suite of effective solutions rather than just than a single solution. The

risk of problem recurrence is directly related to the number of effective solutions that are implemented.

Once implemented, the effectiveness of each solution must be monitored to ensure they are controlling the causes of the problem in the way intended and that the return on investment is acceptable. Leading indicators should be developed for each solution to give managers the best possible chance of detecting solutions that are not working before the full impact of the problem manifests itself again.

Summary

Adopting a formal, structured problem solving method will greatly improve the ability of communities to effectively engage the public in solving wildlife conflicts and in finding the effective solutions. *Ad hoc* problem solving processes are inherently subject to high rates of failure because they force untrained problem solvers to fall into the most common traps associated with ineffective problem solving. The most common causes of ineffective problem solving include:

1. *Incomplete, vague, or no formal problem statement.*

- This is most often caused by the belief that the "problem" is obvious to everyone so a written definition is not necessary.
- A problem that is not precisely defined cannot be solved.

2. *Not knowing the causes of the problem*

This arises when people do not have a solid understanding of why the problem occurred in the first place. This lack of understanding leads to identifying solutions that are not related to the problem. And consequently these solutions fail to prevent problem recurrence.

3. *Focusing strictly on solutions*

- When a problem is not defined properly and the actual causes of the problem are not identified, *ad hoc* problem solving processes often jump right to identifying solutions for a perceived problem. In this situation people, usually after the fact, often find themselves solving the wrong problem.

Adopting a standard formal problem-solving method across the province (i.e., industry accepted method) would allow communities to share results of their formal problem analyses because they can compare and contrast "apples to apples". The sharing of information generated using the same method creates a situation where

communities can proactively implement effective solutions based on the recognition of the same causes identified by a neighboring community.

The results derived from following an industry standard formal problem-solving method are auditable and defensible. Are *ad hoc* processes auditable and defensible?

An example of problem definition:

What is the problem? "Deer reside within city limits year around".
When did this problem occur? 2000 to present. Ongoing 12 months of the year.
Where did this problem occur? Community "X". In all areas of the city.
What is the significance of the problem?

Actual cost:
$62,000 per year x 10 years =$620,000.
$32,000 in private property damage (includes avg. of 4 vehicle collisions) per year.
$10,000 in public property damage per year.
$20,000 in unbudgeted city staff time per year.

Potential cost:
$4,000,000 + $62,000/year over the last 10 years
$4,000,000 potential wrongful death lawsuit / negligence.

TOTAL COST including AT RISK COST: ~$4.7 Million

What kinds of solutions going to prevent this problem – "Deer residing within city limits year-around" from happening again? Can you answer this question without knowing what the causes of the problem are?

How much could be spent on effective solutions to maintain a justifiable cost-benefit ratio given the potential risk to human life from a recurring problem?

How does your community's urban wildlife conflict resolution process measure up? How defensible is your problem solving process? Does your problem resolution process measure up to the standard of care principle if you had to demonstrate due diligence?

Take what you have learned here and complete the checklist to judge for yourself….

Table 2: Checklist to assess due diligence and the likelihood of success in community-based urban wildlife conflict resolution processes

Elements of effective problem solving	**Yes** Demonstrates due diligence and has higher likelihood of success	**No** Lacks due diligence and has higher likelihood of failure
Our community's urban wildlife conflict resolutions process employed a known and proven structured approach to solving problems.		
Our process was facilitated by neutral and unbiased facilitator(s).		
A clearly-defined problem statement was developed and accepted by the stakeholders at the outset of our process.		
Our problem definition was triggered by goals stated in our approved OCP.		
Our problem statement included the actual costs of the problem including potential "at risk" costs associated with recurrence.		
There is certainty among stakeholders that we have logical understanding of the causes of our problem.		
We identified many causes to our problem.		
All the causes we identified are supported with factual evidence.		
The solutions we adopted act upon known causes of the problem.		
Ideas for solutions were evaluated against the total cost of problem recurrence.		
We identified and evaluated more ideas for solution than the actual number of final solutions that were adopted.		
We used a set of objective criteria to determine which solutions were effective solutions.		
We are implementing multiple solutions to control multiple known causes of our problem.		
Some of our proposed solutions will be implemented to address the most likely worst possible consequence of a recurring problem.		
We have a program planned to monitor the effectiveness of our solutions using leading indicator metrics.		
In the event our solution(s) fail to prevent a human injury or fatality, our problem solving process is defensible enough to demonstrate that we did everything possible to prevent such an event from happening.		
TOTAL	16	16
PERCENTAGE %		

Reference

BC Ministry of Environment, 2010. British Columbia Urban Ungulate Conflict Analysis Summary Report for Municipalities, 64 pages. Available at: http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/UrbanUngulatesSummaryReportFINALJune21-2010.pdf

Resource

Effective problem solving training, software, facilitation, and investigation resources: http://www.sologic.com

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8. Urban deer management in Cranbrook

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MOUNTAINS OF OPPORTUNITY
CRANBROOK

In partnership with the Ministry of Forests, Lands and Natural Resource Operations, the City of Cranbrook finds itself in the unique position of breaking trail on the process of wildlife management in an urban setting. The City also finds itself under the watchful eye of our own residents, other municipalities, the media, and a number of special interest groups like People for the Ethical Treatment of Animals and the World Wildlife Fund. My hope is that the information we can share with you today will assist those of you who may be experiencing your own wildlife issues and looking at ways in dealing with them.

These photos were taken by residents of Marysville in 2010, but clearly represent the situation that not only Cranbrook finds itself in, but other communities in our region find themselves as well, including the City of Kimberley, Invermere, Fernie, Sparwood, Elkford and communities to the west of us including Grand Forks.

Members of Council, City staff, and local Ministry of Environment representatives Dave Dunbar and Irene Teske met in early 2010 to discuss the burgeoning urban mule deer population. At that time, provincial staff suggested the City undertake a series of steps, which would better help both City staff, Council and Ministry of Environment understand the true nature of the problem and public sentiment, but also put together a solid management strategy to be endorsed by Council and then provided to the Province.

The process we agreed upon was to:

- Implement a deer feeding bylaw;
- Survey the public;
- Establish a Management Advisory Committee;
- Undertake a population count; and,
- Present recommendations for Council approval.

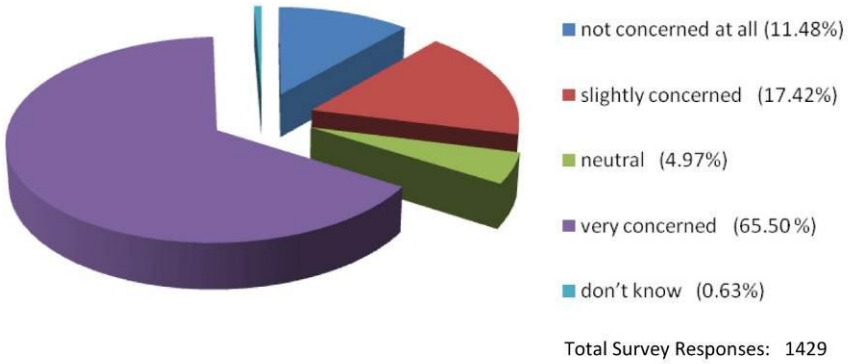
The deer feeding bylaw took effect on October 1, 2010. The bylaw is clear in identifying that no one is to provide deer with food by intentionally leaving out food, food waste or edible material, or other attractive edible material intended for the sole purpose of feeding deer. The bylaw allows for farm operations, and home fruit and vegetable gardens intended for human consumption or ornamental plants and flowers. The bylaw also sets out an escalating fine schedule: $100 for the first offense; $200 for the second; and $500 for the third offense. Each day a violation occurs constitutes a new and separate offense.

The urban deer resident survey was conducted between August 31 and September 24, 2012. The survey consisted of nearly 50 questions taken from the *BC Urban Ungulate Conflict Analysis for Municipalities* report. Approximately 1430 residents responded. The results were provided to Council for information in early October 2010.

The City received a wide spectrum of responses, but when the results came in, it quickly became clear that the public concern was genuine. Nearly 66 percent of respondents were very concerned about the general deer population in Cranbrook…

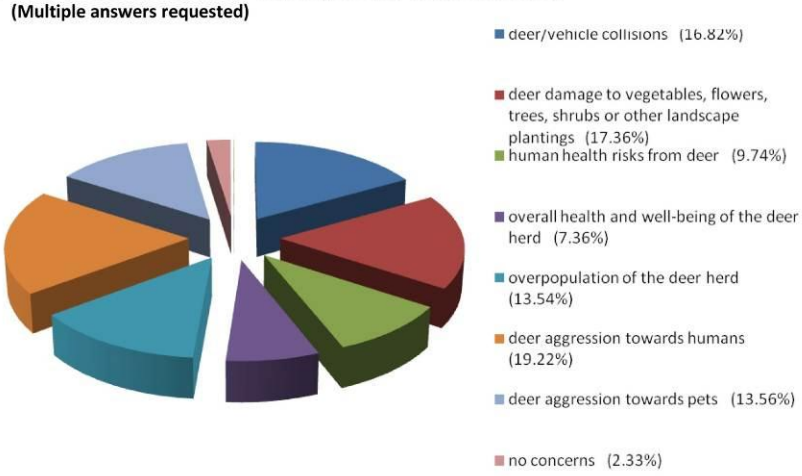
The following illustrations show responses to some of the survey questions.

1. How concerned are you about the deer population in Cranbrook?

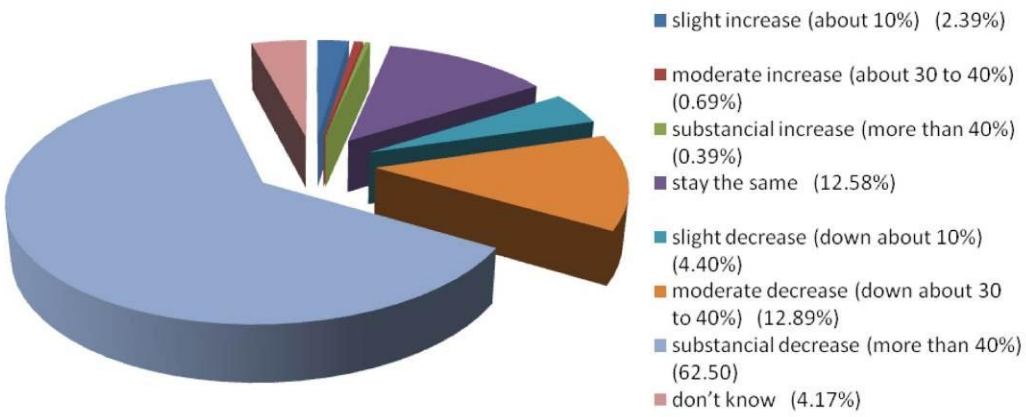


Total Survey Responses: 1429

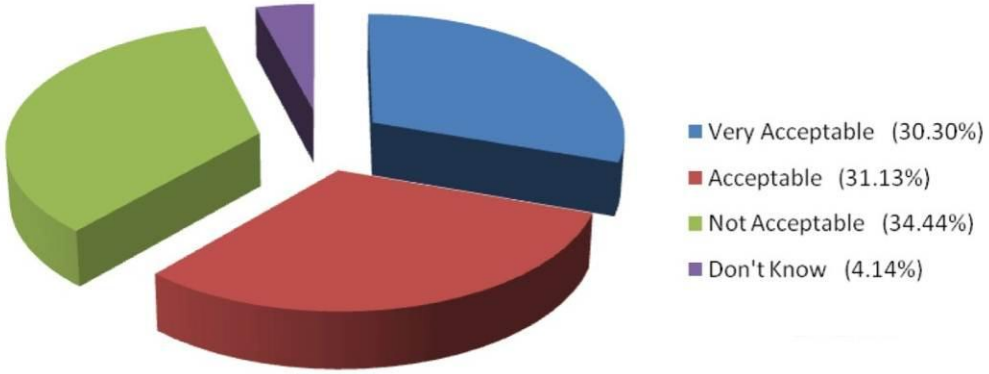
2. What are your main concerns regarding the deer herd in Cranbrook? (Multiple answers requested)



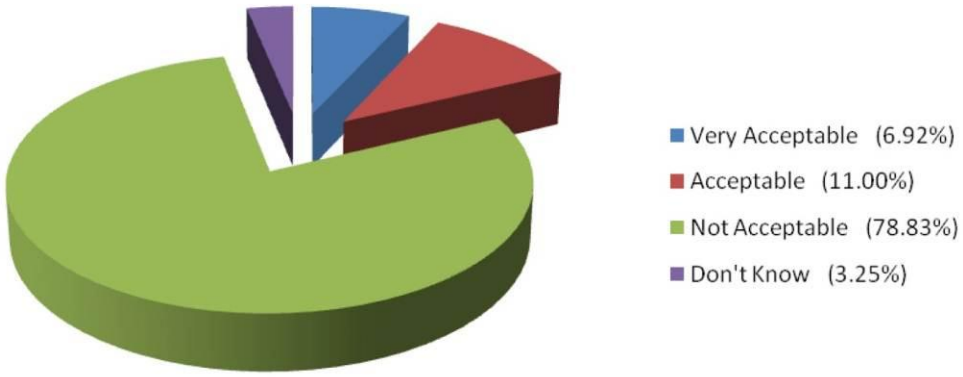
22. In the future, what would you like to happen to the number of deer in Cranbrook?



37. Capture and euthanize



40. No Action



As the results of the survey were provided to Mayor and Council, and to the public, the ranks of the newly formed Urban Deer Management Advisory Committee were filled. The Committee included 8 voting members: two members of Council, including Councillor Bob Whetham; Irene Teske as the Ministry representative; 5 community-at-large members; and myself as the non-voting staff liaison.

Clearly laid out in the Terms of Reference were the committee's responsibilities which included:

- Assessing the survey results;
- Coordinating a count of the deer population within the city;
- Identifying acceptable options for population management;
- Identifying strategies for human–deer conflict management; and,
- Present their recommendations to council.

A count of the urban deer population occurred in November 2010 was coordinated and carried out by the Committee and a team of volunteers. An average of 92 deer, both mule and whitetail were observed during the count; 82 of those animals were mule deer. The total density of deer calculated was 3.7 deer per square kilometre. The density of mule deer was 3.3 per square kilometre. Based on the results, the overall density of deer in Cranbrook is relatively low. By comparison, the City of Kimberley reported a density of 20 deer/ per square kilometre. The recommended density for deer management to take effect in Helena, Montana is 9.6 deer per square kilometre.

The City of Cranbrook recognizes that deer are a natural part of our environment and despite the fact that present mule deer numbers are considered low relative to other urban areas in our region, anecdotal information from the public suggests that human and deer interactions in Cranbrook are increasing.

Several recommendations including a public education campaign and a deer cull were presented to and endorsed by Council. Those recommendations were based on the understanding that wildlife are a provincial management issue; that all rules and regulations, both municipal and provincial, must be abided by; and that the deer management strategy would focus on problem deer.

Other recommendations endorsed by Council included examining the option of capture and relocate; working towards the creation of a controlled perimeter Mule Deer doe hunt in conjunction with the regular fall hunting season and establishing the Advisory Committee as an ongoing body.

Deer Management in Helena, Montana

During this process, past Committee Chair Carmen Purdy travelled to Helena Montana, with Ron Kerr, the City of Kimberley Deer Committee chair, in early 2011. They observed how authorities in Helena carried out the process of culling. Their cull was entering its third season.

Photo courtesy of Carmen Purdy.

The Helena management system is contracted out to one agent and one assistant, and uses baited clover traps. The bait mixture consists of corn, oats, barley, and molasses topped with sliced apples, which lures the mule deer into the trap, tripping the gate, enclosing the deer in a tubular frame covered with heavy netting.

Photo courtesy of Carmen Purdy

Agents quickly collapse the trap with the deer inside and dispatch the animal immediately and humanely with a bolt gun. Agents promptly re-establish the trap from its collapsed state, open the gate, and move the deer into a plastic sled for transfer to a waiting enclosed vehicle. Agents then move on to the next clover trap location. This procedure from arrival at the site to completion is less than five minutes.

The bolt gun is quiet; the agents are professional and discrete. The activity takes place in the early morning before most people are active. The clover trap sites are established on private property. Once all trap sites are visited, agents proceed to the state Fish and Wildlife compound, where the deer are dressed and placed in a cooler. The site in Helena is equipped with electric hoists and meat tracking rails into the cooler. The deer are sexed, aged, and examined by Fish and Wildlife personnel prior to being shipped to a meat processing facility where the meat is prepared for food bank distribution.

In late March 2011, at the request of Ministry of Environment, an Urban Deer Sub-committee was formed to draft a more comprehensive deer cull strategy, which we based explicitly on the Helena model that has seen significant success and was deemed by the Committee as the best option when it comes to public safety. The strategy also broke out the specific costs of the required equipment. The highlights of the strategy included:

- That the province commits funds and staff;
- That the province buy and maintain the traps and equipment;
- That the province make these traps available to other municipalities; and,
- That the city can use the local Ministry of Environment facility to keep the culled animals until they can be properly inspected and processed for human consumption.

In all, the City would make four recommendations to those municipalities that are working to deal with their own urban wildlife issues, whatever they may be.

First–Involve Ministry of Environment staff in the process immediately; use their professional experience and expertise in each step.

Second–Conduct a public survey. This is key to success of the entire process. The results give elected officials a very clear indication that the process is moving in the

right direction. It is also important in garnering their support for management recommendations.

Third–Have a diverse and transparent Committee. Having a representative from Ministry of Environment on the Committee takes much of the emotion out of the process and allows for factual, information based decisions. Having the Committee remain in place to continue to monitor the situation and provide annual reporting back to Council does a lot for the credibility of the process and for Council in eyes of the public.

I think the Cranbrook Advisory committee reflected a solid cross-section of the community, with various viewpoints and interests. Despite these differences the committee stayed together and came up with solutions that were supported unanimously by the Committee. The Committee collectively came up with realistic expectations and identified that our issue requires long term management, not short term fixes. The Committee also recognized that this was a management problem and that residents will have to live with urban deer, as they are not going away. And in the end, the Committee generated a series of recommendations that can be applied.

And finally –Make your important decisions in a public forum, like a City Council meeting. It keeps the process in the public eye and keeps the public aware of progress.

Reference

BC Ministry of Environment, 2010. British Columbia Urban Ungulate Conflict Analysis Summary Report for Municipalities, 64 pages. Available at: http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/UrbanUngulatesSummaryReportFINALJune21-2010.pdf

9. *The Grand Forks Deer Committee: A deer town with a people problem*

Jenny Coleshill, Grand Forks Deer Committee
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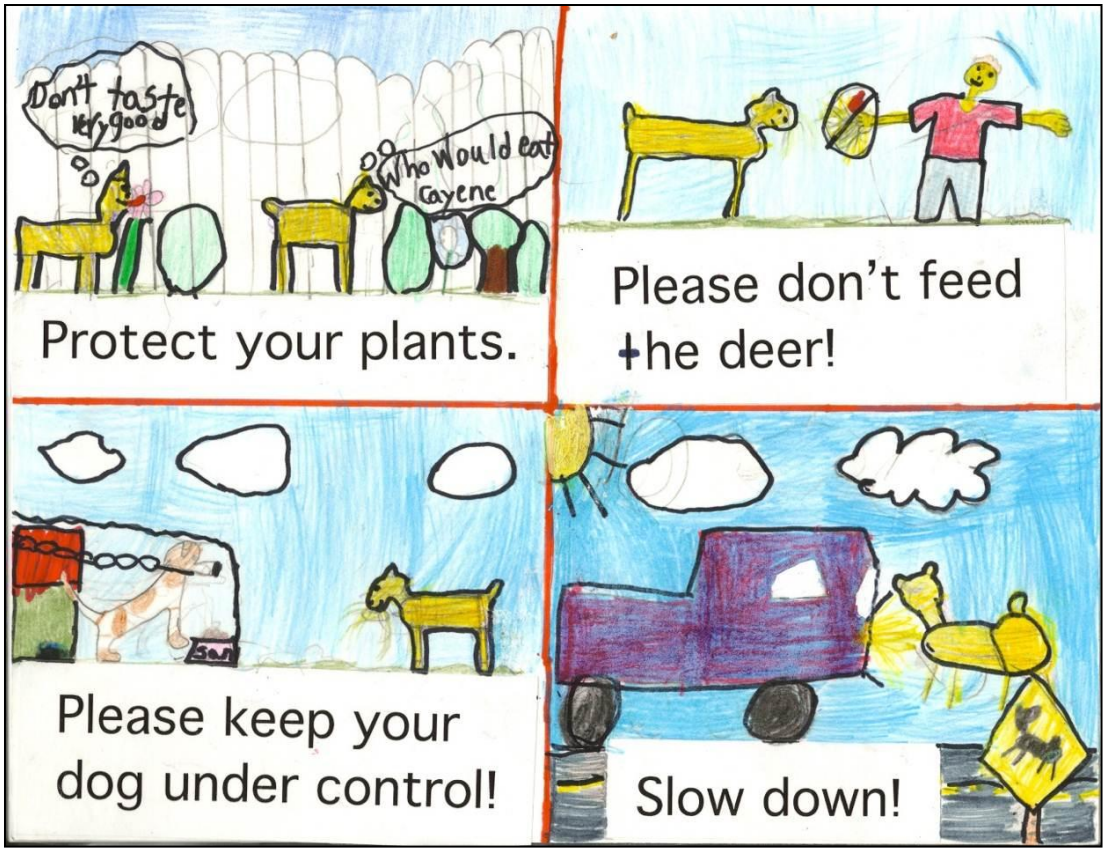
The interface between wild animals and civilization is an historic problem that is complex and requires both professional design and adequate resources. The City of Grand Forks established their current deer committee in December 2009 in response to a growing number of complaints by city residents in regards to our "deer problem." Grand Forks was the first in the province to establish a committee to address the issue around a growing urban deer population. Mayor Brian Taylor appointed community members who represented a range of differing values and interests to sit on the Grand Forks Deer Committee. The committee was tasked with recommending measures to council that will reduce conflict with urban deer and improve safety around deer vehicle collisions.

A public survey was conducted, which resulted in the largest survey return in City history—evidence of how important this topic is to city residents. Out of the 380 respondents 74% would like to see management actions that will reduce the herd. Vehicle collisions with deer were the biggest concern regarding the city deer herd.

Over the last three years the differing values of the committee has made decision-making difficult and a recent change in committee members may have to see certain processes revisited. However, there is now a management plan that has been accepted by council and the options it outlines will be implemented with the direction of the committee and necessary resources must now be acquired.

The actions the committee have seen to date have been the non-lethal approaches of education (the need for education was the only point of consensus for the committee), and enacting bylaws about deer feeding. School kids helped with educational material and made signs that have been placed around city trails.



Signs made by Grand Forks school children

Council members helped initiate the monitoring of the city deer population 5 years ago. Both spring and fall counts have been conducted since then. The population increased the first 3 years and has been stable the past 2 years. Monitoring the population can be used as evaluation criteria of management actions.

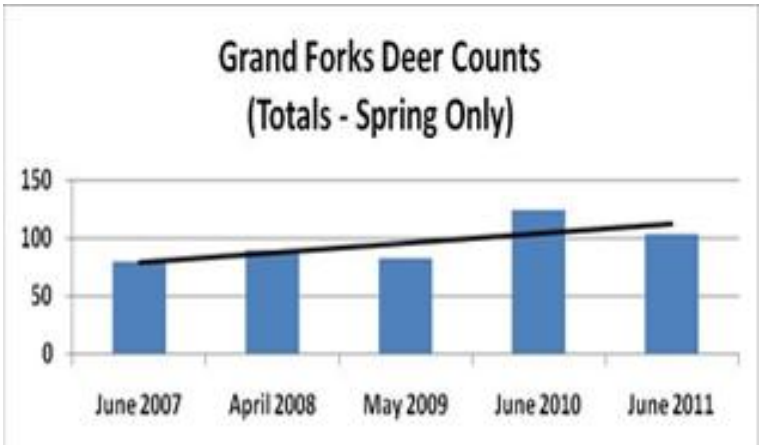


Figure 1: Number of deer in Grand Forks, spring counts.

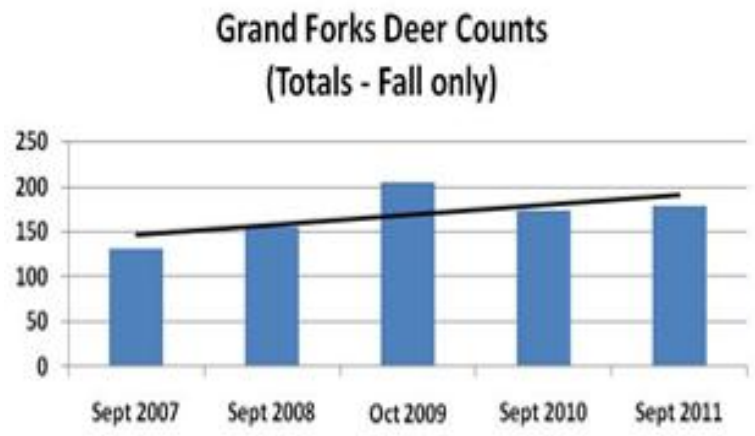


Figure 2: Number of deer in Grand Forks, fall counts.

There have been both successful and unsuccessful steps in getting to this stage. The problem may not be the deer but the multi-facetted social issues that arise from management of deer in an urban setting.

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10. Urban elk management in Banff National Park

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The Banff National Park Management Plan recognizes that changing environmental conditions in the Bow Valley of Banff National Park requires management action to restore the long term range of ecological states and processes, and to reduce human–elk conflicts near the Banff Townsite. The Banff National Park Management plan also emphasizes actions to promote ecological integrity, in part by restoring carnivore movement corridors and ensuring habitat security by managing development and visitor use.

However, the Central Bow Valley elk herd generally selects wintering grounds near the town of Banff where predators are rare or absent, human use is high, and corridor restoration has been partially effective. The implementation of the Banff Elk Management Strategy (1999, 2007), recognized that continued emphasis on corridor restoration and carnivore habitat security was essential, but acknowledged that the management of hyperabundant elk in the Banff Montane would also need to include a mix of direct management actions for elk residing year-round in areas where natural predation effects were absent, and where there were ongoing safety issues involving aggressive elk.

A comprehensive body of research in Banff National Park has focused on population dynamics and trophic processes involving elk and other herbivores, predators, vegetation, and human activity. The work has greatly improved the understanding of the influence people and large carnivores on ecosystem structure and diversity, and has found that in the absence of predators, hyperabundant elk in the Bow Valley can overgraze vegetation, compete with other herbivores like beaver and moose, and can alter long term ecosystem processes (e.g., Hebblewhite 2005). More recently, the large herds of elk inhabiting predator refugia (e.g., near Banff Townsite, and Yaha Tinda Ranch) have been linked to high levels of wolf predation on secondary prey such as the threatened mountain park caribou population (e.g., Hebblewhite et al 2007).

The Banff Elk Management Strategy tested a variety of adaptive management actions to mitigate elk impacts such as aversive conditioning, relocation and destruction,

fencing of school grounds, and public education and awareness. Many of these actions are ongoing, specifically:

- Including aversive conditioning of elk from the townsite;
- Temporary seasonal rail fencing to hold elk north of the Trans-Canada Highway to better connect the population with predators:
- Culling elk with assistance of First Nations in areas where natural predators are absent;
- Assessing options to further improve wildlife corridors; and,
- Ongoing public communications and safety messaging.

Objectives of the Banff Elk Management Strategy

- Reduce elk density (to <2/km^2) and increase elk wariness and migration.
- Reduce human–wildlife conflict incidents (by 75%).
- Maintain and restore wildlife corridors and habitat security.
- Improve forest and grassland condition by reducing herbivory effects and restoring fire.
- Continue communications and engagement to support on-going science-informed actions.

Methods and information collected

- Annual aerial and ground surveys of the elk population to obtain total counts, population distribution, and calf production estimates.
- Radio-tagging to determine seasonal migrant versus year-round resident elk.
- Human–wildlife conflict occurrence tracking.
- Wildlife corridor track monitoring to document trends in predator activity.
- Repeat sampling of vegetation plots to assess shrub/forest condition relative to herbivory levels.
- Regular stakeholder/science advisory meetings.

Results and accomplishments

Elk impacts on vegetation, other wildlife, and public safety have been reduced as the Elk Management Strategy has progressed through several phases under the guidance of stakeholder and science advisory bodies since 1997.

Elk numbers began to decline in 1985 in the western and eastern portions of the Bow Valley following natural recolonization of wolves in combination with several severe

winters. In contrast, high elk numbers persisted in the central Bow Valley (townsite area) until 1999 when the first elk relocations took place as part of the new Elk Management Strategy (Figure 1).

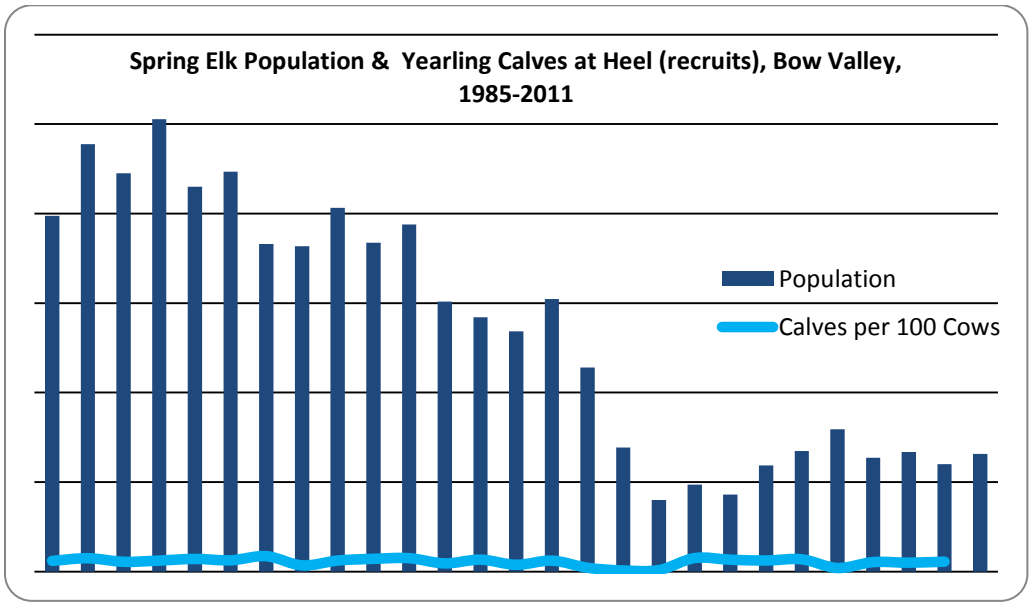

Figure 1: Spring elk populations and yearling calves at heel (recruits) Bow Valley, 1985-2011

Between 1999 and 2001, 217 elk were relocated to areas outside of the park, and the Fairholme wolf pack colonized the central Bow Valley resulting in a sharply reduced elk population of 172 animals (2003). The wolf pack dispersed from the area in 2003 and the elk population rebounded to 318 animals by 2007. Between 2007 and 2012, 77 elk were culled to address the rapidly growing number of habituated non-migratory elk that were not otherwise exposed to natural predation.

The current Bow Valley elk population is 263 animals. Elk culling in combination with limited predation has limited the increase of the Bow Valley elk population, yet a high proportion of calves are recruited each spring suggesting there is continued potential for strong growth in the absence of natural predators.

Aversive conditioning of elk away from the townsite has reduced the level of elk habituation and increased elk wariness (increased flight distance). Safety incidents involving aggressive elk have been reduced to 13-25 incidents per year down from an average of 100 prior to the implementation of the elk strategy. An increasing proportion of the herd migrates away from the townsite in summer, and temporary rail fencing on the Trans-Canada Highway crossing structures has been effective in

temporarily holding 50-75% of the central herd to the portions of their winter range where natural predators are active.

Restoring fire through prescribed burning can be considered under conditions of light browsing, but is not as feasible in the remaining heavily browsed areas. Vegetation recovery begins, on average, at an elk density of approximately 2 elk per square kilometer or less. For the central zone, this would suggest a population of approximately 116 elk (currently 166). Elk population simulations suggest that under the current elk management strategy, target elk density will be reached by 2019, assuming similar conditions of natural predation, winter severity, nutrition, and management actions. The Elk Management Strategy is expected to continue, following a process of adaptive management, including intensive monitoring and adjustment, as necessary.

Project partners

University of Guelph, University of British Columbia, University of Alberta, University of Montana, Elk Advisory Committee (1997-2003) Montane Advisory Group (2007-2010), Parks Canada.

The project contact person is:
Tom Hurd, Wildlife Biologist, Banff Field Unit Tom.Hurd@pc.gc.ca

References

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11. Wildlife exclusion fencing in urban areas – Issues and solutions

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The Kicking Horse Canyon Project involves upgrading the Trans-Canada Highway from two to four lanes between Golden, British Columbia, and Yoho National Park. The west end of the project occurs within the municipal boundaries of the Town of Golden, an area with moderately dense urban and commercial development. A wildlife exclusion fencing system that includes wildlife crossing structures and one-way escape structures was designed to greatly reduce animal–vehicle collisions, conserve wildlife resources, reduce habitat fragmentation, and improve public safety. Planning within the urban interface considered different land-use issues and wildlife impacts than those found in the more remote sections of the project. Access across the wildlife exclusion fencing to a shared pedestrian / bicycle path adjacent to the highway was accomplished through design of a labyrinth gate. Other design features of the fencing system within the urban portion of the Kicking Horse Canyon Project included the use of wildlife deterrent rip-rap, one-way gates, wildlife jumpouts, ungulate guards, and special seed mixtures for slope remediation. Communication and consultation with municipal officials and other stakeholders were key to developing a successful fencing design.

The original highway runs through very difficult terrain and had a low operating speed, a poor level of safety, and high rates of animal–vehicle collisions. Upgrading the highway from two to four lanes will meet the standards for a design speed of 100 km/h, with the exception of the upgrading within the limits of the town of Golden, which will have a design speed of 80 km/h. The 26 kilometre project is broken down into four phases. Phase 1 and Phase 2 cover the middle 9 km, with Phase 3 and Phase 4 covering the two ends of the 26 km (Figure 1). Approximately 2 km of the Golden Hill to West Portal section is within the municipal boundaries of the Town of Golden. Phases 1, 2, and 3 are completed, and Phase 4 is in the preliminary planning stage.

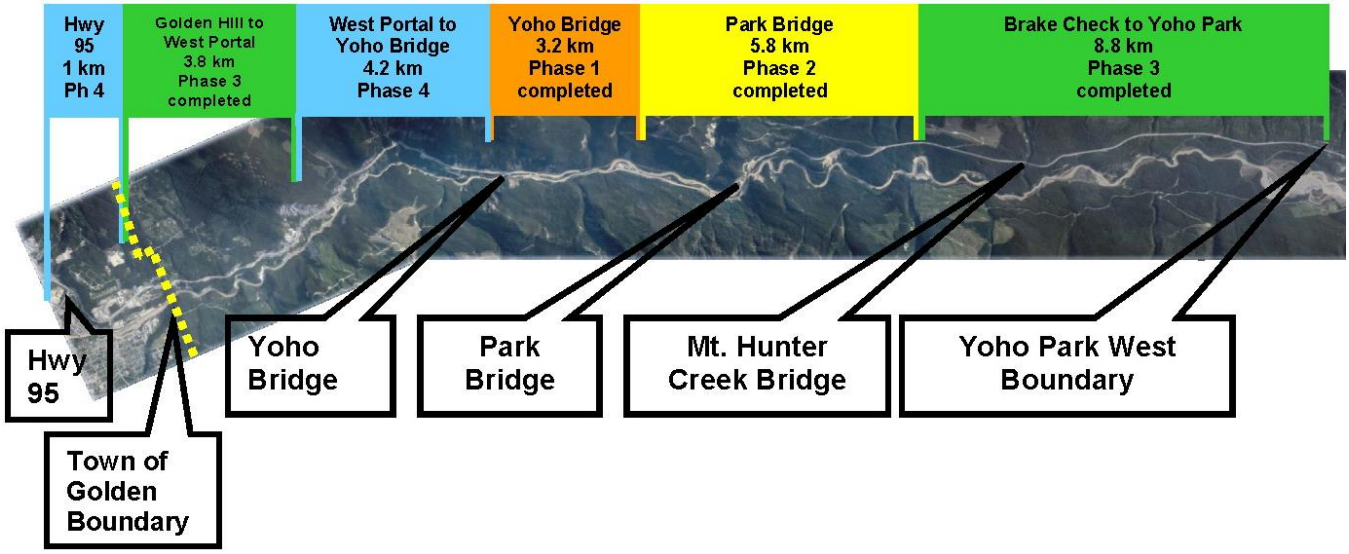


Figure 1. Kicking Horse Canyon Project area showing the various construction phases.

Consideration of wildlife, wildlife habitats, rare plants and ecosystems are an important component of the Kicking Horse Canyon highway improvement project. An ecosystem and wildlife habitat inventory was undertaken, along with breeding bird surveys, a bighorn sheep lambing survey, rare plant surveys, winter wildlife track counts, and aerial surveys. These studies found that the project area is very diverse, with over 200 different combinations of habitat types (Ketcheson 2006), and 72 species of birds (Ferguson 2005). Surveys did not detect any rare plants or bird species at risk. Protection of important vegetation, wildlife, and fisheries habitats was accomplished through establishment of environmental work zones and construction timing constraints.

Reducing animal–vehicle collisions and maintaining highway permeability

The Kicking Horse Canyon project passes through important wildlife habitats with high wildlife use by species such as white-tailed deer, mule deer, bighorn sheep, and elk, along with lesser numbers of bears and moose. At the west end of the project the wide bench within the Town of Golden provides important winter ranges for white-tailed deer and bighorn sheep. The bighorn sheep herd has become quite habituated to human use, and makes regular use of urban landscapes with the Town of Golden, including roadside vegetation and urban lawns.

Based on 26 years of road-kill data (Wildlife Accident Reporting System 2006), winter track counts, and aerial surveys (Harper 2007), and predicted increased

animal–vehicle collisions associated with twinning (Dodd et al 2005, Woods 1988), a 2.44 m high wildlife-exclusion fencing system was approved for the project. Wildlife-exclusion fencing has been installed on both sides of the Trans-Canada Highway on the Phase 3 segments (Harper 2008) and is planned for the Phase 4. The total length to be fenced is approximately 20 km. This fencing system includes wildlife crossing structures and one-way escape structures, and is designed to greatly reduce animal–vehicle collisions, conserve wildlife resources, reduce habitat fragmentation, and improve public safety.

One-way escape structures were located at an average interval of 500 m on both sides of the highway. Most are the traditional one-way escape gates used elsewhere in British Columbia, but 13 are one-way earthen jumpouts that have been estimated to be 8 to 11 times more effective than one-way gates (Hammer 2001). The wildlife fencing system within the Town of Golden includes 7 one-way escape gates, two ungulate guards at a highway interchange and two pedestrian labyrinths associated with a recreational bike path next to the highway.

Wildlife jumpout, Kicking Horse Canyon

Just east of Golden the wildlife fencing system includes a wildlife overpass to maintain permeability for animals in the area, four one-way escape gates, and two wildlife jumpouts. The wildlife overpass near Golden is 7 m wide and 28 m long and was completed in late 2011.

Wildlife overpass, east of Golden

Ungulate guard at highway on-ramp

Special considerations for wildlife fencing in urban areas

Planning wildlife exclusion fencing in the Town of Golden involved an increased focus on addressing potential public safety and liability concerns. Ungulate guards are a modified type of cattle guard specifically designed to allow vehicle passage, but not wildlife access onto the highway. The wide spacing of the rails suggests it could be a safety hazard to bicyclists. On the Kicking Horse Canyon Project all the ungulate guards are well-signed with instructions for cyclists to stop and dismount.

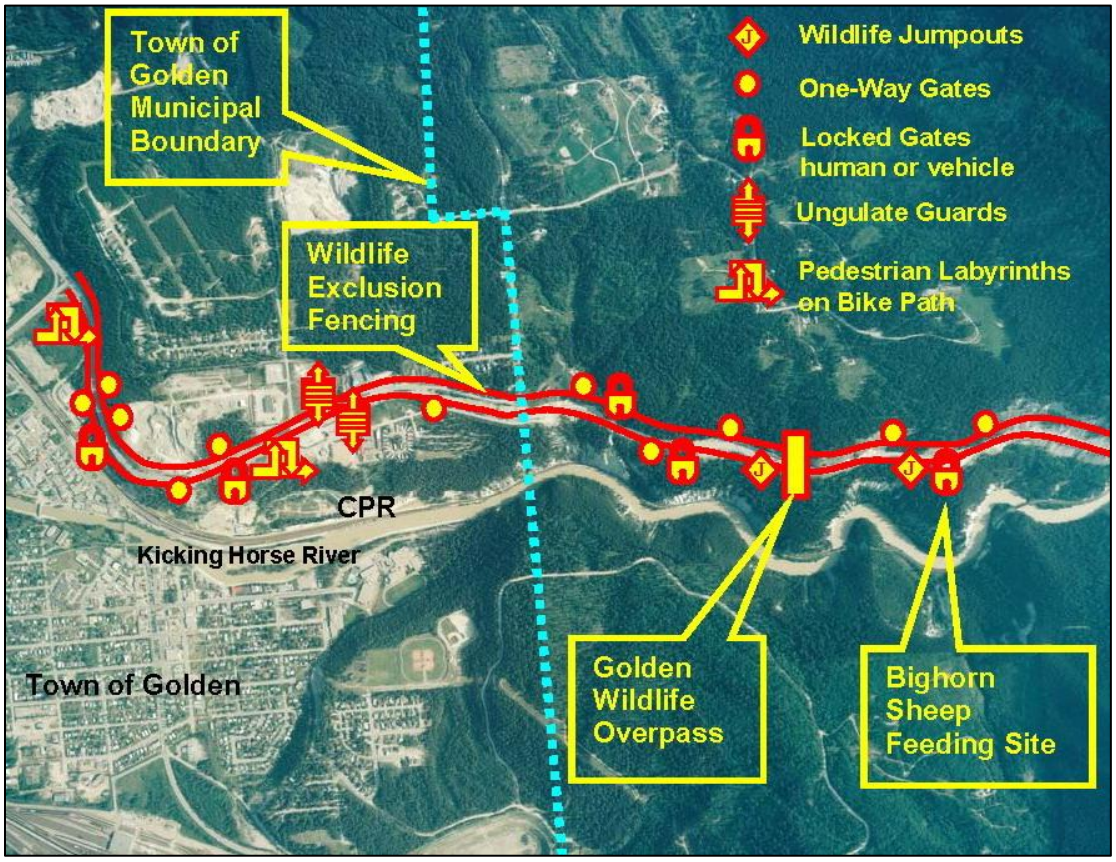
The Golden Hill bicycle path also presented a challenge to develop a gate that would stop wildlife, but still allow pedestrians and bicyclists to access the path inside the fence. A number of alternative solutions were considered, but final design was a labyrinth with a self-closing swing gate, that should deter animal access even if the gate is left open. Urban areas also increase the potential for vandalism of the fence, and human disturbance of animals at the wildlife crossing and escape structures can reduce their effectiveness.

Labyrinth gate on bicycle path

To minimize ungulates entering the highway at the fence terminus near Highway 95, slopes were seeded with a special seed mix that did not include nitrogen-fixing legumes, and wildlife deterrent rip-rap was used at the fence ends.

Although the fencing system can be construed as an inconvenience to the public at some level, the avoidance of high animal-vehicle collisions and the public safety and

conservation problems they cause more than outweigh this downside. The Ministry design team worked with Town of Golden Planners during the design phase and continued this liaison during the construction phase. Public input on the project was actively sought through regular information meetings.



Wildlife exclusion fencing system on the Trans-Canada Highway within and immediately east of the Town of Golden.

Unless properly designed, fencing systems designed to reduce animal-vehicle collisions can fragment wildlife populations and jeopardize their viability. The Kicking Horse Canyon Project includes a number of wildlife crossing structures to improve the effectiveness of the exclusion fencing and maintain the permeability of the highway to large animal movements.

Acknowledgements

The environmental program of the Kicking Horse Canyon Project is a result of efforts the entire project team including Murray Tekano, Jon Jensen, Darcy Grykuliak, Alex Izett, Doug Kelly, Andre Fillion, Bob Ramsay, Terry Coulter, Marco Guarnaschelli,

Elise Pare, Jim Deutsch and Dan Harris. Assistance and direction was provided by the Environmental Services Section of BC Ministry of Transportation and Infrastructure through Angela Buckingham, Len Sielecki, and Al Planiden. We are particularly grateful to staff of the Town of Golden and members of the Golden Fish and Game Club for their advice and input.

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12. Electric fencing: An effective deterrent to protect fruit trees and small livestock from bears

Gillian Sanders, North Kootenay Lake Bear Smart Program, Meadow Creek BC
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Fencing solutions need to:

- Control known cause (predation of livestock known cause of wildlife conflicts leading to wildlife mortalities and intolerance)
- Be within owner's control (easy to install and use when you know how)
- Be feasible, cost effective, and socially acceptable (electric fencing is all these)

Good Fences Make Good Neighbours

- Electric fencing is effective to deter many animals in various circumstances. By understanding the animal you want to keep in or out, you can design the fence you need.
- Many electric fence energizers are manufactured for horses and domestic livestock, and these may not be effective for bears.

Thick bear hair can act as an insulator for the shock, but there are 2 styles of fence to address this.

1. Industrial type fencing for landfills can be installed with high tensile wires that part the thick hair of the bear to reach the skin as the bear tries to go through the fence.
2. The fence can be designed to aim for the animal's wet and sensitive nose to deter it from entering the protected area.

My work has focused on the second style as it's much cheaper and is useful for small area applications.

Temporary electric fencing for fruit trees protect late season apples that allow fruit to ripen on the trees until after the first frost.

A high voltage system with a good ground is essential to keep bears out. There are also back-country and off-grid applications with solar or battery power fence energizers.

How electric fencing works:

- The electric pulse leaves the fence energizer from the positive terminal to the hot wire to complete the circuit. If the wire is touched by a person or animal, the electricity takes the shortest path to the ground through the body to the earth and back to the ground rod and the negative terminal to complete its circuit.
- In dry conditions, the shock will not be as strong as dry earth is not a good conductor of electricity. You can install more ground rods, wet the earth around the ground rod(s), and/or install alternate hot/cold wires.

This nylon mesh with fiberglass posts is useful for campsites and rotating grazing of small livestock. It is easy to and quick to install. This design has a hot/cold wire configuration.

Electrified stucco mesh can be permanent fencing, both free-standing and against an existing wooden fence. So far this fencing has been effective for bears, wolves, coyotes, deer, small mammals, and wild turkeys.

Maintenance

To maintain your electric fence, you need to make sure that nothing is grounding out the current by touching the hot wires. Regularly maintain your fence by removing vegetation. If using metal T-posts, or installing electric wires around existing metal fencing such as orchard fencing or chicken wire, make sure that the hot wires are kept away from grounded metal with extended insulators.

Barriers to electric fencing:

- Cost
- Lack of knowledge
- Lack of maintenance
- Perceived safety concern
- Convenience/Time
- Aesthetics

Benefits of electric fencing:

- ~$300 for fencing average chicken coop or a few fruit trees. Subsidy program for 50% of cost or loaner fencing to encourage trial use.
- Program coordinator available at no cost to resident for on-site consultation and installation; ensures that fence is correctly installed and education about maintenance.
- To install a fence around a couple of fruit trees or small chicken coop may take 1-2 hours with 2 people.
- Fencing around fruit trees is only needed seasonally and can be easily installed and removed (polytape).
- Benefits of electric fencing include coexisting with wildlife while allowing for sustainable living practises such as raising and butchering local food and composting.
- Can change existing predator behaviour.

Safety of electric fencing:

- For small applications I use fence energizers with high volts but low amperage. I'm told that it's the amps that can be dangerous for electrical shocks; volts are uncomfortable and may hurt but won't harm you.
- Capacitor sends out pulsing current @ 4/10,000th of a second, with ¾ second off. This pulse doesn't allow for the lock in effect that could happen with regular AC current.
- Electric fence energizers are Canadian Standards Association approved for sale.
- Not one documented case of lasting harm from electric fencing.
- Parks Canada installation around Lake Louise campground - and other campers wanting to be inside the fence.
- Can put up signage on the fence to notify people.
- Many of your questions can be answered by manufacturers of fence energizers.

Urban applications

Urban applications of electric fencing are becoming more relevant as we experience a resurgence of sustainable living practises across western North America (backyard chickens and beehives). Also relevant at the edges of municipalities where rural lifestyles are prevalent.

Village of Kaslo Bylaw 1070:
A bylaw to regulate animal attractants within the Village of Kaslo.

10. Every owner or occupier of property shall ensure that livestock or beehives are inaccessible to animals by use of properly maintained electrified fencing.

The North Kootenay Lake Bear Smart Program is sponsored by BC Conservation Foundation Bear Aware, Columbia Basin Trust, Fish and Wildlife Compensation Program, Regional District of Central Kootenay, and Village of Kaslo.

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13.Meeting the needs of wildlife education in the East Kootenay

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This presentation was about the East Kootenay Wildlife Aware program. Shaunna talked about the Kimberley bear education program, the changing needs within the community, and the transition to a wildlife education program.

Over the past few years, communities across British Columbia have been recognizing the effects that deer have been having on residents and properties. In 2010 the province of British Columbia commissioned a report which resulted in the "British Columbia Urban Ungulate Conflict Analysis Summary Report for Municipalities" by Gayle Hesse. This report led to the formation of community Urban Deer Committees that began researching options to control impacts. Public education was a key recommendation of the community committees.

While East Kootenay communities are suffering from our "urban deer crisis", other wildlife species in the region have the potential to come into conflict with humans.

The existing bear education program in Kimberley began in the late 1990s. The program was initiated as a result of the high number of bear conflict and destruction recorded, especially after the transfer station became inaccessible as a food source. The town was in a bear crisis mode, similar to the one that we are currently facing with the deer.

In the past we have had wildlife issues within our communities. To date, it is the bears that have received the attention and while bears have a high profile, we are now having deer issues. Education is a key component to management of this species within our communities. While bear and deer may be the most visible of the wildlife that we need to deal with, we have more species to deal with. Cranbrook has skunks, Kimberley has raccoons, Canmore has bunnies, Grand Forks has pigs, and most of our communities have cougars, ravens, coyotes, elk, and so on.

As a solution we could create a separate "deer aware" program, and a "cougar aware" program, and a "wolf aware" program. However using the resources already established through the bear program I am working towards developing and delivering a coordinated education and outreach program to minimize human–wildlife conflict, and to increase awareness of urban wildlife issues for all of these

species. I will be focusing on deer and bear this year as I get started. Education, attractant management, and safety are topics that carry through to all of the species.

Until recently, Bear Aware was the only wildlife education program in the area. Although the Bear Aware program deals specifically with bears, I frequently received calls and requests for information and education relating to all local wildlife including deer, coyote, cougar, and even badgers. It became apparent that delivery of a bear education program was meeting only part of the needs of the community. The program was also primarily limited to the City of Kimberley and thus the frequent requests for attendance at outlying fairs, markets, summer camps, guides/scouts groups, and schools outside of the city went unfulfilled.

When I worked for Parks Canada at the visitor centres in Yoho and Lake Louise, visitors were offered education on all wildlife. Parks Canada does have a species specific brochure on bears—which is great for hikers and backpackers—but the brochure most useful to visitors addressed all of the wildlife in the park, down to the little ground squirrels that like to steal your lunch right out of your hand

Bear education program in Kimberley

The part-time Bear Aware program (British Columbia Conservation Foundation, http://www.bearaware.bc.ca/) generally begins in late May or early June and ends in late autumn. This late start pretty much means that the program is playing catch-up to the bears.

In 2012 I have had an earlier start to program delivery. As the snow is melting and before the bears are an issue I have been able to start with media releases. The day that the Cranbrook Townsman printed the first media release for the season, which was an introduction to the program for Cranbrook residents, the radio was announcing that a sow with two cubs had bluff charged a hiker in the Kimberley Community Forest. A few days later there was a bear spotted on the rail-to-trails near Marysville. This was in early April, a couple of months before the program usually starts.

In the summer of 2009 there had been little funding for Bear Aware. This resulted in a very minimal, almost non-existent program, with no school education or outreach. In 2009 there was a great berry season, there was lots of food, the bears were generally keeping out of town, and the tolerance of citizens towards the animals increased. People got lazy with managing their bear attractants.

After years of Kimberley supporting the Bear Aware program, people were questioning the need for continuing with the program.

So is Kimberley Bear Aware? Do we still need a program?

In the spring of 2010, I returned to the position of Bear Aware community coordinator after taking a few years off. I spent a week in Castlegar at staff training and was excited to start work the following week. Monday morning came and I hadn't even gotten my son off to school when the phone rang. It was the newspaper looking for information relating to "The Great Bread Heist"! The previous day a bear had entered the home of a local resident and stolen a loaf of bread.

The following day a sow and two cubs were destroyed. Two days later a fourth bear followed. I felt like I was in WAY over my head and I never really recovered that season from the angry response of community members.

In 2011 and as a response to the recent "urban deer crisis", the City of Kimberley sponsored, along with the Bear Aware program, an extended program to address urban deer and other wildlife. Resource materials have and continue to be developed in collaboration with the Ministry of Environment, the local Urban Deer Committee and City of Kimberley representatives. Educational media releases, displays, and presentations have been delivered within the community.

Most of my data collection is related to bears, but we can see trends that carry over to many of our wildlife species. Calls to the provincial government wildlife reporting line (the RAPP line: Report All Poachers and Polluters) regarding deer conflict are still relatively few, though Cranbrook residents report wildlife incidents more frequently than Kimberley residents. I think we can look at the bears and apply the information to deer as they also are accessing bird feeders and garbage.

In 2011, I mapped out all of the City of Kimberley bear reports called into the RAPP line. 158 people called the line, 97 of those call reported a bear obtaining an attractant, and 9 bears were destroyed.

Of the 97 attractants noted, 71 were garbage. Oddly, in 2011 very few calls came in relating to fruit. Usually bird feeders, fruit in the autumn, pets, freezers, and compost are all attractants of note. Chickens have to this point been a rare attractant in town, but with the movement towards locally produced foods there are an increasing number of chickens and as a result I expect that number to rise.

No talk about wildlife is complete without talking about garbage. Garbage is the bane of my existence. I would love to see the community of Kimberley follow the lead of the Town of Canmore. Garbage is such a huge attractant for all animals in the area and the problem could so easily be solved by the installation and use of communal bear resistant bins like those found in Canmore and the national parks. They are easy to use, relatively convenient, and in the long run not really any more expensive than the curb-side pick-up being used now. It is the initial output expense that is holding up this purchase/rental. Creation of a pilot project in one or two smaller neighbourhoods would be a great way to start out, however it would be extremely beneficial to see the entire system changed over to the Haul-All system (http://www.haulall.com/bear.htm).

The problems caused by garbage appear to be increasing, because deer are more aggressively seeking garbage than in the past. I also personally have had a raccoon breaking into my shed and ripping apart my garbage. I am at the point that when I have garbage to remove from the house I just go straight to the transfer station. The hill sides around town are littered with the remains garbage dragged there by bears.

Most of the commercial dumpsters have many users and it is almost impossible to get everyone on-board with keeping the bins locked. Last spring one bear was destroyed after repeatedly accessing commercial dumpsters. Likely he was also the offender that was breaking into porches in the area. The owners of the dumpster were repeatedly informed that the dumpsters needed to be secured. One bear was destroyed, another bear accessed the dumpster, and even though this was in an area dense with children, the dumpster was constantly left unsecured. After many site visits educating staff, the bins were locked for the autumn. This spring I have already seen the bins unlocked and reminded the staff. They were locked last time I checked.

In the spring of 2009 a bear moved into an area vacated by four bears that had been destroyed. This bear appeared to be young and to have been abandoned or orphaned. He miraculously made it through the year, even after frequently accessing food and even being repeatedly fed meat by one resident. Apparently there was another household in the neighbourhood that also enjoyed feeding the bear, including providing alcohol. By the spring of 2011 this bear looked unhealthy and was resorting to chasing cats. It was not shy of humans and damaging property to obtain food. He was destroyed.

This is similar to what we are seeing with the deer as residents continue to feed their "pet deer". They are the toughest people to educate and legal action may be the only

way to create a result. Neighbours must also be encouraged to report offenses before it is too late.

In Kimberley the public values having a source of information on local bear activity and bear management practices. Residents have sought consultation on bear issues from Kimberley Bear Aware.

So what has been done so far?

Kimberley Bear Aware and as an extension in 2011, Wildlife Aware, reached all children in Kimberley between kindergarten and grade three through school presentations at all three elementary schools. In addition, presentations were made at day cares, to parent groups, to a group of English-as-a-second-language people, and to a large group of international students.

An effective though time-consuming public education strategy is door-to-door campaigning throughout neighbourhoods of high bear activity. Personal advice is offered about how to manage items that may attract wildlife. In addition, canvassing is done in areas of recent bear activity to avoid redundancy in messaging, as most areas of Kimberley have been visited over the years.

The program receives many phone calls from concerned residents, the Conservation Officers, and the Bylaw Officer, concerning incidents of human–bear conflict, such as property damage or aggressive wildlife. Often visiting the site of the incident to educate the resident and consult on attractants helps relieve the problem.

All rental agents and realtors in Kimberley have been contacted and given an information sheet for all new residents in Kimberley. It is anticipated that all new residents in town will receive this information and will be able to adapt smoothly to living in Kimberley with its wildlife.

All time-share condos provide information to their residents and place signage around their properties so as to inform their visitors how to ensure a safe and enjoyable stay in Kimberley.

It is difficult to reach the part-time and weekend residents of town and this is an area of the program that needs ideas and follow-up to ensure that garbage is not left out on Sunday nights.

Other program successes include:

- Displays at community fairs;
- Media releases to local newspapers and radio interviews;
- Development and delivery of Urban Deer brochure to City of Kimberley; and
- Creation of a Facebook group with 300 contacts.

The City of Kimberley has bylaws in place for attractant management and has incorporated wildlife mitigation measures in its planning documents such as Imagine Kimberley and the Official Community Plan.

In Cranbrook in 2011 wildlife education was shared with all of the students at T.M. Roberts, Amy Woodland, and Pinewood schools as well as other classes. This outreach was done through the Wild Voices for Kids program.

What is in the works for Wildlife Aware in 2012?

I am currently working on building and maintaining relationships with the cities in this region. Though the funding for this program is primarily to be focused on Kimberley and Cranbrook as a pilot project in the East Kootenay, the program is currently also reaching, to a limited extent, Invermere and Fernie.

I am anticipating conducting public workshops, school presentations, creating and distributing brochures, developing a website, use of social media tools, and frequent outreach in newspapers and radio.

I have asked for direction from several of the communities, committees, and Conservation Officers, and asked what projects we could collaborate on. I have only heard back from a few people so far and am looking forward to see what can be accomplished.

What would I like to see?

- Working collaboratively with bylaw enforcement officers, conservation officers, and concerned residents, increased compliance bylaws for wildlife attractants.
- Working with and educating city Bylaw Officers, planners, councils, and mayors to identify and develop necessary policy changes in order to minimize potential for human–wildlife conflicts.
- Working with the Provincial Wildlife Conflict Specialist with the Ministry of Environment, develop a WildSmart program.
- To fulfill recommendations of the urban deer committees' educational component.

Media releases have started, radio interviews conducted, the web site started and Facebook is up and running. This past weekend I was able to set up a display and information booth at a regional event. The open house at the Kootenay Trout Hatchery is a well-attended event that reaches a much wider audience that I have previously been able to reach.

I would like to conclude by saying that ideally this program would turn into a year round, full time program that would be available to answer question and provide a presence in the region and would extend through the entire East Kootenay. A long-term financial commitment would help ensure that the program thrives, and provides trained staff to meet the ongoing needs of the communities.

Reference

BC Ministry of Environment, 2010. British Columbia Urban Ungulate Conflict Analysis Summary Report for Municipalities, 64 pages. Available at: http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/UrbanUngulatesSummaryReportFINALJune21-2010.pdf

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14. Bear Aware mapping initiative

Frank Ritcey, Provincial Coordinator, Bear Aware, BC Conservation Foundation
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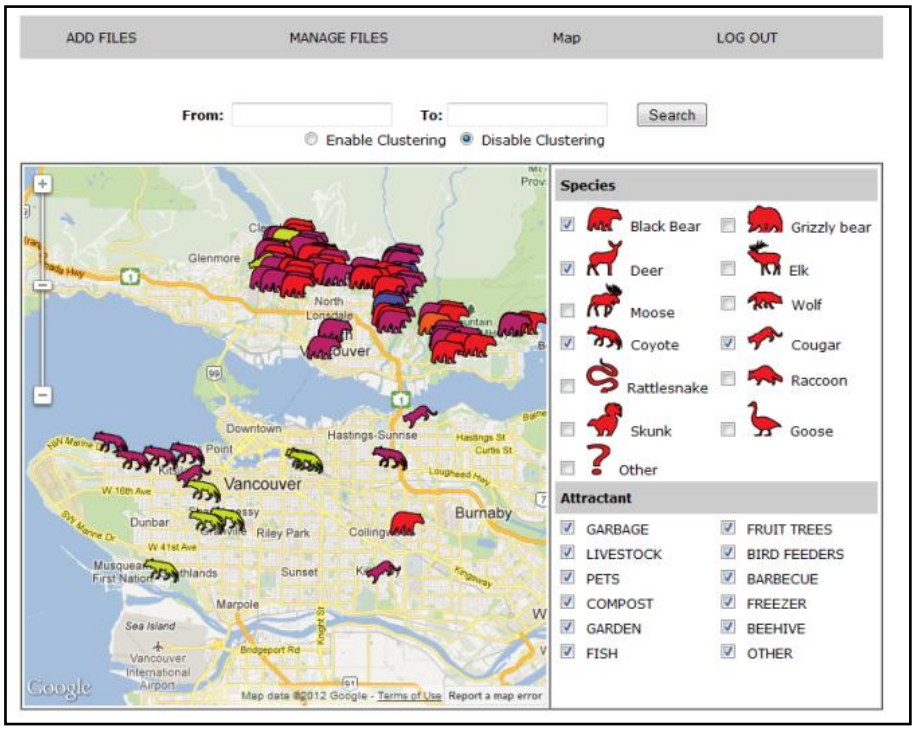
Frank's computer was struck by a virus, and he was unable to present his original presentation on "The perils and pitfalls associated with the use of social media". Instead, he talked about his latest internet initiative associated with mapping human–wildlife conflicts within the province of British Columbia.

Prior to this mapping initiative, the collection of data by the province for the purpose of dealing with Problem Wildlife Occurrence Reports (PWOR) was very efficient for meeting the operational needs of the Conservation Officer Service but was not so efficient in the dissemination of this data to the general public. This was understandable as that was not the reason behind the collection of the data in the first place.

Bear Aware also saw a use for this data. Various communities throughout the province had already created useful and very functional maps for their areas through the manual plotting of this data. This would not be an option for us, tackling the project on a provincial level. With over 25,000 PWORs recorded every year it would be a fulltime job just to plot the data.

Through the use of a programming process called geo-coding (which translates a physical address into a latitude and longitude) I was able to develop a program which could translate the existing PWOR database into a graphic representation of the pertinent data. The process of parsing the data into a format that was usable by the geo-coding portion of the program was not insignificant. My major challenge was to ensure that no confidential data was passed out to the mapping program. I handled this through a series of database filters that ensured only clean data was passed out to the mapping program itself.

The net result of these efforts can be seen at http://www.bearaware.bc.ca/bear-sightings-new . Through a relatively simple interface a user can choose to look at data concerning a variety of species and attractants. Clicking on the mapped icons yields even more information about the sighting (species, attractant, and date and time).



Example of a map from http://www.bearaware.bc.ca/bear-sightings-new .

The benefit from this map to our Bear Aware program is immense. We can show people where, when, and why bears are coming into their neighbourhood and, in turn, elicit a higher rate of compliance when asking them to manage their attractants. People can visit the site on their own—and when seeing that bears are in fact frequenting their neighbourhood they will be more apt to contact us to see what they can do to alleviate the problem.

However, the system will not be without its challenges. I distributed a survey amongst the participants at the conference and had them enumerate what they could see as being potential problems with having this type of data available to the general public.

The response to the survey was very strong – I had about a 50% return rate on the survey and have reviewed the comments to see what, if anything, I could do to avoid problems in the launch of this project. The primary concern was for the welfare of the animals and many respondents pointed out that how too much knowledge might actually exacerbate conflicts instead of mitigating them.

So instead of presenting all of the historical data and the data in real time I have opted for a more conservative roll-out of the mapping project on our website. I present data

for a one month period only and I have a week long delay in the data being placed on the site.

Photographers and people just wanting to get a look at a bear will realize that the lag time is such that there is no point in chasing down the latest sighting that is presented on the site. With only a month's worth of data, the representation of the number of bears in an area should be a little more realistic. For example, while there were over 2,000 bear sightings on the North Shore alone in 2011, it is obvious to most people that this is not the population of bears. However, on seeing 2,000 bear icons on the map, an uninformed visitor to the site might get the wrong impression.

I will roll out this mapping project in installments and listen to the feedback from the users, our community coordinators, the Conservation Officer Service, and the general public to ensure that we minimize and/or address any problems that arise from its deployment.

I should also like to express a great deal of gratitude to the Conservation Officer Service and Mike Badry in particular for their help and foresight in supporting this type of innovative process. Without their assistance this map would never exist.

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15. Changing human behaviour as part of wildlife management: Adopting a Community-Based Social Marketing (CBSM) approach

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"Wildlife management is primarily the management of people."
Aldo Leopold

Every year hundreds of bears are destroyed in British Columbia, because they are attracted to garbage and other unnatural food sources in densely populated neighbourhoods. 2011 was a record year for conflicts with wildlife. There were nearly 26,000 calls to the Victoria-based official hotline with regard to bears. For a number of reasons the overall tendency is toward an increased numbers of conflicts.

The 2010 and 2011 reports of the local Bear Aware Community Coordinator for Vancouver´s North Shore indicate that even after 15 years of education more than 80% of the annual conflicts with black bears are related to garbage. When conflicts arise, many residents voice concerns about both the loss of these iconic animals and about their own safety. However, education campaigns, bylaws, and enforcement have not been effective enough to change the behaviour of a substantial number of residents. The overall compliance rate at the North Shore stagnates at 70-80 percent despite increased efforts to educate people and raise awareness.

Reports from Conservation Officer Service (COS) indicate that the success of legal orders to change the behaviour of non-compliant residents is severely limited. A large number of offenders initially complied with a Dangerous Wildlife Protection Orders issued by COS. But within weeks after they were given the orders, they fell back into their old habits.

Most areas in the Fraser Valley had no such education program. Despite ongoing efforts of the COS to raise awareness about wildlife conflicts, their cause and prevention techniques have low success. The Fraser Valley records a growing population of people and black bears, and conflicts also show a steady increase. In the last years some municipalities (Mission, Hope) and volunteer groups (Bear Awareness Network for the Fraser Valley, Hope Mountain Black Bear Committee) have started to address the bear management issues and support COS in raising awareness.

A critical question is how can we foster and sustain behavioural change for non-compliant residents, irrespective of specific reasons such as low awareness, or limited success of education, bylaws, and enforcement?

After reviewing successful examples for behaviour change we found Community-Based Social Marketing (CBSM) to be a promising methodology. CBSM has proven to be very efficient in promoting behaviour change in environmental programs such as water and energy conservation. It is built on the insights that the connection between attitudes and behaviour of people is often weak, and that even economic self-interest often has little impact on their actual behaviour.

Community-Based Social Marketing (CBSM) basics

Among the lessons learned from the substantial international research on CBSM and other behavior change methods, one finds that programs are most effective when they focus on the community level; when a direct contact with the key groups is established; and when specific behavior change tools are applied that directly reflect the actual motivation and impediments that the audience perceives for the promoted behavior.

One key factor for the broad success of CBSM programs is that they are routinely working through a structured process with five steps to ensure efficiency. The five steps are to:

1. Select a specific behavior based on literature review and local conditions.
2. Identify what barriers and benefits for a selected behavior are relevant to the audience.
3. Develop a strategy that is customized to the audience´s barriers and benefits.
4. Test and evaluate the strategy in a pilot.
5. Implementation on a broad scale, upon proven efficiency in the pilot.

CBSM deals directly with the interests and perceptions of the target audience regarding benefits and barriers for the promoted behavior. CBSM identifies what matters to the audience and delivers on these findings. Through literature review, focus groups, and surveys CBSM analyzes which barriers deter the audience from the behavior and which benefits motivate the audience. Based upon the findings a custom-tailored communication strategy is developed.

Piloting the draft communication strategy allows the testing of variations of behavior change tools until the program is efficient. The strategy is not rolled out to the full area until the CBSM program certifies its efficiency.

Our considerations for the pilots

To test the effectiveness of the CBSM methodology we designed pilot programs for wildlife management. Our envisioned pilot regions for the CBSM programs are on Vancouver´s North Shore and in smaller communities in the Fraser Valley Regional District.

In a first step we analyzed existing scientific papers, grey literature, and media reports to select a non-divisible, end-state behaviour. We preferred a repeated behaviour over a one-time behaviour, as research indicates a better program success rate with repeated activities. To select a single behaviour for the program we compared the impact of various behaviour changes and the likelihood of their implementation. Based on this assessment we decided to focus on timely curbside placement of residential bins.

In the next step of the analysis we will involve residents in focus groups to uncover the perceived barriers and benefits of the audience in relation to our selected behaviour. Additional surveys will be conducted to validate the findings of the focus groups, obtain generalized information about perceptions, and identify a possible distinction of subgroups in the key audience. A simultaneous field observation will help us to determine the actual level of compliance/non-compliance with the selected behaviour.

Based on the results of the analysis we will design a communication strategy that is customized to the barriers and benefits that are relevant for our key audience. The communication might use a different frame than bear management if the audience is more receptive to other benefits, such as health implications or public safety.

According to the identified barriers we will select and combine various CBSM communication tools. The following table gives an overview of the specific application for the various tools.

Identified Barriers	Applicable Tools
People lack knowledge or are unaware	• Communication (education, information campaign, raising awareness) • Social diffusion
People forget to act	• Prompts
People have a lack of motivation	• Commitment • Social norms • Incentives
People face a lack of social pressure	• Social norms
People face structural barriers	• Convenience

Final comment

We welcome the exchange of ideas at the Urban Wildlife Conference and beyond and would be pleased to find other project areas that join our efforts to test and adopt CBSM for wildlife management.

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16. Considerations for mitigating human–moose conflict in moose habitats undergoing urban development.

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As cities expand, the resulting land development can encroach on existing wildlife habitat present in the adjacent, often undeveloped, land base. Land development activities have obvious and deleterious effects upon the wildlife species that occupy these areas, including landscape fragmentation, disruption of habitat connectivity, and reduction of biodiversity. Deer and moose, which often have established home ranges at the urban–rural interface (Whittaker et al. 2001, Lopez et al. 2004), are often significantly impacted.

Land clearing and subsequent development generally results in a mosaic of fragmented habitat. These greenbelt patches provide human transportation, recreational opportunities, floodplain protection, and wildlife habitat. Along with many other cities, the City of Prince George contains many greenbelts that serve as excellent shelter, foraging areas, and protect wildlife such as moose from predators (Garrett and Conway 1999). Although greenways provide a variety of services to the communities in which they are located, each user has a different set of needs and expectations which may conflict with other users.

We have:

- Surveyed Prince George residents about their perceptions of human–moose conflict and also to document when and where interactions between people and moose were occurring;
- Studied urban moose–vehicle collisions and documented existing moose-collision prevention initiatives in Prince George; and
- Examined recent urban residential developments which occurred in prime moose habitat.

We identified strategies that could be undertaken both pre- and post-land development to incorporate moose-friendly initiatives into urban development

planning, particularly in areas within municipal boundaries that are currently prime moose habitat but are scheduled for clearing and land development. We focused primarily on recommendations to reduce human–moose conflict that can be included in development planning and implemented prior to land development.

Community planning

The main planning document that governs municipal development is called the Official Community Plan (OCP). All other land use plans and decisions must be consistent with the OCP. The OCP provides the overall strategy for community development; sets priorities and objectives for land use; ensures consistency in land use decisions; and enables the framework for good development decisions to take place at the site level.

Neighbourhood Plans, which direct development closer to the site planning level, are the means by which objectives and strategies laid down in the OCP are integrated into "site level" plans. Neighbourhood Plans provide a clear and comprehensive land use vision for larger tracts of land (typically greater than 40 ha) regarding how an area may be developed. Neighbourhood Plans are policy documents intended to guide land use decisions over time, and strive to balance social, environmental, and economic factors.

In 2006, the BC Ministry of Environment published *Develop with Care*, which contained guidelines for urban and rural development in BC. *Develop with Care* recommends that OCPs include ecosystem and species protection guidelines to identify and protect large habitat reservoirs, wildlife corridors, and areas with environmentally valuable resources. *Develop with Care* further recommended that OCPs contain wildlife conflict guidelines assisting municipalities to identify potential wildlife conflicts when planning new developments and establish bylaws and policies that help reduce human–wildlife conflicts.

Prince George planning

The 2001 Prince George OCP contained three goals for management of the natural environment:

1. Support protection of the natural environment;
2. Provide long-term stewardship for important natural features; and,
3. Ensure significant wildlife habitat is not designated for urban development.

These goals did provide broad direction, but the 2001 Prince George OCP did not contain any other specific, practical guidelines or policies to reduce wildlife conflict.

In 2010, Prince George began the process of developing a new OCP, which passed its third reading at City Council on May 4, 2012. The City of Prince George Official Community Plan Bylaw No. 8383, 2011 (2011 Prince George OCP), contains objectives and policies that reflect the *Develop with Care* guidelines, including a specific objective to reduce the potential for human–animal interactions before they occur. Future Neighbourhood Plans, developed under the 2011 Prince George OCP, will have to, where appropriate, contain guidelines for moose-friendly initiatives in landscaping, fencing, greenbelt planning, and road layout.

Landscaping

The 2011 Prince George OCP objective to reduce the potential for animal–human interactions before they occur is supported by a policy that states the City should implement strategies to reduce human–moose conflicts such as developing moose friendly landscaping guidelines.

To implement this policy, a neighbourhood plan could contain recommendations such as "boulevard beautification and homeowner landscaping should not include planting of tree species that provide attractants for moose (for example red osier dogwood, mountain ash, or crabapple trees, among others)." Previously established Bear Aware guidelines already recommend removal of some of these types of trees if the fruit cannot be used and is proving an attractant for bears. Restricting the planting of trees attractive to moose is merely another kind of attractant management which is no more restrictive than bylaws which prohibit backyard beehives or backyard chickens.

Fencing

The 2011 Prince George OCP objective to reduce the potential for human–animal interactions before they occur is supported by a policy that states the City should implement strategies to reduce human–moose conflicts by identifying fencing opportunities to exclude moose.

Fences can be used to protect specific areas such as parks or school yards and areas known to be the source of moose trespass such as travel corridors, drainages, stream passages, and river banks. Further, the Neighbourhood Plan should include specific fencing guidelines for the height, style, location, and fence position upon the lot that

are required to ensure that fencing is appropriate in size and location to meet the 2011 Prince George OCP objective.

Greenbelt planning and trail characteristics

The 2011 Prince George OCP objective to reduce the potential for human–animal interactions before they occur is supported by a policy that states the City should implement strategies to reduce human–moose conflicts such as planning greenbelt locations and sizes to facilitate moose travel around neighbourhoods.

The scientific literature is clear that the connectivity and corridor linkages must be designed in such a way to facilitate wildlife movement into and out of urban areas (Snep et al. 2006, Forman 2009). However, simply setting aside riparian zones or areas unsuitable for building due to topographical or hydrological constraints is clearly not sufficient to provide effective connectivity.

One of the challenges associated with greenbelt planning is the perception that greenbelts can serve many purposes, such as wildlife refuges, wildlife travel corridors, floodplain protection, or as trail systems for walking or other recreational purposes. If greenways are to serve as human recreational areas as well as to provide wildlife travel corridors and diverse habitat, their design must accommodate both purposes. Moorman and Hess (2009) compared human preferences for wide trails with well-maintained shoulders, broad sightlines to address any perceived safety concerns, and minimal root intrusion under a paved path, to wildlife needs for complex vegetative structure and low amounts of impervious surface or bare earth. In an attempt to facilitate use by native wildlife and satisfy human recreational needs, they recommend wide (100 m+) forested corridors that are located in low-density development areas, contain a complex vegetative structure, and have unpaved trails and shoulders located near the edge of the greenbelt to avoid or minimize habitat fragmentation. Neighbourhood Plans should incorporate these recommendations where appropriate.

Road layout and design

The 2011 Prince George OCP objective to reduce the potential for human–animal interactions before they occur is supported by a policy that states the City should implement strategies to reduce human–moose conflicts such as designing road layouts to incorporate moose–vehicle collision mitigation features.
Reducing moose–vehicle collisions in urban environments has been discussed by Rea (2004), who recommended the formation of an adaptive moose–vehicle management

plan that included improved moose–vehicle collision data collection and placement of oversized, seasonal, and non-traditional moose warning signs in high collision areas indicated by the data. In order to minimize the number of moose present on or near urban roadways, moose-vehicle mitigation can be directed towards changing the behaviour of the driving public (signs, public awareness, speed reduction) or the behaviour of the moose (fences, wildlife crossings, roadside brushing, repellents).

The layout and design of the road infrastructure can be addressed at the Neighbourhood Plan level, by considering:

1. Provisions to maintain wildlife habitat connectivity;
2. Wildlife passage at bridge locations;
3. Road and right of way design to provide appropriate sightlines sufficient to spot moose on or adjacent to the road;
4. Inclusion of roadway lighting in high risk collision areas, and
5. The locations of any necessary roadside wildlife exclusion fencing and appropriate fence tie-off points or alternate crossing locations.

Post-development strategies

Managing human–moose conflict after the land development and subsequent building has occurred can be both proactive, to prevent or reduce contact between moose and people; or reactive, managing the moose after the conflict has occurred. Common areas of human–moose conflict that can occur after development has occurred were identified during our survey of Prince George residents as moose-vehicle collisions and negative interactions between moose and dogs.

Wildlife warning signage

One example of a recent moose–vehicle collision reduction strategy in Prince George is the use of oversized, seasonal, and non-traditional signs. These signs have been located along the road having the most moose vehicle collisions in the city. A moose-focused sign will be in place for the six winter months when the collision risk is the highest, and then switched for the more general wildlife warning sign during the rest of the year. Switching signs makes them more memorable and noticeable for drivers and increases their efficacy.

Signs are changed seasonally to make them more memorable and noticeable to drivers. Photos by G. Hesse, Wildlife Collision Prevention Program.

Note: The moose sign should be in place during winter months, and the general wildlife sign should be in place during the summer months.

Dog management

Many people are concerned about negative interactions between dogs and moose. Our survey of Prince George residents showed that these interactions often occurred when people were walking their dogs in the peri-urban areas surrounding more developed residential areas. Negative encounters have occurred when dogs have been both on- and off-leash. Restricting dogs from certain areas during calving or rutting season or during January to March in years of heavy tick infestation could be implemented by the city, in the same way and under the same authority as when the city posts signs that read "Do not enter – Bear in area". Information on preventing moose–dog interactions can be provided to the public at the time of dog license purchase or by signage at common dog-walking venues.

Summary

Using Official Community Plans and Neighbourhood Plans, municipalities can take steps to mitigate some of the factors that contribute to human–moose conflict before new subdivisions are developed. These planning documents can set out objectives, policies, and guidelines for landscaping, fencing, greenbelts, trails, and road layout and design so that the potential for negative human–moose conflicts is reduced. Municipalities must continue to be proactive after development as well, particularly in implementing moose–vehicle collision initiatives and the management of dogs in areas commonly frequented by moose. Generally, in order to reduce human–moose

conflict, municipalities need more deliberate management of attractants and dogs, consistent data collection on human–moose interactions, and increased public education on safe behaviours in moose habitat and around moose.

View the Prince George Official Community Plan at:
http://princegeorge.ca/citybusiness/longrangeplanning/officialcommunityplan/Pages/Default.aspx

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17.A community response to goose management

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Large populations of non-migratory Canada Geese contribute to heath, economic, and environmental issues affecting municipalities, parks, farmers, businesses, health agencies, and airport authorities, just to name a few.

The Capital Regional District, in partnership with municipalities, wildlife provincial authorities, Victoria Airport Authority, stakeholders and farmers in the Saanich Peninsula and Metchosin are developing a regional goose management strategy. This is a collaborative regional approach to examine, communicate, decide, and co-manage the issues.

The Working Group, consisting of representation from provincial, municipal, First Nations, environmental, agriculture, and a non-government agency meets regularly with public information and involvement. Over the next two years, a strategy will be developed which will identify key actions (individual and collective) to address the ongoing management of Canada Geese.

Keys to success of the program have been:

- Seed funding available to initiate the collaboration (preferably from outside of agencies in the group);
- One agency in a facilitator capacity;

- Political support but not management of the initiative;
- Need for ongoing public transparency;
- Engaging public/stakeholders in strategic but meaningful ways; and
- Consensus decision making model.

For details about this regional goose management strategy, visit:
http://www.crd.bc.ca/parks/gooseman-strategy.htm

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18. Management of southern sub-populations of Canada Geese in British Columbia: The biological and practical challenges of implementing appropriately- scaled management plans.

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The global population of Canada Geese (*Branta canadensis*) and the smaller, closely related Cackling Geese (*Branta hutchinsii*) together comprise 12 subspecies of geese (Banks et al. 2004) hereafter collectively referred to as Canada Geese. Prior to the 1960s, Canada Geese were considered migrants and summer visitants in British Columbia (Campbell et al. 1990). By the 1970s, however, their numbers had increased through natural adaptability and transplants of flightless young. Young from different taxonomic stocks across Canada were introduced to British Columbia with the aim of providing a sustainable population for sport harvest opportunities, and to introduce this Canadian iconic symbol to the west (Dawe and Stewart 2010). The adaptability of these geese was unforeseen, as was their change in migratory behaviour.

Most Canada Geese in western North America are migratory, but under mild winter conditions with abundant open water and readily available food sources, some geese have altered their migratory behaviour. This is largely because the transplanted young of the 1960s and 1970s did not have the opportunity to imprint on mature geese (i.e. parents) and did not learn migratory patterns. Therefore, these geese and their progeny remained in areas to which they were originally relocated. Many of these

progeny are in fact, taxonomically indistinguishable hybridizations of the different stocks of geese that were originally transplanted decades ago.

At the time of the relocations, the British Columbia landscape also changed. Urban and rural areas increased and many areas were closed to hunting. Consequently, increased habitat with fewer population controls assisted Canada Geese to become over-abundant in areas throughout the province.

Today, urban populations of Canada Geese are largely perceived as problem wildlife, due to their abundance, territorial behaviour during breeding season, crop damage, human health and safety, fouling of grassy areas with droppings, fecal coliform contamination of public swimming areas, damage to lawns and green spaces, and other economic losses (Smith et al. 2005). Urban Canada Geese can be found on land governed by various jurisdictions including federal, provincial, municipal, and private properties such as golf courses, schools, and agricultural lands.

Management

Canada Geese are protected under the *Federal Migratory Birds Convention Act* and pursuant *Migratory Bird Regulations*; thus any attempts to manage geese must abide by the *Act* and typically involve multiple levels of government. Environment Canada, the regulating body for Canada Geese, recommends the development of management plans for the following reasons (Environment Canada 2010):

- Improves implementation efficiency by coordinating activities;
- Improves ability to evaluate and adapt the program for quicker results;
- Supports relations with the public;
- Reduces administrative burden; and
- Helps to secure budgets for the management activities.

Very importantly, the development of a management plan demonstrates to Environment Canada that proposed management activities are well thought-out, and any permit applications associated with those activities may be reviewed more positively by Environment Canada.

In general, the development of management plans for southern sub-populations of urban Canada Geese must also consider the following:

- Goose sub-species are native to Canada, but the populations to which we are directing management are outside of their native range due to human intervention;

- The geese are no longer members of definitive taxa;
- Management is not directed to migratory geese that use historical flyways;
- Geese are residing year-round within urban boundaries where predation and hunting mortality is essentially nil;
- Geese are able to occupy a large land base—activities must be coordinated to prevent "Ping-Pong" management where geese move between jurisdictions, but are not effectively controlled;
- Characteristics of the problem are similar to managing invasive species;
- The general public is sensitive to management of visible, iconic, beautiful and social species; and
- Communities are responsible for the implementation and costs of management activities.

Case studies

Two regional goose management programs exist in British Columbia in different stages of development. These are the Okanagan Valley Goose Management Program which has been in operation since 2007, and the Capital Regional District Regional Canada Goose Management Strategy, which is still in a data collection phase.

Okanagan Valley Goose Management Program

The Okanagan Regional Goose Management Committee (ORGMC) originated in 1995. ORGMC was (and largely is still) comprised of representatives of local governments concerned with the rapidly growing Canada Goose population. Independently, each jurisdiction had been managing geese with varying success; however, these efforts were restricted to municipal lands, and the committee recognized that this was a regional, valley-wide issue that required coordinated management at a valley-wide scale. Motivation for management arose from the following conflicts:

- High fecal coliform counts in lakes and along beaches;
- High presence of fecal matter in parks and schools;
- Threats to public safety (e.g., airplane strikes); and
- Environmental degradation.

Together, these conflicts posed serious economic threats to a region that relies on tourism for much of its employment and revenue. In 2006 a Canada Goose Management Strategy and Action Plan for the Okanagan Valley was prepared, and

implementation began in 2007 with the development of the Okanagan Valley Goose Management Program.

Summary of what the Okanagan Valley Goose Management Program is doing successfully:

- Valley-wide program branding;
- Public education;
- Bylaws and enforcement (e.g., "don't feed the geese");
- Valley-wide humane population control through egg-addling;
- Hazing in targeted conflict areas at peak times (e.g., summer beaches), and
- Habitat modification.

Summary of current challenges in the Okanagan:

- Need more partners to ensure addling and habitat modification covers the whole valley; all goose sources are identified and monitored;
- Need increased hunting to directly reduce the population; and
- Need streamlining of permits and polices so it is not difficult for individuals to make informed decisions about goose management on private property.

Capital Regional District Regional Canada Goose Management Strategy

The Regional Canada Goose Management Strategy Committee formed in 2010. Similar to the Okanagan, the source of conflict comes from an over-abundance of Canada Geese, and some goose management has occurred in local jurisdictions with varying success. The Capital Regional District also experiences issues such as high fecal coliform counts at lakes and swimming beaches, and airport safety. However, the largest motivation for management in the Capital Regional District is the impact to farmers. Crop damage results in the loss of local food production. That, coupled with mitigation measures to control geese, is costing farmers hundreds of thousands of dollars each year across the region.

Summary of what the Regional Canada Goose Management Strategy Committee is doing successfully:

- Approaching the issue at a regional scale;
- Forming a multi-stakeholder committee with representatives from municipalities, Victoria International Airport, First Nations, Environment Canada, Ministry of Agricultural, Ministry of Environment, naturalists, and farmers;

- Collecting historical and current data on goose population abundance and habitat use; and
- Developing a regional strategy following a thorough data collection process.

Summary of current challenges:

- The development of a new program requires identification of funding sources and partnership support;
- Public consultation has yet to be developed (but will be as part of the strategy);
- Unlike the linear landscape of the Okanagan, the CRD has more variability and management recommendations will likely vary with landscape.

Upon completion of the regional strategy, and initial implementation, the program can be evaluated for improvements.

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19. The rabbit problem: University of Victoria story

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By 2009 the population of feral rabbits on the 400 acre campus of the University of Victoria had reached an estimated 2500 rabbits. These rabbits, the result of the release of unwanted pets, first appeared in the late 1980s. In 2007 the University realized it needed to take action to address growing health and safety concerns. By this time the public had grown quite fond of the cute bunnies, and the challenge was set to find a solution to the problem.

In British Columbia, feral European rabbits are classified as Schedule "C" Wildlife—as an invasive species, in the same category as grey squirrels and possums. As such, you can capture and kill rabbits at will, but permits are required to hold them or move them more than one kilometre.

The University issued a request for proposal to attract someone to conduct a pilot project on a specific area of campus that included our athletic fields.

The original project failed in that no one was prepared to go through the permitting process to establish a sanctuary to receive rabbits. Rabbits were trapped and sterilized but then had to be released back onto campus.

The University then produced a widely controversial "Rabbit Management Plan" and captured and humanely dispatched 102 rabbits from the athletic field complex to address growing safety concerns.

After this event, and following a brief court injunction which prevented the University from trapping rabbits, four individuals obtained permits to receive rabbits, and the necessary funds to sterilize them.

When all was said and done, 102 rabbits were killed, 902 were trapped, sterilized, and relocated to sanctuaries (some as far away as Texas), and the remaining population was removed by the large resident population of hawks, owls, eagles and osprey.

Through the entire process the University found itself besieged through the social media and by the news media from across Canada and around the world.

The University of Victoria has stated that it will manage its campus as "rabbit free". Since the end of the removal process, a handful of rabbits managed to find their way back onto campus from the surrounding neighbourhoods. Rabbits are now trapped by the University Grounds Department, and taken away by a private contractor to be humanely dispatched.

For more information about the management of feral rabbits at University of Victoria: http://communications.uvic.ca/rabbits/

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20. Wildlife corridor planning in a rapidly growing community: Town of Canmore

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Until the recent downturn, Canmore experienced rapid physical growth and development as a recreational property and tourism destination. Throughout the growth periods, Canmore has attempted to identify, delineate, and protect a series of habitat areas and connecting wildlife corridors to ensure that viable landscapes remain for both ungulates and carnivores in the Bow Valley. The community has long recognized the desire and need to protect spaces to ensure continued biodiversity, and to protect the landscapes which draw people to the community. The result has been an extensive system of protected areas in the community, linked to adjacent provincial and national parks. The existence of protected private lands within Canmore continues to distinguish us from almost all other communities in North America.

Our extensive experience in dealing with wildlife corridor issues has provided Canmore with a wealth of lessons learned regarding:

- What needs to be done and when for effective conservation?
- The interaction of environmental science with political science;
- Collaboration with private property owners;
- Collaboration with Provincial land managers;
- Dealing with human safety issues;
- Long term habitat, wildlife and human use management issues;
- Balancing wildfire prevention activities with conservation issues; and,
- Long term security of conservation areas.

Brief history of wildlife corridors in Canmore

The Town of Canmore first recognized the potential importance of wildlife corridors through the community in 1980s. The planning and protection of corridors on private lands within the town started formally in 1998. Canmore and the Bow Valley

represent one of the key north-south links in the international Yellowstone to Yukon (Y2Y) initiative.

Year	Canmore's actions on wildlife corridors	Population *denotes part-time population included
1980	Canmore's Municipal Development Plan recognizes corridors as conceptual, one-dimensional lines through the community	3,000
1988	Winter Olympics in Calgary & Canmore; no changes to recognition of corridors	4,400
1992	Provincial Natural Resource Conservation Board conducts resort development review hearings; concludes comprehensive corridor system required	6,600
1998	Canmore's updated Municipal Development Plan includes criteria for the design and establishment of wildlife corridors	11,300*
2002	Sustainable "recreation corridors" (trail network) designated to complement wildlife corridors	13,500*
2012	1998 criteria still applicable; corridor alignments essentially complete; legal protection still required for most. Managing & monitoring wildlife & human use phase.	18,300*

In the last five years, it has become increasingly apparent through a number of surveys conducted in the community, with visitors, permanent and non-permanent residents, that the existence of large areas of undeveloped lands that still hold value for wildlife remains the most significant reason that people come to community, both to live and visit. The preservation of habitat lands is seen as both preserving ecological integrity and viability, (scientifically the right thing to do) but also as an "economic resource" or amenity (consumed in situ). Preservation has therefore also become something of an economic development imperative; lose the environmental battle and you lose a significant economic development asset.

Lessons learned

1. Plan early – before development occurs on the ground

Identifying wildlife corridors well before development is proposed or significant recreational use occurs increases the likelihood for establishing effective corridors. This can be very challenging in the municipal framework in Alberta, as municipalities have no legislated mandate or legislative tools to protect corridors, and wildlife issues normally arise in response to a specific development proposal or human–wildlife encounters.

Conceptual wildlife corridors have been mapped in Canmore on a small scale since 1998. Subsequently, those corridor boundaries and alignments have (over time) been clarified and refined during the planning development review processes in response to a specific planning and development proposals.

This fine tuning of conceptual corridors requires cooperation with provincial departments, because wildlife is the province's mandate. Timing is essential since the collection of adequate data may take years and early identification of corridors assists both developers and the municipality. Where baseline data exists and has been collected, this greatly assists in the establishment of valid corridors.

The Peaks of Grassi (a 400 unit residential development approved in 1997) represents the "bad old days", and is illustrative of corridor designation post-planning approvals. It exists as an island of residential use in the middle of a major east-west wildlife corridor, and adjacent to a park and a habitat patch. No provisions were made for wildfire protection or for a separation of human activities from wildlife movement.

Wind Valley represents the ideal situation. This area has been recognized as a key wildlife movement area since the 1970s. In 2002 the province, the town, and developers in the area jointly completed a wildlife corridor study to align a corridor based on wildlife monitoring and topography, well before any development proposals were on the table. Although development approvals have not yet reached this area of the town, the expectation is that development areas will respect the corridor boundaries.

2. Use environmental science not political science

In order for wildlife corridors to be integrated into the municipal planning process, municipal politicians and the community as a whole must regard wildlife as an appropriate and valuable component of a community. Canmore articulated such a policy in its planning documents in 1998.

Like many planning municipal planning decisions, whether or not wildlife is important and how much protecting wildlife should be allowed to limit development is a value based, and therefore a political, decision since municipalities are not required (and often not legislatively enabled) to protect wildlife corridors. Few municipalities will have the money, staff, or desire to acquire the needed scientific information—particularly since they have no jurisdiction over wildlife.

Canmore has relied on various provincial studies and ongoing monitoring to establish general guidelines for corridors. In addition, developers are required to submit environmental impact statements to refine conceptual corridor alignments and to evaluate the potential impacts of proposed developments on those corridors. Canmore commissions third party professional reviews of these environmental impact statements.

However, in order for the establishment of wildlife corridors to have credibility in a community they must be seen to be based on the best available monitoring data and landscape analysis. An example of where did this not initially occur delayed one of Canmore's major resort developers for four years (known as Three Sisters Site 1) as the proposed corridors were initially based on "political" science.

In 1998 the developer proposed, and the province approved, wildlife corridors above undermined lands (Canmore has a history of coal mining), essentially designated land that could not be developed as corridors, regardless of its value to wildlife movements. In many areas the corridors also consisted of golf course fairways. At Canmore's initiative, collaborating with the province and the developer (albeit reluctantly) the proposed alignments were reviewed in 2002 by a wildlife biologist and major re-alignments occurred to reflect current scientific knowledge.

3. Protect perpetually

Wildlife corridors are intended to function in perpetuity. Communities are not used to planning on this timeframe. Wildfires, pine beetle infestations, plant succession,

growing recreation pressures, and changing societal values will all have impacts on these corridors over time.

Many levels of protection are available for wildlife corridors. Again, municipalities have a very limited range of legislative authority in applying the required protection. In Alberta, wildlife corridors cannot be acquired as an Environmental Reserve unless a land owner agrees and no permanent protection for corridors can be imposed on private land.

The greatest level of protection a municipality can legally impose is zoning. The Town of Canmore has a Wildland Conservation district that has been established to protect wildlife corridors. However, such a level of protection is far from "permanent" since any future municipal council can change the zoning at any time. The only requirement is that public hearings are held. Councils are not bound by any of the input provided from the public.

There are options including municipal acquisition of property (often prohibitively expensive for local, municipal taxpayers), or designation as provincial park, which likewise often draws claims for compensation.

Conservation easements with a third party participant such as the Nature Conservancy provide the most enduring protection for wildlife corridors on private lands. However, such easements must be negotiated in collaboration with the private land owner and therefore generally need to be part of a large-scale planning exercise (they cannot be mandated by a municipality). Early planning in this regard allows for such processes as density bonusing in other areas of a site in order to provide a developer with the required incentives to agree to such a scheme.

4. Manage human use.

So, in an ideal situation Canmore has a conservation easement on a wildlife corridor that protects the corridor in perpetuity from any development whatsoever, including perhaps trails and any human use other than random walking.

However, in Canmore there are 18,000 area residents, and over 1,000,000 Calgarians within an hour's drive, who regard this portion of the Bow Valley as a recreational activity destination for hiking, running, canoeing, dog walking, hang-gliding, and mountain biking (amongst other activities). Most of these potential recreationists must, at minimum, use or otherwise cross some of these established corridors to partake in their activities.

This recreational pressure is not going to go away. The pressures will likely increase both in numbers as southern Alberta grows, and in the types of activities that may evolve. This is another major challenge requiring long-term commitment to protect wildlife corridors "in perpetuity".

Although the Town of Canmore has no jurisdiction over wildlife management we have taken a number of actions during the past fifteen years that contribute indirectly to reducing conflict between people and wildlife. These include such actions as bear-proof garbage bins, prohibition of bird feeders in non-winter months, guidelines for landscaping to minimize attractants, and the removal of native attractants from residential areas.

Alberta provincial park and wildlife agencies, Canmore, WildSmart, and local recreation groups have all cooperated to initiate educational and monitoring projects through publications, interactive websites, and trailhead information sessions. Educational efforts are complicated by the fact that many users are from the Calgary area and therefore harder to reach. Ongoing cooperation between the Canmore, provincial wildlife agencies, volunteer groups, residents, visitors, and developers is critical as most trail activities start on town-owned lands and then enter provincial park lands.

Today, a comprehensive system of wildlife corridors is in place on paper with full protection; monitoring and management are the ongoing challenges. The presence of two of Canada's major east-west transportation corridors in addition to increasing recreation use and development pressures ensures that these challenges will only increase in the future.

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21. Data collection as a means of validating human–wildlife conflicts management decisions in the Town of Canmore

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Canmore is a town of 12,000 people situated one hour west of Calgary along the Front Ranges of the Rocky Mountains and bordered on three sides by the protected areas of Kananaskis Country and Banff National Park. It is a year round tourist destination that is home to wildlife including large carnivores such as black bears, grizzly bears, cougars, coyotes, and wolves. Many of these species have learned to adapt to human presence and intensive development. This leads to numerous human–wildlife interactions every year.

There have been a number of programs implemented in the Canmore area designed to reduce the number of negative interactions between people and wildlife. They include the creation of highway wildlife crossing structures, highway fencing, a wildlife corridor network, a bear-proof garbage collection system and community bylaws (i.e., birdfeeders, dogs on leash). Efforts to manage attractants, both natural and non-natural, continue in order to discourage wildlife from coming into residential areas. This includes the removal of natural vegetation attractants from developed sites and feral rabbit control, both designed, at least in part, to reduce wildlife activity within developed areas.

The challenge for many communities, including Canmore, has been to recognize what constitutes an actual "conflict" and its associated public safety concern and then implement strategies necessary to reduce the conflict. This is complicated by the diverse perception and emotional connections that the community has with wildlife. It is often difficult to reach consensus on the consequences to public safety of conflict as large carnivores travel through areas inhabited by humans. The ability to measure the effectiveness of conflict mitigation programs, supported by factual data, is critical to gaining the public support for their implementation. The Government of Alberta in conjunction with the Town of Canmore has compiled an extensive database that attempts to track the temporal and spatial characteristics of these incidents including

assessing the severity of these interactions relative to the species involved. Based on these factors, mitigation strategies can then be tailored to manage specific incidents.

These data evaluate the "conflict level" specific to the various carnivore species. These levels range from low to very high and are intended to reflect the potential public safety threat based on the animals' behaviour (e.g., close distance, charge, indifference, etc.), where the incident occurred (e.g., urban residential, trail, campground, etc.), the type of food attractant involved if applicable (e.g., garbage, domestic livestock, natural vegetation, etc.), and the human activity type (e.g., hiking, biking, camping, etc.) when the incident occurred. The classification of the conflict level will differ pending the species involved. For example, a coyote chasing a feral rabbit in Canmore would be classified at a lesser conflict level (moderate) than a grizzly bear killing an elk calf in a residential area (very high).

Upon reviewing these data for bears in Canmore, the majority of conflicts (almost 80%) are classified as low to moderate; bears are feeding on natural foods near developed areas. Conversely, 50% of the coyote conflicts were classified as high to very high and consisted of coyotes approaching people at close range. A similar pattern arises with cougars: 55% of incidents are high to very high and stem from cougars feeding on ungulate carcasses in residential areas and golf courses on the periphery of town.

In the case of grizzly bears, this information has enabled decision makers to identify where natural and unnatural attractants should be removed from urban areas. It has also highlighted the issue of coyotes hunting in Canmore, and the potential implications of having a food source, such as feral rabbits, in Canmore. A similar concern exists with the presence of ungulates within town limits and cougars preying on them adjacent to residential areas. This information has promoted discussions around removing rabbits from Canmore and the need to discourage the feeding of ungulates by residents, particularly in the winter when the majority of cougar incidents occur. In all of these cases, a quality database can be an additional tool to validate either the destruction of individual animals that have been involved in persistent high conflict incidents or, in the case of low conflict levels, using alternative mitigations such as education within the community to resolve the issue.

The ability to have reliable information to make decisions that affect both wildlife and people, is critical and can play a key role determining whether wildlife should be translocated, euthanized, or remain in the valley; all in the interest of reducing conflict between people and wildlife in urban areas while ensuring public safety and sustainable populations of large carnivores.

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22. How to engage communities in reducing human–wildlife conflict through community outreach and education

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The Bow Valley WildSmart Community program is a proactive conservation strategy that encourages efforts by communities to reduce negative human–wildlife interactions.

Our goal is to develop a coordinated approach to education and outreach programs and help support direct management activities that will aid in increasing public safety and enjoyment as well as contribute towards sustainable wildlife populations.

In June 2005 Canmore had a fatal grizzly attack in our community. This led to a need to bring all the agencies that manage wildlife together to create a strategy to reduce conflict between people and bears. The group quickly decided that we had multiple species to focus on related to conflict, including elk, coyote, cougars, grizzly, and black bears. WildSmart was chosen as the organization's name, and all these species are encompassed into the conservation strategy.

The following stakeholders came forward to create the coalition:

- Alberta Sustainable Resource Development
- Alberta Tourism, Parks, and Recreation
- The Association for Mountain Parks Protection and Enjoyment
- Bighorn Corridor Environment Committee
- Defenders of Wildlife
- Grizzly Bear Alliance
- Karelian Bear Shepherding Institute of Canada
- Municipal District of Bighorn
- Parks Canada
- The Biosphere Institute of the Bow Valley
- Three Sisters Mountain Village
- Town of Canmore

These stakeholders decided to leave their past issues with each other aside and sit down to work together to reduce conflict between people and wildlife. It was a very

inspiring thing to be a part of, and we are a demonstration to other communities living with wildlife that this kind of alliance is possible.

Early work of the coalition and community input showed there was need for:

- Transparency of government to provide more information on wildlife activity to the community;
- Multiple government agencies to work together;
- Education of the public about how to be safe around wildlife on the trails, and
- Understanding how to avoid attracting wildlife to the town sites.

Today I will briefly highlight a couple of our outreach programs that can be effective tools in reducing human–wildlife conflicts, and share our social media tools and how we use them to meet our mandate and raise funds for WildSmart.

In the winter we hold the **"How WildSmart are you?" speaker's series** to inform residents of recent wildlife research and issues. This provides us with the opportunity to engage long term and new residents about the challenges we face to coexist with wildlife. Between 100- 350 people attend these monthly events. We record all these presentations and then **podcast them on our website**. In only one month of having our first podcast online we had 219 people from the U.S and Canada tune in. Having a glass of wine at home and listening to a talk on coexisting with coyotes is the thing to do now on a Friday night. It also creates a great number of resources to share with the public when there is interest and or concerns on a specific topic. For example, if we were having an increase in coyote conflicts, we would post Shelley Alexander's talk on coexisting with coyotes on our Facebook and twitter feeds.

We provide **wildlife safety workshops**, including **bear safety and bear spray training** for the general public, recreation groups, child care professionals who take children outdoors, guides, and corporate partners. We have had between 100 to 400 people show up to our public workshops. The interest is so great that the bear spray company Counter Assault donated $8,000 worth of training canisters to help us provide these programs.

In 2012 we will be providing these workshops specifically to young families, and in multiple languages including French, Spanish, and Tagalog.

It is important to collect expired bear spray canisters so people are not on the trail with a product that does not work, and to stop people from disposing of expired cans improperly. We began working with the Town of Canmore's waste managers a few years ago to have expired bear spray round-ups twice a year along with the hazardous

waste round-ups. These round-ups see high turnouts of people. At the last round-up we had 185 cans returned. We also work with local retailers of bear spray to provide 10% off discount coupons to anyone who gives us their expired can. This has been really effective at getting them to purchase a new can right away. One of the retailers had over 50% of the coupons returned last year.

Through a Partnership Program with the Alberta Tourism, Parks, Recreation and Culture the **Wildlife Ambassador Program** was created. The Wildlife Ambassadors are a growing group of trained volunteers who rove trails throughout the Bow Valley and provide wildlife safety information to visitors and locals. They speak to thousands of people each year and we actually have a waiting list of people wanting to apply for the program. It is a great way to get outside, meet new people, and help be an ambassador for wildlife.

One of the best ways to get the attention of your community is to **get the interest of the media.** Over the years we have created some really solid relationships with local and national newspapers, televisions networks, magazines, and radio stations, from "Breakfast Television" to CBC's "The Home Stretch". We average one or more articles each week in a year. This year we have already had 30 media articles and anticipate an even greater interest in our messaging and programs with the connection of Twitter and Facebook. We spend a lot less time chasing the media as we have become known to them and they follow us through social media and we receive calls based on this communication tool.

Our website www.wildsmart.ca has many resources including an online newsletter, information on bear, cougar, elk safety, social media tools, and resources. Last year we had almost 16,000 visits to the site and 41,000 page views. This is also where the Alberta Government houses the bear and wildlife report. We have over 700 subscribers and an open rate that is 14% higher than the industry standard. This tool creates a greater level of transparency for government to the community and is a great way to keep bear activity on the minds of recreational users and residents.

Our Twitter account is used to send out timely messages of wildlife closures, warnings, and our bear report. Additionally we use it to post upcoming events, volunteer opportunities and announce sponsorships. Many of our followers will re-tweet the bear and cougar warnings and closures, which increases the amount of awareness immensely.

We have multiple **wildlife biologists that go out hiking and tracking** every few days and we post any signs of wildlife from them on Twitter as well, such as cougar tracks.

WildSmart YouTube is a great tool for getting people to your website to learn more and a great project idea to engage youth in creating video projects on wildlife issues. It is a resource that people enjoy, will share with friends on Facebook and a great venue to share your wildlife safety messaging. When our birdfeeder bylaw comes into effect each year, it is great to share a video of a bear eating bird feed as an example of why we need to put the bird feeders away. Sometimes we post funny videos like a bear rubbing a tree, to just create interest in an upcoming event like our speaker series on bear rub trees.

We started using **Facebook** very minimally back in 2009. We created a Facebook person, page, and group. These were options at the time. Now Facebook recommends that organizations use a page. We found our Facebook person got the most interest and worked best.

It is important to know what you want to use Facebook for, and know who you want to reach. Have a strategy, make it a priority, be timely and interesting, and dedicate staff to it. Be clear within your organization about who posts and create a policy about what can be posted by your organization and by the public. We have a very clear set of guidelines for the public as to what can be posted and our right to remove material. You can find this under notes on our Facebook page.

We choose to let the public have full access to post comments. Very few posts ever have to be managed and those that are deleted we call or email to explain.

We love our Facebook and have been amazed at how successful it has been at engaging the public. Up to 26% of our website visits in a month come from a Facebook reference, which means those that read our posts also go to the links we refer them to on our website.

Here are a few reasons to love Facebook as a communication tool and fundraising strategy.

- Share wildlife activity, bear closures, warnings
- Share online resources, link to website resource such as podcasts, bear reports, YouTube, upcoming workshops, volunteer opportunities
- Increase awareness of who you are, what you do.

- Share photos, statistics
- Recognize sponsors.
- Gain sponsorship, make people aware of your charitable needs
- Opportunity to correct information, dispel myths, add context to issue, perspective, resources
- Create a place for discussion on human–wildlife conflict issues
- Share media articles about your group
- Source for the public to post questions and get answers.

In 2011 we provided programs for 9,800 people with one full time staff person, 30 volunteers, and a community that cares about wildlife and understands the importance of creating safe communities for both people and wildlife. On behalf of WildSmart staff, our Advisory Committee and the wildlife that call the Bow Valley home, we would like to thank our sponsors, volunteers and community for staying engaged and committed to our programs over the past six years.

If you would like to learn more about Bow Valley WildSmart programs, go to http://www.wildsmart.ca/

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Posters

1. The Provincial Agriculture Zone Wildlife Program in the Kootenay Boundary Region

Donna Thornton, BC Ministry of Forests, Lands and Natural Resource Operations
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The "Provincial Agriculture Zone Wildlife Program" (PAZWP) was developed in 2009 by the British Columbia government to accommodate the special objectives in British Columbia's agricultural zones and provide special opportunities for hunters. PAZWP helps coordinate crop damage prevention, mitigation, and compensation strategies for damage done by certain species of wildlife. Special hunt zones had already been delineated due to concerns with elk depredation on agricultural crops, rangeland condition and/or forage availability on important winter range for wild ungulates. By 2011, PAZWP was a program delivered in those regions of the Ministry of Forests, Lands and Natural Resource Operations that had significant agricultural initiatives.

In the Kootenay Boundary Region, the Ministry of Forests, Lands and Natural Resource Operations' Agriculture Wildlife Specialist, the local Ministry of Agriculture's Resource Stewardship Agrologist, and regional wildlife biologists had worked together successfully to liberalize hunting regulations in the special hunt zones, helping to move elk off farmed fields. PAZWP-KBR also hosts bi-annual Regional Agriculture Wildlife Committee meetings as a forum to discuss current topics, encourage private land stewardship and biodiversity conservation.

For more information visit:
http://www.env.gov.bc.ca/kootenay/wld/pazwp.html

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2. *Evaluating East Kootenay elk use on private land under hunting pressure*

Donna Thornton, BC Ministry of Forests, Lands and Natural Resource Operations, donna.thornton@gov.bc.ca
Becky Phillips, BC Ministry of Forests, Lands and Natural Resource Operations, becky.phillips@gov.bc.ca

In 2011, the Provincial Agriculture Zone Wildlife Program in the Kootenay Boundary Region applied for British Columbia Agricultural Research & Development Corporation funding to conduct further study on the elk telemetry data that had been collected in the East Kootenays by Wildlife Branch biologist Tara Szkorupa and Becky Phillips. The main objectives were to demonstrate how non-migratory elk were using private land in the Special Hunt Zone X of Wildlife Management Unit 4-03 (4-03 Zone X) and if the type of hunting season from 2007 to 2009 had any impact on that use. Ancillary correlations may also be possible to the amounts of Agriculture Wildlife Program compensation payments, as well as to locations of Ecosystem Restoration projects. As our sample size of collared elk is small, the statistical rigor will be low and generalizations may not be possible. Recommendations for further work will be proposed.

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3. *Saving those on the not-so-cute side of the ledger*

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Many challenges face those that attempt to protect wildlife in the urban wildlife landscape. These challenges are multiplied many-fold when the object of your attempts at preservation happens to be an animal that falls on the “not-so-cute” side of the ledger. Ecto-therms routinely get lumped in with cold-blooded killers and attempts at their preservation get short-shrift especially if there is a wide-eyed mammal competing for the same preservation dollars. I shall explore the state of popular literature and perception of our legless reptiles and explain how that directly affects the challenges faced by those of us acting as their un-official champions.

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4. *Challenges of wildlife utilizing roadways: Investigating amphibian road occurrence and road mortality mitigation within the south Okanagan, British Columbia*

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Wildlife road mortality challenges arise when increased traffic volume and road expansion coincide with migration movement corridors. Amphibians are vulnerable to road effects in their annual movements from upland overwintering habitat to lowland breeding areas. Within British Columbia's south Okanagan valley there is particular concern for road-impacted populations of the COSEWIC-listed blotched tiger salamander (*Ambystoma mavortium melanostictum*) and Great Basin spadefoot (*Spea intermontana*). Our study assesses amphibian movement and population threats across this highway-bisected landscape. During spring and summer 2010 and 2011, fifty kilometers of roadways (including 33 km of highway) were repeatedly surveyed within the south Okanagan valley. Surveys were carried out using vehicles, bicycles, and on foot. Survey efforts were concentrated within a three kilometer highway expansion zone adjacent to a floodplain. Here, a four-lane highway was constructed parallel to the original two-lane highway, creating a six lane obstacle for migration and dispersal. Amphibian road occurrence data and landscape variables from our 2010 field season represent pre-highway expansion road activity (232 survey hours recorded 1385 mortalities from 2022 amphibian road occurrences). Four species of amphibians were found on the roads surveyed: Pacific tree frog (*Pseudacris regilla*); Western toad (*Anaxyrus boreas*); plus the aforementioned blotched tiger salamander and Great Basin spadefoot.

Road mortality mitigation plans were incorporated through strategic culvert placement and enhancement, combined with drift fencing to guide wildlife beneath the roadway. Continued research on post-construction roadway effects on amphibians, monitored use of culverts through camera traps, priority wetland surveys, and species movement data commenced in 2011 with the passing lanes in use. In 2011, 708 mortalities were recorded from 1592 amphibian road occurrences, over 264 survey hours. Field research will continue throughout the spring and summer of 2012 to capture the use and effectiveness of the finalized enhanced crossing structures and fencing during migration movement periods.

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5. Kimberley Wildlife Aware

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Wildlife Aware has been created to provide urban and rural/urban communities with tools and knowledge to effectively coexist with wildlife and minimize human–wildlife conflicts.

The goal is to increase community awareness about ways to coexist with wildlife through the development of a public education program including workshops, school presentations, online outreach tools, landowner contact, and brochures. This program also aims to facilitate inter-agency collaboration between regional governments, communities, and residents by incorporating wildlife conflict reduction measures into community plans.

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6. Kimberley Bear Aware

Shaunna McInnis, Kimberly Bear Aware Coordinator, Kimberley BC
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Bear Aware is a community education program operated by the British Columbia Conservation Foundation. Bear Aware's mission statement is "to reduce conflict between people and bears through education, communication, and innovation". Kimberley Bear Aware achieves its objective when bears that enter the City of Kimberley leave without foraging or lingering in town. The Bear Aware Community

Coordinator and Bear Aware volunteers work with government, community groups, schools, and local businesses to reduce available in-town bear attractants. Reducing the availability of bear attractants greatly decreases the number of habituated bears and bears conditioned to human food in our communities.

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7. Resident coyotes in the City of Calgary, Alberta: Functional connectivity of urban natural spaces

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Urbanization is a growing global phenomenon that tends to generate mosaics of fragmented habitats from natural continuous landscapes. Among the effects of most concern are habitat and species biodiversity loss. There are few resilient species, such as coyotes, that have the ecological and behavioural plasticity to adapt to the rapid alteration of habitat associated with urbanization. Coyotes coexist with people in urban environments by selecting natural habitat patches and corridors between resource patches to minimize exposure to humans. Connectivity has received increasing attention due to its potential to conserve fragmented and urbanizing landscapes. It is a measure that in graph theory describes the accessibility of a habitat patch (a node) based on several landscape-based interactions.

This study aims to assess urban landscape functional connectivity for coyotes. A resource selection function (RSF) model will be used to identify coyote habitat selection within the city from GPS location data. Ten residential adult coyotes will be collared with GPS collars (Lince model, Microsensory, Inc. Spain) in 5-10 city parks in the spring of 2012 with juveniles equipped with UHF transmitters.

The following layers will be used as predictor variables: *habitat* - land cover/use, distance to natural cover, distance to water; *terrain* - slope, elevation; and *human use* - human population density, road density, fencing density, traffic volume. The inverse RSF will then be used as a cost–movement raster for a patch-based graph theoretical analysis of coyote functional connectivity using the Conefor Sensinode software package. The land cover map will be generated from 2010 LANDSAT imagery and

classified into seven land cover classes: urban land, water, agriculture, deciduous vegetation, coniferous forest, cleared ground, wetland, and grassland. The graph theoretical connectivity model will then be validated using GPS telemetry data to identify actual movement corridors.

This work will provide pivotal data to develop models of human–coyote conflict and coyote pathogen transmission risk. Identifying landscape functional connectivity among natural areas and corridors for coyote movements are also important stepping-stones for the City of Calgary to develop more advanced management actions to face the challenges urbanization brings at the interface between wildlife and humans.

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8. *Managing for human-facilitated wildlife invasions: Lessons from an adaptive management program for introduced frogs in the South Okanagan Valley, BC*

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Human facilitated wildlife invasions have detrimental social, economic, and environmental repercussions. Multiple anuran species have become globally invasive because of their popularity as pets or for human food consumption. Introduced anurans outcompete, predate upon, and transmit disease to native amphibians. This research is focused on the globally invasive American Bullfrog (*Lithobates catesbeiana*). A popular food item, American Bullfrogs were incidentally introduced into the South Okanagan in the 1950s, and have since been detected in five wetlands. We developed a three-tiered, adaptive management system in response to the bullfrog

threat. The first management tier is physical removal of, and active monitoring for, bullfrogs of all stages. Removal has resulted in significant reduction in bullfrog detections from a high of 73 adults and/or juveniles in 2005, to 4 adults and/or juveniles in 2010.

The second management tier assesses risk levels for future colonization or recolonization post-removal. Maximum entropy habitat suitability modeling in conjunction with effort analysis will determine the proportion of wetlands vulnerable to recolonization post-removal, and how much human and financial resources are required for continual population suppression. Habitat suitability modeling has shown permanent, stagnant wetlands surrounded by agriculture to be at highest risk for bullfrog invasion.

The third management tier incorporates stakeholder awareness and education to facilitate monitoring of bullfrog populations. We distributed surveys to 4 stakeholder groups to measure each group's level of knowledge of bullfrog presence, identification, and reporting. We targeted:

1) grade-school teachers,
2) landowners adjacent to at-risk or infected wetlands,
3) businesses that may act as vectors, and
4) the general public who recreationally use infected or at-risk bullfrog locations.

Response rates were highest when surveys were distributed in person, versus mail-outs. The majority of all surveyed groups were aware of bullfrog presence; however, 50 % of landowners, 84 % of vector businesses, 50 % of teachers, and 91 % of the general public were not confident with identifying and/or reporting bullfrogs. The survey results indicate that the general public and vector businesses are greater at-risk stakeholders than teachers and landowners, and education programs need to focus on bullfrog identification and reporting avenues.

Not only has the information gained from this project provided information specific to bullfrog management, we have learned valuable lessons in engaging the public in human-facilitated wildlife issues. Citizens are more receptive if information is presented in an interactive, personable manner, and information must constantly be reiterated to ensure wildlife invasion issues are kept at the front of citizens' minds. Single, passive information sessions are inadequate in engaging citizens in long-term conservation.

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9. *Management of resident Canada Geese and restoration of degraded estuaries on eastern Vancouver Island*

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Estuaries along eastern Vancouver Island are experiencing significant habitat degradation due to overgrazing and grubbing of sedge beds by over-abundant resident Canada Geese (CAGO). Two such estuaries in central Vancouver Island are currently under study and action by the Guardians of Mid-Island Estuaries Society: the Englishman River estuary and the Little Qualicum River estuary. The impact of resident CAGO on these estuaries is great enough to have reduced biological productivity and has even affected the physical structure of the estuaries. Long-term photo-documentation (1970s to present) has shown the denuding of previously vegetated areas and widening of channels. In the Little Qualicum River estuary alone, an estimated 17-18 metric tons (dry weight) of sedge biomass annual input has been lost, with certain, but not quantified, negative consequences on productivity of invertebrates, wildlife, and fish (e.g., juvenile salmonids). At the present time, restoration of degraded estuary habitat would be senseless without a well-structured plan to deal with the source of the degradation. To this end, Guardians of Mid-Island Estuaries Society has been working towards the development of a resident CAGO management plan to reduce current resident CAGO populations and to maintain them at a level that would allow restoration of sedge communities. Restoration efforts are planned after resident CAGO populations that use the estuaries decline sufficiently.

The project's objectives are:

1. To improve knowledge around the behaviour and movement of local populations of resident CAGO by use of a mark–re-sight program with neck-collared geese;
2. To increase primary productivity in the degraded areas of the estuaries through the use of physical exclosures around degraded and sensitive areas;
3. To increase cooperation between parties impacted by resident CAGO through the establishment of a resident CAGO working group involving impacted landowners, businesses, and municipal government;
4. To increase local support for the project and improve cooperation efforts with impacted parties through presentations to local groups and distribution of informational brochures;
5. To reduce current resident CAGO population levels by increasing hunting opportunities through higher early season bag limits that target resident geese, coordination with farmers experiencing high numbers of geese in their fields to

open their lands to hunting, and the opening of hunting closure areas within municipalities; and
6. To limit CAGO production on the two estuaries through a yearly egg addling program.

Conference participants viewed a short video about this project.

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10.Rethinking beaver management to reduce conflicts and costs

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Managing human–beaver conflicts can be expensive and time-consuming, thereby compromising other initiatives needing attention and funds. Removal of beaver-created wetlands also compromises current goals to reduce wetland loss and restore aquatic ecosystems. Traditionally, beaver management involves removal of dams and often the beaver colony itself. However, this approach can result in the loss of critical habitat for many other species, and the inevitable recolonization of the site by other beavers. In the Cooking Lake–Blackfoot Provincial Recreation Area in east-central Alberta, we are testing alternative approaches such as pond levelers and culvert fences with the goal of maintaining valuable aquatic ecosystems, beaver populations, and park facilities. Our objectives are to quantify conflict occurrences, determine cost-effectiveness of management actions, and assess biodiversity in ponds receiving various forms of management.

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11. Wildlife record keeping at western Canadian regional airports: Implications for risk assessments

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Aircraft collisions with wildlife, primarily birds, result in substantial personal and economic losses in Canada and throughout the world. As part of a larger online survey, we collected survey data from 16 regional airports in British Columbia, Alberta, and Saskatchewan to document the use of Airport Wildlife Management Plans (AWMPs) and wildlife strike and sighting record keeping systems. Eighty-one percent of airports had an AWMP and strike records were kept at 94% of airports, however despite the legislative requirements, only 19% of airports recorded all bird sightings and only 25% recorded all animal sightings on their airport lands. Out of the 12 responding airports, 25% used strikes, near misses, and sightings data as factors in risk assessment; 25% used the data in their data bases; and 25% used the data to develop management plans. Only three percent of airports used strike records to evaluate the success of countermeasure implementation, with 33% using staff or pilot reports and 57% using experience. Airports that are not recording data on wildlife movements and habitat use patterns on and near airport properties will not have the necessary information to accurately conduct a risk analysis of wildlife hazards. More education, funding, and enforcement may be required not only to collect, but use these data for countermeasure implementation. Testing the effectiveness of countermeasures that improve aircraft and human safety through research and record keeping is a critical component of countermeasure evaluation that we found was lacking. Such testing must be conducted so that countermeasure costs can be evaluated, due diligence demonstrated, and effective tools advertised and adopted broadly.

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12.Sumas Mountain Environmental Management Plan

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The Sumas Mountain Environmental Management Strategy will recognize the need to balance growth with the protection of important natural areas, ecological values, and ecological services. The strategy will ultimately be designed to provide decision tools to meet results-based management objectives for sensitive and important habitats on Sumas Mountain. An approach unique to the values and sensitivities of Sumas Mountain will integrate accepted standard methodologies with similar approaches to habitat analyses used regionally and will facilitate municipal land use decisions to promote multiple environmental, economic, and social benefits. The approach will be to use land use and environmental baseline data to classify the existing landscape into broad vegetation types, riparian, wildlife movement corridors, important wildlife habitats, environmentally sensitive areas, exposed/impervious surfaces, etc., that demonstrate valued ecosystem components. The plan will also include implementation through developer incentives to maintain green spaces and natural capital.

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13.Coquitlam's journey to coexist with wildlife

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Coquitlam is very fast growing community of 126,000 residents with new residents coming from all over the world. Coquitlam is bordered by mountains and rivers and home to a very diverse population of wildlife. On average seven bears a year are destroyed by Conservation Officers when bears come into the community looking for easy food. One resident was seriously injured by a black bear in 2007. Coquitlam has been involved with the BCCF's Bear Aware program for eight8 seasons and has recently created a new full time position of Urban Wildlife Co-ordinator to help educate residents about living with all species from squirrels to bears. The education is not only directed at residents but at businesses, schools, planners, and developers. Our poster showed the steps Coquitlam has made to reduce conflicts between people and wildlife.

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14. Long-term fluctuations of avian biodiversity in urban woodlots: Replacement or loss

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Small forested woodlots found within urban landscapes represent possible refugia or simply population sinks for many forest specific species. However, generalist species are considered a stronger competitor in highly fragmented forests and may replace forest-interior specialists where encroaching urban centres surround small woodlots and urban parkland. In addition, there is evidence that some urban bird species are also experiencing population declines for a number of reasons such as the concentration of urban forest predators (e.g., domestic cat). Does this trend signify a general decline in urban avian forest biodiversity as opposed to the replacement of forest-specialists by urban generalists?

To better understand these questions and concerns, bird-monitoring data collected in the Greater Toronto Area during the years 2002-2011 was used to measure trends in urban bird populations. The analysis had three components:

1. A comparison of broad diversity trends throughout the watershed to the urban forest sites;
2. A comparison of the biodiversity trends in urban, generalist species to forest-interior species; and
3. An assessment of the contribution of land variables at the landscape and site level.

Thirty monitoring sites were established across the Credit River watershed, a mixture of agricultural, park, and urban land use. The specific sites used in this study were found in the lower watershed and represent landscapes of contiguous forest, urban fringe, and urban woodlots and parkland. The urban forests include small woodlots, ravine parkland and several sites recently engulfed by subdivisions. Results indicate there is a general increase in woodlot biodiversity across the watershed. In the urban woodlots this trend is not as evident; isolated, smaller woodlots showed declines in

biodiversity while those in the urban fringe were increasing. The ratios of specific avian guilds indicate that generalist species are the dominant birds in the urban core while forest-interior birds have a greater presence in the rural, contiguous forests. These patterns can be linked to variations in surrounding landscape patterns and site-level stressors. Long-term monitoring has improved the knowledge of biodiversity for this urban region but illustrates that a number of factors have to be considered when developing management strategies that improve urban woodlots for avian biodiversity.

Rob Milne is preparing a paper on this project. Please contact him for more information (rmilne@wlu.ca).

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15. Development of a wildlife hotline resource manual: Toward a model of community education.

Erin Luther, Toronto Wildlife Centre, Toronto ON
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Recognizing southern Ontario's need for a specialized public education resource, Toronto Wildlife Centre (TWC) began operating a full-time wildlife hotline in 1997, staffed independently of our wildlife hospital and rehabilitation centre. With staff trained in conflict resolution, community education, and well-versed in natural history, TWC's wildlife hotline grew exponentially in the following decade, responding to requests for help from community members as well as local animal services, humane societies, police, non-profit rescue groups, vet clinics and other community businesses. TWC's wildlife hotline now receives approximately 30,000 calls per year and is considered a leader in the wildlife education field in North America.

Despite this success, TWC continued to face three primary challenges in prevention and mitigation of wildlife conflicts and emergencies via a telephone service:

1. Insufficient resources to meet the ever-growing demand for service;
2. Staffing difficulties due to long training period necessary to respond to the diversity of wildlife calls
3. Inconsistent and incorrect information being delivered by other organizations responding to the same types of calls.

To address these challenges, TWC created and published a first-of-its-kind wildlife hotline manual, both for internal training purposes and to distribute to other organizations offering formal or informal wildlife hotline services. Released in 2010, this 500 page resource is now being used as a training tool in a number of Ontario organizations (as well as many others across North America). Offered in conjunction with training workshops, the hotline manual continues to move TWC closer to our goal of facilitating high quality intra-organizational wildlife education services for Toronto communities.

To read about this 500 page manual, view the table of contents, and order a copy:
http://torontowildlifecentre.com/hotline_manual

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16. Herding deer and elk with dogs

This table top display was prepared by John Zehnder and Chris Jobe.
(no abstract provided)

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17. Demonstration of herding geese

Chris Jobe, Canine Solutions, Cypress County, AB
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Chris and her sheepdogs have conducted a program to herd deer out of Waterton Lake townsite. We viewed a short video of her dogs doing in action at Waterton. At noon on the second day of our conference, Chris and her dog Fly gave us a demonstration of herding geese around the parking lot beside the Rocky Mountain Prestige Inn.

For more information about Canine Solutions and to view Chris's videos, visit:
http://www.caninesolutions.ca/

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Summary of conference evaluation forms

Of the 100 evaluation forms distributed to the participants, 41 were returned. Not all participants responded to every question.

1. How well did the conference meet your expectations?

1 Person added the category "exceeded"
26 People said fully met
13 People said mostly met
0 People said met only a few
0 People said did not meet any.

2. Do you have any general comments about the conference?

- I thought the range of speakers and attendees was a great mix and added to the discussions. Some topics were sensitive but all discussions were rational.
- Great breadth of speakers and attendees
- Fantastic collection of speakers and topics. So many species have similar issues.
- Fantastic people, information, talks, organization. Thanks for a wonderful opportunity to learn, share knowledge, and network!
- Well organized, excellent venue, relevant talks. Good amount of time for chatting with others. Would attend again. I liked that the poster authors had to introduce themselves and give a brief summary of their work. Excellent evening speaker and great that it was open to the public free of charge. I also liked the roundup of ideas at the end.
- Good location, good food and break service, interesting speakers.
- Good variety
- Well organized
- Well organized, excellent suite of topics
- Well organized, good venue, excellent choice of speakers
- Great diversity of subjects, good job staying on track and on time
- Very informative! I liked how you grouped the talks and introduced the poster presenters. Good variety of talks.
- Very well done, well organized and a great line up of speakers

- General intro at the beginning could have been more formal. Where were the safety exits, etc.? Jackie didn't get introduced until half way through the first day. Introduction of Mike Badry – I know who he is, but does everyone else?
- As with the last one that I attended, the format, content, and speakers were excellent. Great job, organizers.
- I liked the grouping of speakers, the 15 minute time limits, and coordinated Q&A at the end of each segment. Well done!
- Very well done, great speakers & information exchange, smooth transition, great relaxed feel.
- Well done
- A good mix of topics, presenters and geographics represented.
- Actually even exceeded my expectations. Good job!
- Timely, good presentations
- More solutions would have been helpful
- Excellent information provided, I learned a lot. I thought that the registration fee was too high for many people who wanted to attend to learn however couldn't afford the fee.
- Overall really well done. Screen could be higher. Maybe for question time after a session, have all the speakers come to the middle; they tended to talk to themselves in the corner.
- Make sure sound system works well.
- Excellent speakers and information. Really liked the flow and format. Enjoyed that poster presenters were introduced. Very good networking opportunities. Would have preferred a 9 or 9:30 a.m. start if coming from Pacific Time Zone.
- Overall great, good talks.
- Wanted a mixer activity at lunch or breaks, some activity to facilitate networking.
- Good speakers, interesting breadth. Would also be good to look at strategies that have been used outside of BC, get expertise from other provinces and countries.
- Well organized, great pace, nice variety of speakers and topics.
- Wasn't overly happy with the setup, would like to have had tables instead of a chair to sit at. Sound system poor for such a nice hotel. Was disappointed to have no speakers on cougars. Food was good and thanks for coffee and snacks. Good central location for western Canada. Good conference.
- Well done. Maybe offer additional specific topic related breakout sessions for people to sign up for. This would create an opportunity for more networking and idea sharing.

- Great organization, good food, great talks, lots of input from around the province, need one more day of talks next time or a second room going.
- A little too much on deer management as opposed to other species such as bullfrogs (and others). Definitely need more time for poster session.
- Conference presentations were quick and informative. Conference moved along very well.
- Venue was cold. Broader keynote address. Consider more/longer panel discussion.
- Conference room was cold. Conference workers and staff very friendly and accommodating
- A more diverse species of wildlife should have been included, i.e. heavy focus on bears and deer.
- More tools for how to manage people. Longer talk on Community Based Social Marketing. More time for dialogue and brainstorming session, for which we would need round tables.

3. What were the most interesting things you learned at this conference?

- I was focused on ungulate/urban issues but found the presentations on educational programs informative and changed my perspective. As well, Mark Hall's talk on process was very informative.
- Similarities and differences between communities
- How many of the topics have touched my past life as a biologist. One way gates and jump-outs are new things despite the fact that I have worked in wildlife collisions.
- All the issues being faced in the different communities and their approaches to it. I thought I knew a lot about these issues but I still learned so much.
- The breadth of topics and strong links between ecological and sociological issues.
- The common link between many organizations and agencies
- Encouraging to see us move from bear awareness to wildlife in general
- Similar issues in many areas and creative ideas to work with.
- New approaches and strategies to address urban wildlife conflict, but also to see the similar good work being done by others, we are on the right track.
- New mitigation methods, new research
- Learning the interconnectivity of our problems
- The collaboration between landowners, conservation committees, researchers, etc. to form solutions for urban wildlife.
- Wildlife spatial data, biology involved in wildlife management

- Experiences of other municipalities in meeting their urban wildlife challenges. Electric fencing talk was good. Proctor talk was good.
- I was very impressed by the highly-proactive activities that many communities in BC are taking in dealing with urban wildlife issues. I am also very impressed by the community approaches in finding management solutions.
- Process *vs.* implementation and why this works well
- Social marketing, structured process to problem resolution, Mike Proctor's stepping stone model.
- Loved the diversity of information
- The use of social media and Mark Hall's talk on urban wildlife problem solving
- Diversity of approaches to addressing wildlife conflicts
- All the trials and successes that others have tried and reported = tools for me to use.
- Research that has now been applied
- The problems of urban wildlife
- Urban ungulate issues, issues with geese.
- A little of everything, it was a valuable conference. I now have stuff for my personal interest, for my teaching, for teaching projects with other instructors, and for projects with the city.
- Just what everyone else is doing, do's and don'ts. There are many issues in many communities
- Importance of managing human wildlife conflicts, various tools available for management, tips/process of problem solving.
- Hearing case studies for rabbits, bears, etc.
- Active programs and ways to mitigate human–wildlife conflicts, specific organizations and initiatives to look to for assistance, also great info on the pros/cons of social media as used to convey conservation messages.
- Loved learning about case studies of conflict management and potential tools for conflict resolution
- What various communities are doing, scientific case studies re: coyotes in Calgary, deer in Winnipeg, importance of managing attractants. Education how-to's. Commonalities among problems in different cities and species.
- Issues in other areas compared to the ones we have in our community and how they are handled.
- Research techniques being used to drill down to what really are the issues and the pro-active planning of Prince George and Canmore. Education program of WildSmart in the Bow Valley

- Hints and tips at the end of the conference was a wonderful idea. Dogs used as aversion management. That urban wildlife corridors are seen to attract wildlife into town rather than facilitating safe movement into traditional use areas of wildlife. That urban native vegetation is seen to attract wildlife while exotic planting is such a problem for invasive species issues.
- Process is required for establishing urban wildlife management committees. And about bats!
- Biological overview of deer was useful. Integration of urban wildlife and land use. Canine deer hazing. Post-cull meat usage.
- Blaire's elk management talk was fascinating
- How hard it is to manage the people
- The innovative things that are being developed to learn about why things are happening. Also innovative actions to help to change some human behaviour that has caused the human–animal conflicts.
- The magnitude of conflicts with multiple species

4. The papers presented at this conference were the result of a Call for Papers. If we run a sequel to this conference, what topics would you like to see included? Can you suggest someone who can speak to these topics?

- More non-ungulate/bear talks, for example promoting and monitoring wildlife in backyards such as reptiles, amphibians, rare birds.
- Ben Long. WildSmart – more on people management. Dr. Mackenzie-Mohr. Andreas Comeau, Canmore, on how the bear-proof bins really work.
- Carnivore management in isolated communities such as Gulf Islands where, for example, a bear or cougar has written its own death certificate by landing on the island.
- How to communicate with urban wildlife stakeholders and community members in tone, language and through outlets which are most effective to make the message understood by all, specifically to the different age groups and demographics. Not everyone is online and how to adapt the same message for those different demographics in language and tone they will understand. Colleen Bailey's comment and she would offer to speak to this.
- I would like to see a bi-annual cougar conference, would like to have seen cougars included in this conference and more on coyotes. More on social media successes and failures, how to use it, what's best, why it is important.
- Topics could include beavers, non-lethal management. Role of advocacy groups, how can they help cities, work with cities. First Nations perspective.

The effectiveness of culls, do they work for the long term? Overview of laws related to wildlife, provincial *vs.* municipal.

- Would like to see more detailed presentations on communication strategies for wildlife issues. What kind of messaging. Also info on coalitions built between organizations, stakeholders, communities in implementing strategies.
- More case studies
- Translocation of urban deer and elk. Fertility control of urban deer/elk. Lethal control of urban ungulates. Lessons learned regarding urban ungulate management programs over the long term.
- More of the same, feature solutions.
- Ghert – Chicago urban coyotes. American challenges, what can we learn from them.
- Follow-up on projects we heard about, e.g. geese and deer culls. More info on the pitfalls and bonuses of social media for getting the message out and combatting the groups that have a head start on using these technologies. How to "sell" the lethal removal of problem wildlife.
- Transportation and wildlife
- Animal and plant invasive species management, similar presentations as at this conference.
- Conference with a focus strictly on urban deer. The info in this conference was diluted by other species.
- Management of smaller animals such as beavers, ground squirrels, racoons.
- Evaluation of community based education programs.
- An annual or bi-annual urban wildlife conference would be useful to track results from projects.
- I enjoyed the diversity of topics resulting from the Call for Papers. Perhaps Colleen Cassidy St. Clair, U of Alberta. Riparian management.
- Keeping a human dimension to wildlife approach/focus is key. Integrate the social and the biological for success.
- Want follow up to see success of current projects
- Have some of the landowners or community members available to speak from their perspective, a panel?

5. Do you have suggestions for Columbia Mountains Institute conferences and courses on other topics?

- How to effectively get messages from the research to the public and the policy makers?
- How to get better community engagement

- Occupancy modelling using non-invasive measures.
- Landscape change in long term and mitigations to return to historical range of variability.
- New methods of wildlife research.
- Habitat and species restoration
- Challenges and successes of eco-tourism
- Landscape ecology and related wildlife issues
- Human dimensions and community based social marketing courses
- Education messaging/communication, wants longer workshops within conferences to get more in-depth
- Course on non-lethal approaches to urban wildlife conflicts
- Public relations training for people who work with wildlife and manage wildlife
- Cougar specific conference every 2-3 years.
- RISC standards
- Urban ecology
- Wildlife conflict management
- Need to brainstorm how to get bear-proof bins.
- Community based social marketing / social media training.
- Media training for natural resource managers
- Online and free mapping tools.

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